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DEPARTMENT OF THE PREMIER OF SARAWAK

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PETRA JAYA,
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FINAL REPORT

SRI AMAN MASTER PLAN

2020 - 2030

SRI AMAN DEVELOPMENT PLAN

B

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STEERING COMMITTEE

- State Secretary of Sarawak as Chairperson
- State Attorney-General's (SAG);
- State Financial Secretary's Office (SFS);
- Deputy State Secretary (Economic Planning and Development);
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- Permanent Secretary, Ministry of Education, Innovation and Talent Development Sarawak
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- Permanent Secretary, Ministry of Tourism, Creative Industry and Performing Arts Sarawak
- Permanent Secretary, Ministry of International Trade, Industry and Investment Sarawak
- Permanent Secretary, Ministry of Transport Sarawak
- Sri Aman Resident;
- Other relevant Agencies to be invited based on needs.
- Economic Planning Unit as the Secretariat.

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- Secretary, Sri Aman District Council
- General Manager, Sarawak Land Consolidation and Rehabilitation Authority (SALCRA)
- General Manager, Land Custody and Rehabilitation Authority (LCDA)
- Chief Executive Officer, Housing Development Corporation (HDC)
- General Manager, Sarawak Tourism Board (STB)

- General Manager, Sarawak Multimedia Authority (SMA)
- Chief Executive Officer, Sarawak Biodiversity Centre (SBC)
- Chief Executive Officer, Sarawak Energy Berhad (SEB)
- Economic Planning Unit as the Secretariat.

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- Centre of Technical Excellence (CENTEX)
- I-Cats University College
- Sarawak Department of Labour
- Sarawak Museum Department
- Sarawak Craft Council
- IADA Batang Lupar
- Sarawak Disaster Management Committee
- Fire and Rescue Department Sarawak
- Sarawak RELA Office
- Sarawak Malaysian Civil Defence Force
- Sarawak Contingent Police Headquarters
- Giatmara
- Institut Latihan Perindustrian (ILP) Miri
- Institut Kemahiran Belia Negara Miri
- Sarawak Education Department
- Department of Marine Fisheries (Biosecurity Section)
- Inland Fisheries Branch, Department of Agriculture
- Batang Ai Ecofish Sdn. Bhd.
- Supreme Cold Storage Sdn. Bhd.
- Persatuan Nelayan Kawasan Sebuyau
- Persatuan Nelayan Kawasan Layar Rimbas / Pusak
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PART 1 INTRODUCTION

The Sri Aman Master Plan Study 2020-2030 (SAMP) was commissioned to guide the development planning of the Sri Aman Division. To this end, the SAMP was expected to make recommendations on strategic direction and focus areas to accelerate and achieve sustainable as well as balanced spatial and socio-economic development for the Sri Aman Division within the span of ten years.

Volume B provides an in-depth analysis and description of the “Sri Aman Development Plan.” It focuses on defining the various frameworks to be implemented throughout the development of this Masterplan from its conceptual inception to the eventual implementation of the projects to fulfil the goals set for the Sri Aman Division. It highlights different aspects of the developmental plan, including the economic framework, sustainable development framework, prioritize key projects, financial analysis, and economic assessment. This volume guides how various strategies and frameworks conceptualized for this master plan help reinvigorate the Sri Aman Division and transform the living standard of her people while ensuring sustainability.



Figure 1-1: Components of the Development Plan

Source: UNIMAS Holdings, Daya Rancang and Frost & Sullivan

SECTION I.I STUDY APPROACH: SURVEYS AND OTHER BASELINE DATA

This volume constitutes the Development Plan, setting out the strategies, projects, and initiatives that are designed to stimulate development and growth for the Division. High priority projects are identified and recommended to be implemented in the immediate, medium, or long term based on financial analysis and feasibility studies. These high priority projects are designed to bring about impacts and achieve outcomes that reflect local, state, and national aspirations and development targets.

Based on the expected output of the SAMP study, baseline data and findings gathered from field research and surveys were analysed to benchmark and develop key performance indicators (KPI). At the outset, there was a need to define the economic drivers to help direct Sri Aman’s economic, social, and environmental development as well as formulate strategies to accelerate the growth of human capital development and productivity in the region. In this regard, it is critically important to consider strategic positioning in the formulation of economic and spatial development plans that adhere to the time frame. Additionally, there must also be financial and feasibility assessments for each project and programme proposed.

SECTION 1.2 STRUCTURE OF THE REPORT: VOLUME A · B · C

The SAMP Study report is comprised of three volumes: Volume A - Background and Analysis, Volume B - Sri Aman Development Plan, and Volume C – Sri Aman Detailed Projects. The Executive Summary section serves to provide an overview, highlighting important findings and recommendations from these three volumes primarily to address the expected output of this SAMP Study as indicated earlier. The following table serves to indicate the connection between the expected output of the SAMP Study and the relevant volumes of the Final Report.

Expected Output of the SAMP Study	Relevant Volumes of the Final Report
(i) Overview of Baseline Data	Volume A
(ii) Strategic positioning and Socio-Economic Development Plan	Volume B
(iii) Strategies for human capital development	Volume B
(iv) (iv)A GIS-based concept plan to articulate the development of transportation and logistics system, infrastructure and utilities, land use zoning as well as conceptual master plans for towns and important settlements	Volume B Appendix (Maps)
(v) Maps showing the general land use, land titles but not land ownership	Volume B Appendix (Maps)
(vi) Implementation plan of programmes and projects according to time frame	Volume B
(vii) Pre-feasibility studies and commercial viability of proposed projects and its sub-components for the purpose of funding by private sectors	Volume B
(viii) Sri Aman Detailed Projects	Volume C

Additionally, each volume of the Sri Aman Master Plan Study is not independent of each other and will require a reading of volumes A, B and C in their entirety to have a proper understanding of this report.

1.2.1 Introduction for Volume A

Volume A covers the 'Background and Analysis' of the report. This study has considered the various development plans in the region and used data collected from several agencies, including critical input from SADA. The baseline data is essential as it provides a comprehensive background and description of the past and current situation of the Sri Aman Division as well as providing a clear understanding of Sri Aman within a regional context. The information also helps with understanding the circumstances surrounding the various sectors and industries within and around Sri Aman. It also provides an understanding of the socio-economic trends affecting the region. These inputs facilitate our formulation of strategies for the development of the Masterplan.

I.2.2 Introduction for Volume B

Volume B provides an in-depth analysis and description of the “Sri Aman Development Plan.” It focuses on defining the various frameworks to be implemented throughout the development of this Masterplan from its conceptual inception to the eventual implementation of the projects to fulfil the goals set for the Sri Aman Division. It highlights different aspects of the developmental plan, including the economic framework, sustainable development framework, prioritize key projects, financial analysis, and economic assessment. This volume guides how various strategies and frameworks conceptualized for this master plan help reinvigorate the Sri Aman Division and transform the living standard of her people while ensuring sustainability.

I.2.3 Introduction for Volume C

Volume C provides a detailed list of projects proposed for the Sri Aman division. This volume of the Masterplan explains in greater detail the purpose of every project proposed and how they will impact their respective sector in the Sri Aman Division. It will also help inform how the various projects will need to be implemented within each sector and how each project is prioritized within the Sri Aman Masterplan.



PART 2 SAMP OVERVIEW

SECTION 2.1 VISION, GOALS, AND STRATEGIES

The Sri Aman Master Plan calls for innovative development and economic activities that will bring about desired changes in Sri Aman. This plan has identified strategies, projects and programmes that will facilitate the change and impact the livelihoods of the people by creating jobs and increasing income. SAMP will ensure the national vision of “shared prosperity” is achieved.

2.1.1 Vision

The overarching vision is for:

A graphic with a dark blue background. On the left, there is an orange square containing the year '2030' in white. Below the year is a white icon of a hand holding a small green plant. To the right of the orange square, the text reads: “A prosperous, sustainable, and competitive Sri Aman” in white, with the words 'prosperous', 'sustainable', and 'competitive' highlighted in yellow, blue, and green respectively.

- ❖ **Prosperous**
With the implementation of economic projects and programs, wealth will be created- with increased wealth, income of the residents will be increase in line with the increased in Division’s.

- ❖ **Competitive**
Sri Aman shall be competitive in its endeavor for economic development. Competitive in pricing of products and services. Competitive in its human resource pool.
- ❖ **Sustainable**
Economic activities shall be environmentally friendly and sustainable. Existing natural environmental functions shall not be compromised and traded total commercial benefit.

2.1.2 Performance Indicators

There are several key performance criteria that will need to be met in order to achieve this vision and these relate to:

- (i) Household income in comparison to other Divisions;
- (ii) Improvement in community values and lifestyle;
- (iii) A rapid shift towards a digital economy;
- (iv) Communications and transport connectivity which underpin the development initiatives;
- (v) Liveability principles are applied in the planning and development of townships and supporting infrastructure;
- (vi) The potential of women and youth are realized.

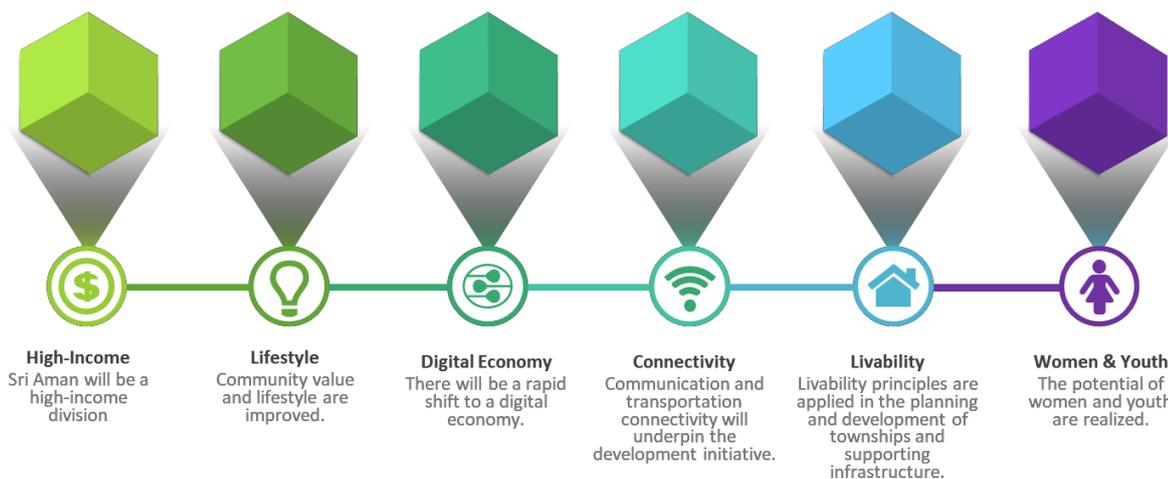


Figure 2-1: Performance Indicators for SAMP

Source: UNIMAS Holdings, Daya Rancang and Frost & Sullivan

2.1.3 Overarching Strategies

From a socio-spatial perspective, the development of the Sri Aman Division as a single entity will require the provision of resources, services, and facilities throughout the Division as a whole.

From an economic development perspective, the development of a master business model/ business canvas for the development of the Sri Aman Division will require a sectoral business model that would guide economic development with a view towards synergy among implementing agencies and investors based on value propositions.

2.1.3.1 Critical Components

The successful progress of the Sri Aman Division will be dependent on the following critical components:

2.1.3.1.1 High Quality and Extensive Communication Facilities

The aim is to provide at least 95% of the population with access to digital communications through mobile phone connection, Wi-Fi, or landlines. It is essential that this coverage is adequate for the population to access the internet for both business and social purposes. This will place Sri Aman Division at the forefront of Digital Technology in Sarawak.

The improved connectivity will mean that people will be able to undertake banking, marketing, council transactions, and other business activities on-line. It will reduce the demand for more physical resources such as having banks and Council offices in each and every township.

2.1.3.1.2 Good Quality Road Connections to All Significant Settlements

Well developed roads would allow more people to move more easily from their previously isolated location to locations where they can access important services such as hospitals, schools, and other institutions. It enhances the opportunities to bring products direct to market at minimum cost.

Additionally, better quality roads would better afford the opportunity for a well patronized public transport system. This can be built around transporting children to centralized schools strategically located to service a number of settlements.

In locations where roads are not as practical, existing transport systems should be enhanced and improved so that connectivity will be improved for all those in the Division.

2.1.3.1.3 Agricultural Development of Sri Aman's Land Resources

Agricultural development will be a key component towards the future development of the region. Matching appropriate crops to the soil and taking into account terrain limitations will be crucial. Additionally, a transition to higher value crops, or secondary processing of traditional crops would help in achieving better profitability.

The Sri Aman Division could also spearhead a move towards agricultural mechanization, by alienating a suitable parcel of land and developing it with intensive agriculture. One of the crops being considered for this approach is paddy – not necessarily for its economic value, but strategically for the benefit of the State's and Nation's food security.

2.1.3.1.4 Tourism Development Based on Natural Assets and Heritage

The long-term prospects for tourism at Batang Ai are positive. Interest in ecotourism is growing worldwide and there is a growing interest in the great outdoors amongst Sarawakians. Batang Ai's excellent tourism resources can support a wide range of activities. Additionally, tourism can also be dispersed over a wide geographical area at Batang Ai. There is also potential to develop lake tourism.

The presence of a significant population of orangutans in the Ulu Sungai Menyang landscape presents opportunities for expanding low volume, high margin orangutan tourism. Gazetting the Ulu Sungai Menyang landscape as a national park or different category of conservation area could provide a boost to tourism and give Sarawak positive media coverage around the world.

The future of Batang Ai's tourism sector is highly dependent on the conservation of the natural habitat. Development of large-scale agriculture (e.g., oil palm) and / or logging activities have the potential to impact negatively on tourism at Batang Ai and have a significantly impact on the income that local communities receive from tourism. In contrast, if the natural environment is preserved and well-

managed, Batang Ai will continue to be one of Sarawak's most important tourism destinations for decades to come.

2.1.3.1.5 Major Service Institutions Such as Hospitals, Schools and Training Centres

These are to be strategically planned and located based on the specific population served. They will need to be large enough to attract quality staff to provide the required services.

2.1.3.1.6 Electricity Must Be Available 24/7 In All Settlements

With the Sri Aman Division, via the Batang Ai HEP, providing a large proportion of Kuching's electricity, it is only right that the population in this division have universal access to reliable electricity.

2.1.4 Development Thrust

The capacity for geographical and digital connectivity through improvement in transport, and information and communications (ICT) infrastructure are an important development thrust that needs to be fully leveraged in order to realise the vision, goals and objectives for Sri Aman as a region. It is acknowledged that development thrust is multifaceted. As such, improvements in ICT connectivity, trade and transport connectivity, as well as people-to-people connectivity would, in the medium to long term, narrow the gaps and disparities in the region especially between urban and rural areas. Such connectivity would necessarily involve both physical and non-physical interactions at various spatial scales, including across the border with Kalimantan.

2.1.4.1 Connectivity and the SDGs

The development thrusts focused on improved connectivity would support economic, environmental and social links between rural and urban areas in the Sri Aman Division. Within the context of the SDGs, this would result in important benefits in relation to SDG 8, which calls for sustained, inclusive and sustainable economic growth through employment and access to work. Improved road networks will enable faster and safer access to markets, jobs and other economic and social activities, which will provide significant socio-economic benefits to rural communities. Such road networks will improve income generation and farmers' livelihood activities. It is envisaged that better rural-urban linkage will lead to stronger agricultural productivity; essential for achieving SDG 2, which promote sustainable agriculture. SDG 10 - reduced inequalities pertaining to mobility and migration; and SDG 11 – sustainable cities and communities are other important goals that could be achieved based on both physical and non-physical connectivity.

2.1.4.1.1 Physical Connectivity

In the context of the link between urban and rural areas in the Sri Aman Division, the current emphasis on building better transport infrastructure and other projects aimed at greater rural-urban connectivity should improve the efficiency and volume of economic activity in rural parts of the Sri Aman Division. Notably, most rural communities in the Sri Aman Division depend on agriculture (including crops, livestock, fisheries) for subsistence and to some extent, income generation. As a component of generating economic activity, rural connectivity plays an important role for poverty reduction and improving quality of life. However, without investment in sustainable and affordable public transport taking into consideration the needs of the rural population they are likely to remain disadvantaged in terms of connectivity, with benefits only reaching the more socio-economically advantaged households (in the urban areas). Connectivity and development do not have a simple causal relationship and for these other forms of interventions need to be introduced. These interventions should initially minimise and in the medium to longer term remove structural constraints such as market structures and relations,

traditional culture and practices, commercialisation and poor access to enabling resources. These interventions should address issues related to lack of skills, information, organization, and understanding of market operations.

2.1.4.1.2 Non-Physical Connectivity

With respect to non-physical connectivity, overcoming infrastructure access barriers and digital inclusion is a complex phenomenon because the challenges faced even in a connected society do not end when people overcome access. On the contrary, when connectivity is provided, psychological and sociocultural barriers emerge. In the case of the Sri Aman Division, internet access through broadband adoption would stimulate the possibility of home businesses, increases community attachment, and would potentially overcome geographic isolation. Although individual-level factors may influence the subsequent level of internet penetration and adoption, it is necessary to recognise and address digital inclusion as a multidimensional issue by including the sociocultural and demographic aspects of the people of Sri Aman Division. Inevitably, one of the main factors that would hamper the technological development of rural communities in the Sri Aman Division is their geographical and demographic characteristics. The high proportion of ageing population in the rural areas of the Sri Aman Division may still result in low levels of digital media engagement. Inevitably these levels of engagement will improve over time, with the rate of adoption being the unknown factor. Importantly these digital connection facilities will provide the opportunity for a shift in the demographic mix in the region as younger people are less inclined to migrate from the area to achieve or maintain their aspirations in the digital world.

SECTION 2.2 SPECIAL DEVELOPMENT AREA PROJECTS

The Sri Aman Master Plan has a comprehensive range of proposed development projects covering the geographic area, economic sectors, and communities.

Amongst these projects are some key catalytic initiatives that will be instrumental in driving the development in the division. These are summarized here and outlined in detail in this report and in Volume C.

2.2.1 Gunung Lesong-Lingga Tourism Precinct

Gunung Lesong is a site with tremendous tourism potential but is currently very difficult to access. It is known to be the habitat of the endangered orangutan.

The plan is to protect the valuable environmental flora and fauna at the site and provide facilities to allow nature tourism to be undertaken. Access will be provided by a number of new roads and upgrading existing roads.

Importantly these road initiatives will create a 'tourism loop' that will encourage multiple day visits to the area, covering Pantu town, Gunung Lesong, Banting historical precinct, Lingga Town, Batang Lupar riverside road with outlooks to Pulau Seduku, visits to rural villages, and eventually to Simanggang Town.

This is demonstrated in Figure 2-2.

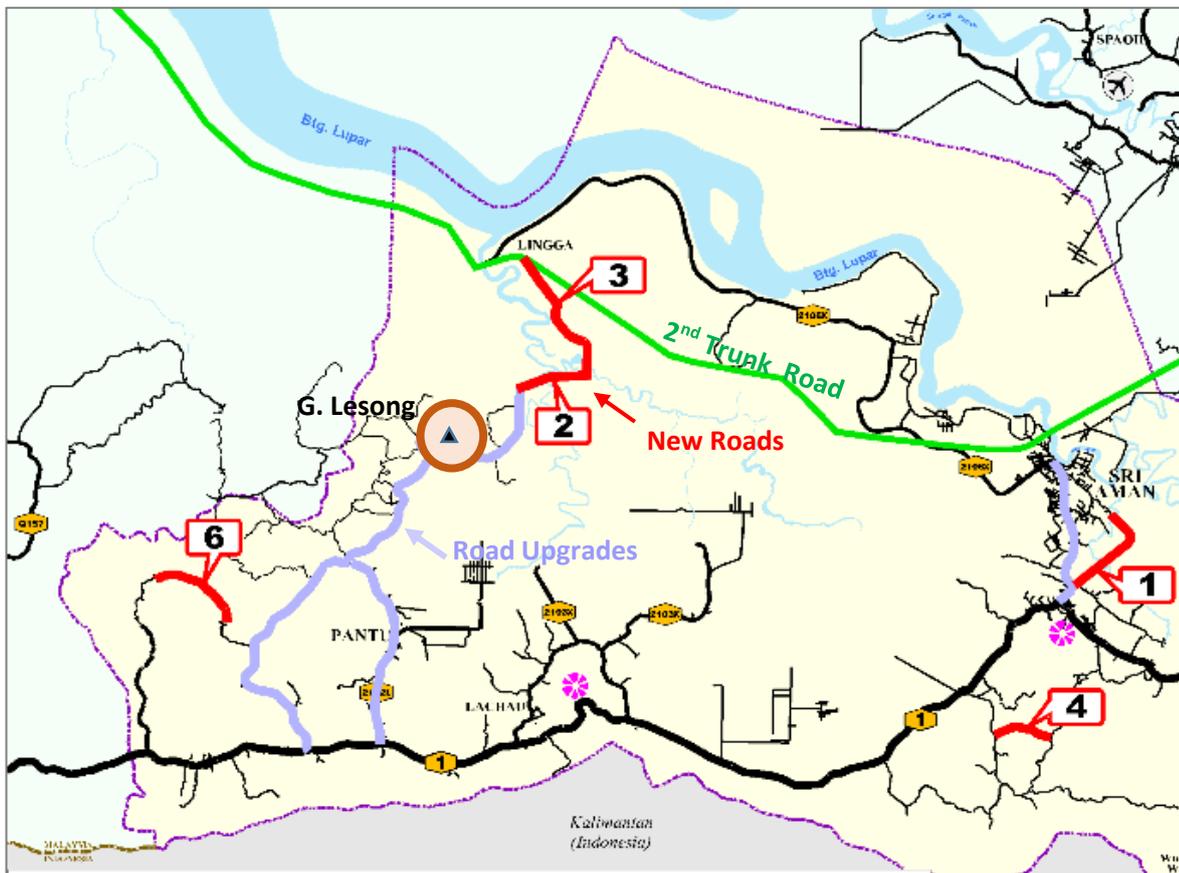


Figure 2-2: Loop Road Opening Up Gunung Lesong Area

Source: UNIMAS Holdings

The Gunung Lesong-Lingga Ecotourism development will initially focus on building park HQ facilities, community-managed accommodation and improving accessibility and facilities. The proposed arrangement at the site is shown in Figure 2-3 and Figure 2-4.



Figure 2-3: Gunung Lesong NP Showing New Tourism Facilities

Source: UNIMAS Holdings



Figure 2-4: Proposed Facilities at Entry to Gunung Lesong NP

Source: UNIMAS Holdings

Tourism Tours & Packages

Upon completion of the new access roads and tourism facilities (Kampungstay, trails, campsites, etc.), a range of tours and packages of the Gunung Lesong area will be possible. Listed below are ten suggested tours and packages that will be possible when the planned projects and access roads are complete. Tour operators and ground handlers in Sarawak will undoubtedly create their own tours and packages based on their client needs.

Sample Tours & Packages for Gunung Lesong-Lingga Ecotourism Cluster

No.	Tour Package	Itinerary / Description
1	Gunung Lesong Summit Climb 3D2N	<p>Day 1: Depart Kuching, arrive at Gunung Lesong. Early lunch at the Kampungstay near Munggu Sawa / summit trail. After lunch, trek to the 'prayer hut'. Settle into camp, swim in waterfall. Dinner and overnight at camp.</p> <p>Day 2: Breakfast in camp, then begin trekking to the summit. Arrive at summit, enjoy the view and picnic lunch before beginning descent. Arrive back at the Kampungstay at base of trail, check in. Dinner and overnight.</p> <p>Day 3: Breakfast and time to enjoy the surroundings, swim in river and visit the Cultural Centre. Lunch at Kampungstay before returning to Kuching.</p>
2	Gunung Lesong Orangutan Trek 3D2N	<p>Day 1: Depart Kuching, arrive at Gunung Lesong. Settle into the campsite near Kpg Menuang. Lunch in camp. After lunch going trekking on the Menuang-Langgir trail. Dinner and overnight at camp.</p> <p>Day 2: After breakfast go trekking in search of orangutan and visit a waterfall. Lunch on the trail. Return to camp late afternoon.</p> <p>Day 3: Morning trek to search for orangutan. Lunch in camp before returning to Kuching.</p>
3	Gunung Lesong Discovery 3D2N <i>(2D1N version of this tour is also an option)</i>	<p>Day 1: Depart Kuching, arrive at Gunung Lesong and check into at Kampungstay near Munggu Sawa / summit trail. After lunch, take a boat to Banting and visit the historic church. Return to Gunung Lesong late afternoon. After dinner, go on a crocodile watching tour on the Sungai Seterap.</p> <p>Day 2: After breakfast go trekking in the park and visit a waterfall. Return to the Kampungstay for lunch. Afternoon, visit the Cultural Centre.</p> <p>Day 3: Free at leisure to enjoy the river and jungle surroundings near the Kampungstay. After lunch return to Kuching</p>
4	Gunung Lesong-Banting-Lingga-Simanggang Loop 4D3N	<p>Day 1: Depart Kuching, arrive at Gunung Lesong. Settle in to Kampungstay near Munggu Sawa. After lunch go trekking in the park. Late afternoon, visit the Cultural Centre.</p> <p>Day 2: Drive to Banting and visit the church. Check in to Banting Kampungstay and have lunch. Afternoon free to explore the village. After dinner go on night cruise to search for crocodiles.</p> <p>Day 3: After breakfast, visit a local farm then proceed to Lingga for a seafood lunch in the old Bazaar. After lunch proceed to Seduku jetty (or another site along the Lupar River) to see the Tidal bore (time dependent). Arrive in Simanggang and check into your hotel.</p>

No.	Tour Package	Itinerary / Description
		Day 4: Visit the Fort and Sri Aman Cultural Centre in the morning. After lunch return to Kuching.
5	Rewilding Gunung Lesong Volunteer Packages	It should be possible to offer a range of volunteer packages linked to the tree planting project. These programmes could vary in length from 2-3 days to 1-2 weeks. Volunteers would stay at the Kampungstay or campsites and participate in tree planting activities with the community. Various tour options could also be included in the volunteer programme.
6	Lingga-Banting 2D1N	<p>Day 1: Drive along the coastal road from Kuching to Lingga. Seafood lunch in Lingga Bazaar. Then drive to Banting and check into the Kampungstay. Tour the historic village and church. Evening, go on night cruise.</p> <p>Day 2: After breakfast drive to Gunung Lesong. Go trekking in the park and have lunch at the Kampungstay. Visit the Cultural Centre and return to Kuching.</p>
7	Lingga-Banting-Gunung Lesong Summit 3D2N	<p>Day 1: Drive along the coastal road from Kuching to Lingga. Seafood lunch in Lingga Bazaar. Then drive to Banting. Tour the historic village and church. Continue to Gunung Lesong, check into Kampungstay at the base of summit trail.</p> <p>Day 2: Early breakfast and begin summit trek. Arrive at summit and enjoy the views. Packed lunch at summit. Then begin descent and return to the Kampungstay. Dinner and overnight at the Kampungstay.</p> <p>Day 3: Free at leisure to enjoy the river and jungle surroundings near the Kampungstay or visit the Cultural Centre. After lunch return to Kuching</p>
8	Lingga-Simanggang 2D1N	<p>Day 1: Drive along the coastal road from Kuching to Lingga. Seafood lunch in Lingga Bazaar. Then proceed to a lookout point on the Lupar River to watch the tidal bore (time dependent). Continue to Simanggang town.</p> <p>Day 2: Tour of the fort and Sri Aman Cultural Centre. After lunch returning to Kuching.</p>
9	Sri Aman Experience 4D3N	<p>Day 1: Depart Kuching (or Batang Ai) and travel to Simanggang. After lunch, visit the Fort and Sri Aman Culture Centre. Watch the tidal bore arrive (time dependent). Overnight in Simanggang.</p> <p>Day 2: Drive to Lingga and have seafood lunch. Continue to Banting and check into the Kampungstay. Tour the village and church. Evening night cruise to see crocodiles.</p> <p>Day 3: After breakfast proceed to Gunung Lesong. Visit the Cultural Centre and then check in to the Kampungstay. After lunch go on short trek.</p> <p>Day 4: Morning at leisure to enjoy the river and jungle surroundings. After lunch return to Kuching.</p>
10	Gunung Lesong Day Trip	Depart Kuching and drive to Gunung Lesong. Visit the Cultural Centre and then proceed to Kampung Menuang. Have lunch at the campsite. Then go on a trek and visit a waterfall. Late afternoon, return to Kuching.

2.2.2 Specialty Rice Farms

Rice is a strategic crop in Malaysia due to it being a staple food with a high dependence on importation to meet local demand.

This rice project will be developed in the Pantu District where about 6,000 ha of land is found suitable for wet paddy cultivation. With suitable irrigation development, these areas can be made suitable for double cropping of paddy.

The project will be dedicated to the production of specialty red rice for processing & export with companies such as Nestle as Anchor Company under the Contract Farming Scheme.

It is expected to be able to achieve average paddy yield of 5 mt/ha. This would result in production of 60,000 metric tonnes of paddy once fully developed. This alone will be a 30% increase in Sarawak's rice production, and significantly enhance its self-sustainability index for this staple crop. This project will also complement other rice paddy projects being developed along the Batang Lupar.

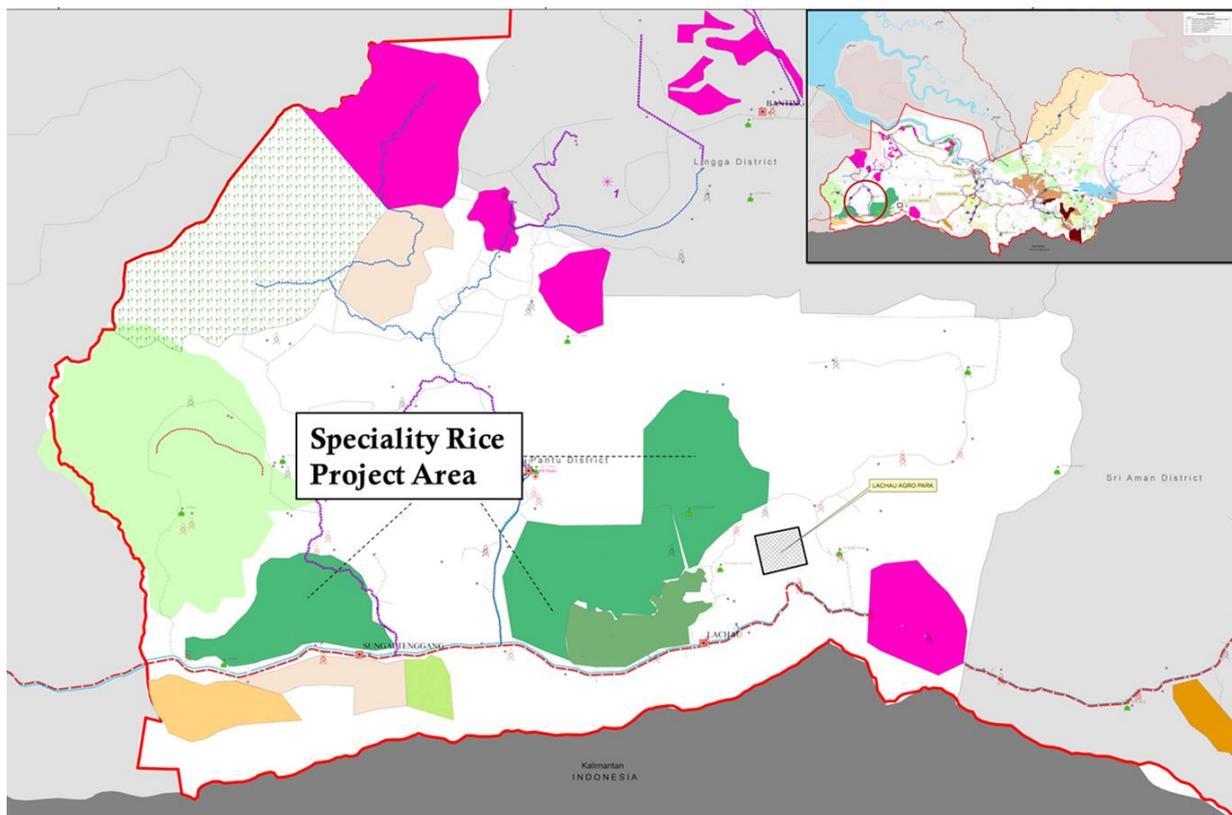


Figure 2-5: Proposed Specialty Rice Farms

Source: Daya Rancang

*Notes: Base map source from UNIMAS Holdings

2.2.3 Batang Ai Plan for Aquaculture and Tourism Expansion

Batang Ai's natural assets - the rivers, rainforest, wildlife, and lake - provide a solid foundation for the sustainable expansion of both the aquaculture and tourism industries. With regards, to conservation, biodiversity, and tourism, the wider Batang Ai region has the potential to become Sarawak's equivalent of Danum Valley (Sabah). In the future Batang Ai will be known as a leading center for rainforest field research and a destination that showcases the Borneo rainforest and wildlife (including the iconic orangutan). Additionally, the lake is currently an underutilized tourism asset. Long term there is potential to develop lake tourism. The clear waters of the lake are also the main location for Sarawak's expanding aquaculture industry.

Recommendations for tourism include:

- Setting aside lakeside land for future tourism development (a Lake Tourism Zone)
- Continued promotion and support for existing nature- and culture-based tourism products and community-based tourism activities
- Promotion of recreational fishing in the lake
- Promotion of lake-based events & festivals
- Development of agro-tourism products and 'farm-to-fork linkages' e.g. (fish restaurant, fish farms tours)
- Expansion of protected areas (gazetting Batang Ai NP extensions & Ulu Sungai Menyang landscape) to safeguard these world class ecotourism assets and allow for future expansion of low volume, high yield ecotourism
- Market feasibility study on float plane service to Batang Ai
- Lakeside campsite targeted at domestic tourists
- Improved river transport to assist local communities and ensure safe boat travel for tourists (debris removal, fuel station at lakeside, etc.)
- Maintenance of the existing tourist jetty and reception area
- Renovation and upgrading of the existing Longhouse Resort to better match the needs of today's travellers

Batang Ai's inland fisheries industry is set to expand with the lake having the capacity to accommodate around 24,000 fish cages.

Recommendations for fisheries include:

- Expansion of fish cages in an 'aquaculture zone' covering most of the western side of the lake
- A new fish landing area separate from the public jetties
- A new bio security control point and laboratory
- A fisheries processing and packaging centre
- Greater use of smart farming systems and remote monitoring and management

The proposals for Batang Ai are shown in Figure 2-6.

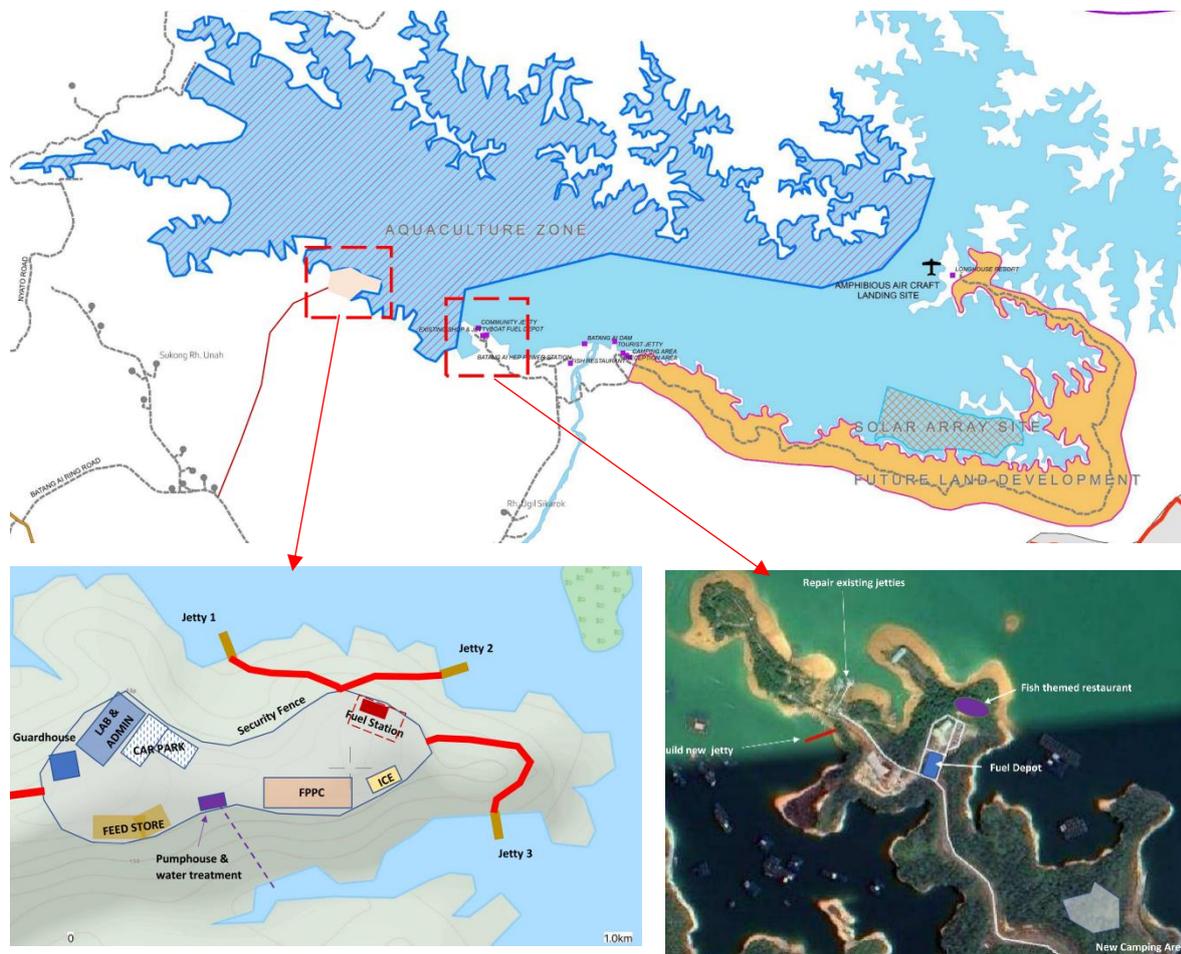


Figure 2-6: Batang Ai Proposed Programs

Source: Daya Rancang

2.2.4 Rainforest Field Studies Centre at Batang Ai National Park

It was proposed to establish a Rainforest Field Studies Centre at the southern end of the Batang Ai NP. This will have several advantages:

- It will promote the ecological assets of the TPAs
- It will facilitate a higher level of environmental research in Sarawak, and complement courses at local universities
- It will make the area more attractive as a tourism destination
- It will target the high yield SAVE (Scientific, Academic, Volunteer & Education) Tourism niche
- It can provide a training facility for government officials involved in managing the Park.
- It will provide a presence in the BANP that will discourage illegal activities in the area (hunting, logging)
- It will provide new opportunities for employment or business for people from the local villages.
- It will provide the opportunity to improve data collection and reliability from the area.

The proposed location for the Field Studies Centre would be very remote, which would be an advantage for its function. However, it also represents a challenge in terms of access and maintaining the facility.

We recommend that the pristine amenity of the site should be maintained as far as possible. A minimal area should be cleared to allow for the construction of buildings. The buildings can be distributed amongst the existing forest but kept in close proximity. Separate buildings will be provided for a develop

research center / laboratory, office / management area, rangers house, communal kitchens / gathering area, sleeping quarters, shower, latrine.

All materials should be brought in by helicopter (the river is likely to be too shallow to transport materials). Local timbers may be selectively cut and used for the buildings.

The research center should be marketed internationally, and users expected to pay their way (suggested charge = RM1,000/person/week). Room rates and other fees for the Centre would be similar to established field centers in Sabah (e.g. Danum Valley, Imbak Canyon)

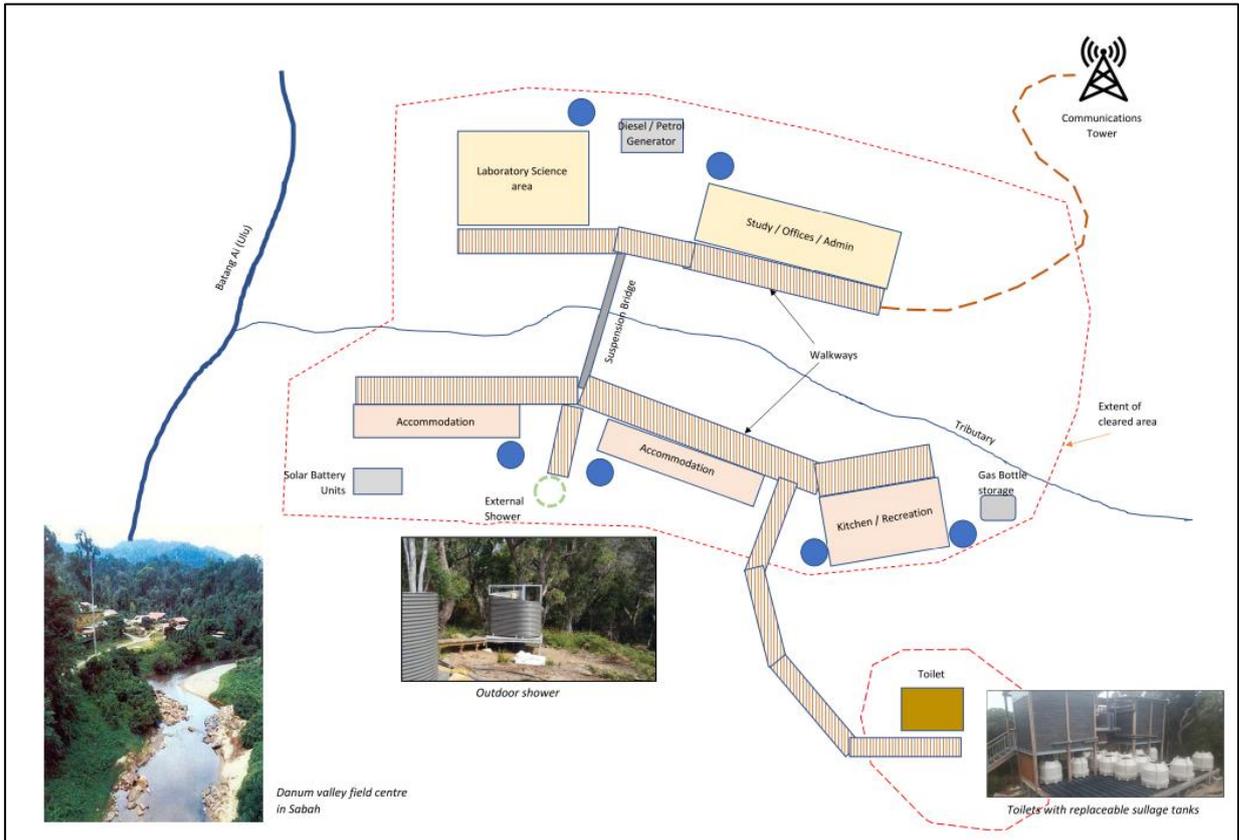


Figure 2-7: Proposed Field Studies Research Centre at Batang Ai NP

Source: Frost & Sullivan

2.2.5 Development of Temudok as Agro Processing and Industrial Hub

Temudok is located near the junction of the Pan Borneo Highway and the main feeder road to Simanggang. It is central to the whole Sri Aman Division, both geographically, and in terms of transportation routes.

It is only 12 kilometres from Simanggang, the Division capital. Thus, there will be good access to a substantial workforce, for which it will create many employment opportunities, particularly for skilled and semi-skilled workers.

It is proposed to use this strategic advantage to make Temudok a hub for development activities in the region. A proposed land use plan is shown in Figure 2-8.

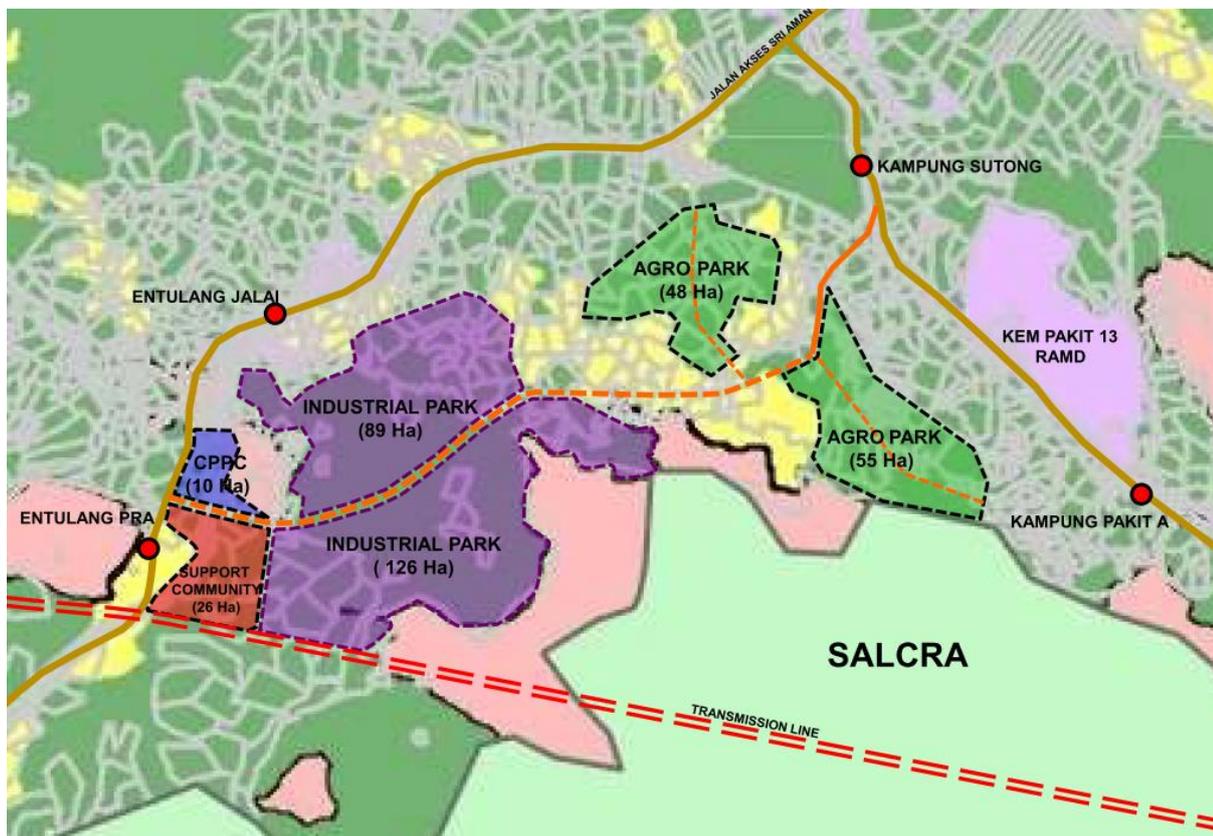


Figure 2-8: Proposed Land Use Layout Plan for Temudok

Source: Frost & Sullivan

2.2.5.1 Crop Processing and Packaging Centre (CPPC)

There will be a new CPPC established at Temudok which will support agriculture projects being established in Sri Aman district and Engkilili, and Lubok Antu subdistricts.

2.2.5.2 Industrial Park

An industrial park covering approximately 200 hectares will be established in Temudok. The proposed park will primarily focus on food processing and packaging, providing and servicing agricultural machinery, and recycling of waste arising from the food processing. In the long run the park will focus on other light manufacturing activities.

2.2.5.3 Agropark

An agriculture technology park (or Agropark) is proposed to be established at Temudok. It will have an area of approximately 200 hectares allocated for this purpose.

The Agropark will have compact, modern farms that develop, adapt and showcase advanced smart technologies and techniques. The park will focus on the cultivation of high-value crops and commodities such as red chili, rock melon, mushrooms, specialist fruit and vegetables, and others.

2.2.5.4 Fisheries Research Hatchery

The development of a Fisheries Research Hatchery at Temudok is proposed for the development of seed production capability that would enable production of disease-free seed supply.

2.2.6 CENTEX Campus

It is recommended that a CENTEX campus be established in Sri Aman. The proposed location for CENTEX is in Simanggang to take advantage of the town's connectivity and existing infrastructure.

The Centre of Technical Excellence (CENTEXS) is a wholly owned subsidiary of Yayasan Sarawak, established to provide technical education to assist in the industrialization of Sarawak's economy. Almost all of its programs offer international certifications and are developed in close consultation with the State government and direct involvement of industry players in assuring the relevancy of training to meet the demands of the industries and for job assurance.

2.2.7 Sri Aman Recycling Industry Servicing Southern Sarawak

Sri Aman is well placed to establish a state-of-the-art waste recycling industry. It can be developed on a greenfield site, well away from residential areas, and service recyclable waste from surrounding Divisions.

With the increasing focus on reducing waste and recycling there would be a constantly growing market for these services. There is also a growing range of products that can be produced from waste apart from paper and recycled plastics and glass. Concrete from demolitions is often ground down to form road base, plastic bottle material is used for polar fleece clothing, rare metals are extracted from electronic goods, waste to energy power plants, etc, etc.

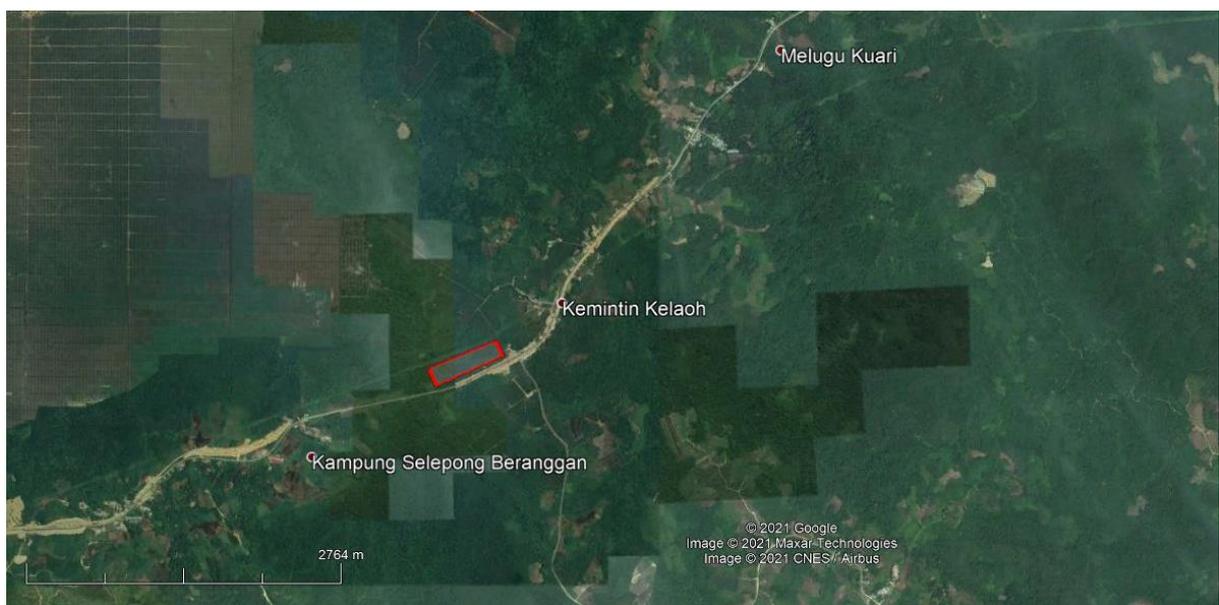


Figure 2-9: Possible Location for Sri Aman Recycling Industrial Park

Source: Sri Aman Master Plan 2020-2030

The key to a successful recycling industry is being able to achieve economies of scale and having reliable supply of good quality waste material. The plan is to establish this centre in Sri Aman with recycled

material to be delivered from Kuching and Sibul Divisions. The distance from Kuching and Sibul to Sri Aman is not excessive for this purpose. While still in its infancy the management of recycled waste is now established in these major towns (Kuching and Sibul) and can grow at pace once facilities for recycling are more available. The alternative is to develop separate recycling parks in each Division, which would result in duplicated expenditure and smaller resource supply base for each.

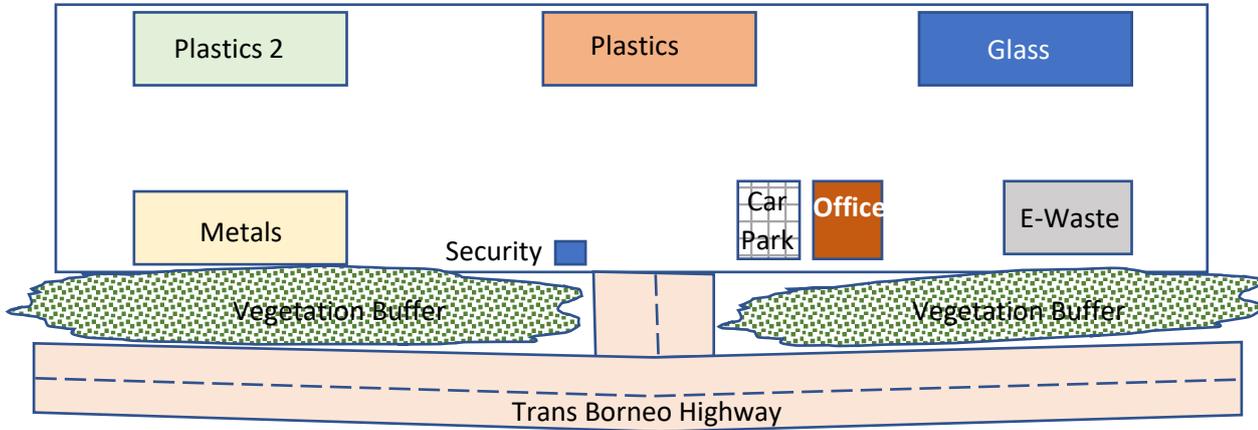


Figure 2-10: Possible Layout for Sri Aman Recycle Industry Park

Source: Daya Rancang

SECTION 2.3 Development Framework

A SAMP study of the overall development framework was developed for a systematic inter-sectoral analysis, which has enabled the setting of strategic direction and establishment of focus areas for the SAMP (Figure 2-11).

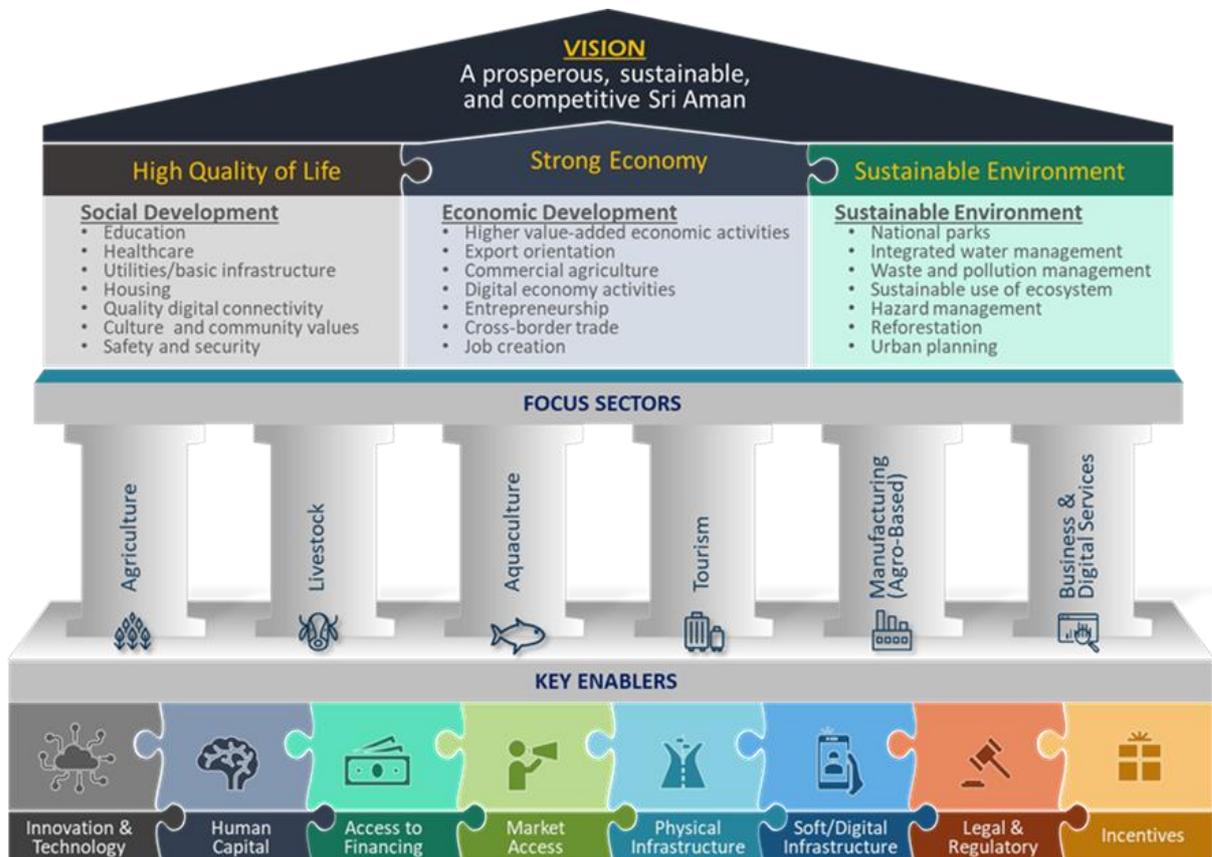


Figure 2-11: SAMP Study Overall Development Framework

Source: UNIMAS Holdings, Daya Rancang and Frost & Sullivan

The exercise began with an overall vision: “A prosperous, sustainable, and competitive Sri Aman”. Moving on from this vision, three development goals were established each focusing on the economy, quality of life and the environment. Both the continued development of a strong economy and the assurance of the well-being of the population will need to acknowledge environmentally sensitive areas. Development in such areas could negate expected improvement in socio-economic condition and the quality of life of the people.

Key enablers were then identified which need to be enhanced and, in some cases, need to be introduced to move forward strategic initiatives based on economic, social, sustainable and environmental factors. All of the above have implications for six economic sectors in the Sri Aman Division, with agriculture and aquaculture, and tourism as the sectors that need to be reinvigorated in particular.

This development framework took serious consideration of the fact that planning of the development in Sri Aman must proceed while acknowledging current and emerging challenges over the immediate, medium- and long-term. The development outlook at the international context, and policy shifts and thrusts at both the national and in particular the state level were translated into possible strategic policy directions with strategic focus areas at the Sri Aman Division level.

Overall, the objective was to find a method to best achieve as many of the intended outcomes with the resources available. It took into consideration current and future development proposals of various ministries and state agencies especially the newly established Sri Aman Development Agency (SADA). Admittedly, these would necessitate the adoption and implementation of new business model/canvas.



PART 3

ECONOMIC FRAMEWORK

SECTION 3.1 STRENGTH AND OPPORTUNITIES

The current economic state of the Sri Aman division is largely driven by local consumption where the largest contributor is the services sector which comprises predominantly of the food and beverage sector as well as the wholesale and retail sector.

Opportunities exist in developing economic sectors that have scalability potential and new growth sectors which create white collar jobs. The impact of focusing on primary drivers leads to demand for products and services from dependent sectors which may also create cross-border trade opportunities.

Figure 3-1 is the schematic representation of economic activities that have potential for scalability and are recommended to be the focus of development in Sri Aman Division.



Figure 3-1: Economic Activities with Scalability Potential

Source: UNIMAS Holdings

3.1.1 Sectors with Scalability through Production and Market Access

3.1.1.1 Agriculture (Farming, Aquaculture, Fisheries, Livestock)

The Sri Aman Division has approximately 118,000 hectares of agriculture land of which more than half remains underdeveloped (61,000 hectares). Agriculture, at present, is largely taken in the form of subsistence farming and has much room for growth in terms of productivity.

The aquaculture and fisheries segment has potential for growth, especially in the Batang Ai reservoir where there is room for a substantial increase in productivity. The Batang Ai reservoir supports the largest freshwater fish culture in Sarawak and is among the largest in the country. The primary species are tilapia and patin, though labang has been recently introduced. Production in 2018 was 342 tonnes but it is increasing.

On the other hand, livestock is not a prominent economic activity. However, the study findings have shown great potential for the development of livestock through mixed farms in crop plantations such as palm oil estates.

3.1.1.2 Manufacturing Processing and Value Adding on Agriculture and Cross Border Traded Goods

Manufacturing is the third largest productive sector in the Sri Aman Division and at present consists predominantly of palm oil mills, rice mills, and various small cottage industries. The manufacturing sector in the context of processing of agriculture produce, has been identified as an area of potential development; processing of agriculture produce is a natural progression into value-added activities for the agriculture sector. While it is well developed for the palm oil sector there is much room for development for other forms of agriculture such as fruits, pepper, aquaculture produce, and rice.

3.1.1.3 Tourism (Eco-tourism and Community-Based Tourism Activities)

Tourism, at present, is not a significant contributor to the Sri Aman Division. However, there are potential opportunities to be explored that are largely orientated towards eco-tourism. These include Batang Ai lake-based tourism, and development of the Gunung Lesong-Lingga ecotourism precinct.

There is also potential to develop tourism activities based upon the cultural heritage and history of the Division.

3.1.2 White Collar Jobs

3.1.2.1 Digital Services (As an Enabler for Market Access)

The implementation of digital services such as e-Commerce in the Sri Aman Division will be important to help the farmers, food processing companies and tourism sector improve productivity and efficiency in their activities. As an illustration, agriculture e-Commerce involves trading of agriculture products and goods via electronic communications and computer technology which are linked together over inter network protocols and standards. Agriculture e-Commerce will enable online transactions of good and products - with this facility, goods and products can be sold over a longer distance seamlessly. Physical stores would be largely replaced by virtual stores where information of products and goods, including pricing, would be easily accessible online without having to travel far to obtain the products. Essentially, agriculture e-Commerce covers “agricultural information flow, business flow of agricultural products, cash flow of business transactions and physical flow of agricultural products”. In other words, the business flow will now involves taking orders and payment over the phone or via online forms to place orders with payment by card or cash at time of pickup or delivery.

Tourist attractions could also be promoted via digital platforms such as mobile applications and social media such as Facebook, website, and blogs. Digital platforms will impact the way destinations facilitate tourism, develop products, gather data, access markets, and attract visitors.

3.1.2.2 Business Services (As Part of a Broader Sarawak State Global Business Services Development)

The Global Business Services (GBS) industry in general has immense potential to generate employment opportunities. In the context of Sarawak, Kuching can be the center of business services serving clients both locally and globally, and several supporting nodes to be based in areas outside of Kuching such as Kota Samarahan, Sri Aman, Bintulu, Miri etc. for processing-related tasks as well as to support unique local demands and requirements as mentioned earlier above. The local centers like Sri Aman can house standard non-transactional activities that require local understanding and skills such as integrated data warehouse, call center, customer service, development of site-specific policies etc.

3.1.3 Dependent Sectors

The above mentioned five sectors will be the primary drivers for economic development. The outcome of the economic development will lead to increased job opportunities and eventually population growth. As a result, there will be increase in demand for 1) Wholesale and retail, 2) Food and beverage, 3) Personal services and 4) Construction. These four sectors will largely be serving the local population.

3.1.4 Cross Border Opportunities

Opportunities exist to harness the cross-border economic synergies with Kapuas Hulu regency in areas of agriculture logistics, food processing, and establishing the collective area as an eco-tourism region. The next section presents in detail cross border opportunities favouring Sri Aman division.

SECTION 3.2 CROSS BORDER OPPORTUNITIES FOR ECONOMIC INTEGRATION

The Sri Aman Division is a geographical area that does not have international seaports or airports and this excludes ports based cross-border trade opportunities. The opportunities for cross-border trade exist in the form of overland trading activities with Kalimantan (Indonesia) that shares an extended land border with Sarawak. The planned movement of Indonesia’s capital to Kalimantan was initially viewed as a growth driver for cross-border trade with Sarawak as the development of the capital would bring about increased population and economic growth. Further analysis shows that, while the new Indonesian capital will boost overall economic activities in Kalimantan, the fact that it will be located more than 1,000 kilometers away means that its impact on Sri Aman Division is expected to be muted due to comparatively higher logistical cost compared with the rest of Kalimantan.

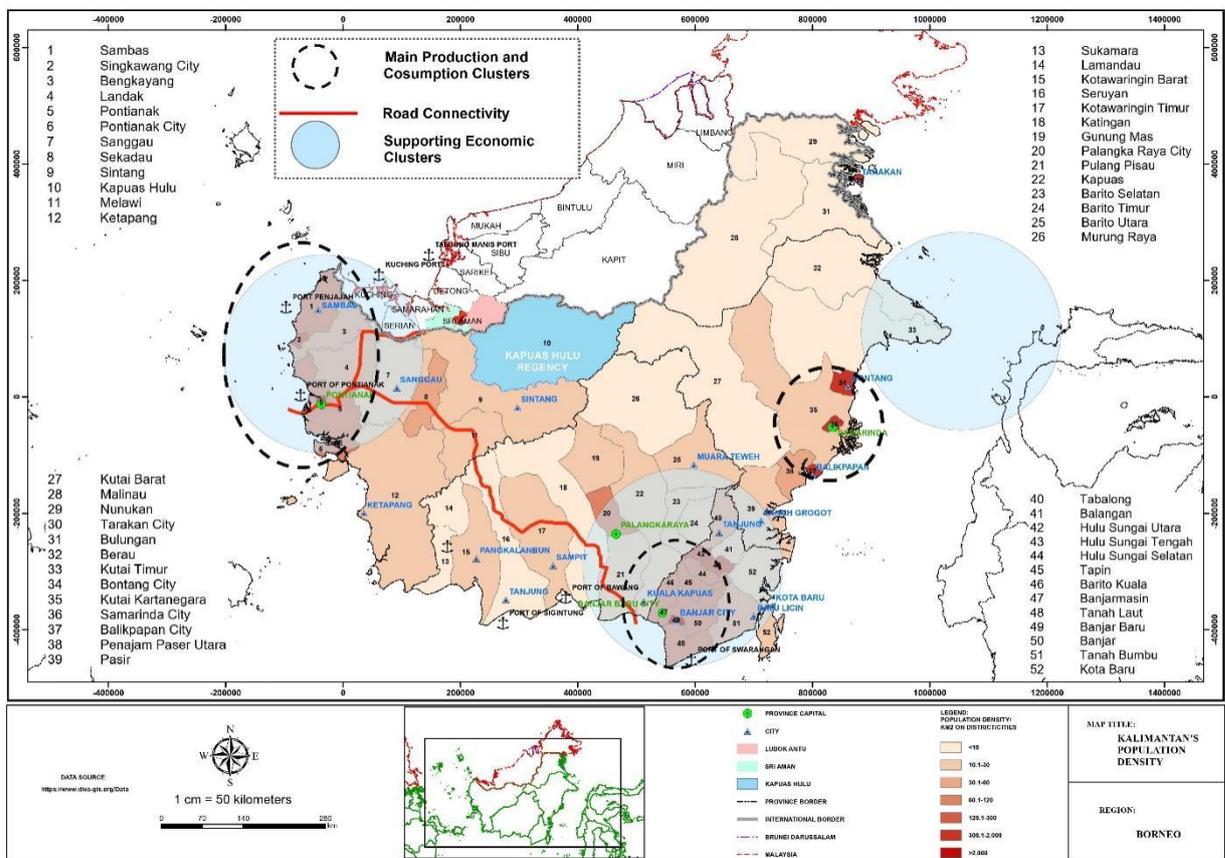


Figure 3-2: Sri Aman Division in Relation to the New Capital of Indonesia

Note: Base map sourced from Australian National University maps database

Overland cross-border trade opportunities for Sri Aman division are with the Kapuas Hulu Regency, an area that shares a direct border with the Division. From a logistical perspective, Sri Aman Division stands to benefit from import and export activities of Kapuas Hulu Regency as the access to seaports and airports are comparatively shorter through Sarawak, thus enabling logistics and cost savings compared to the nearest logistics hub at Pontianak.

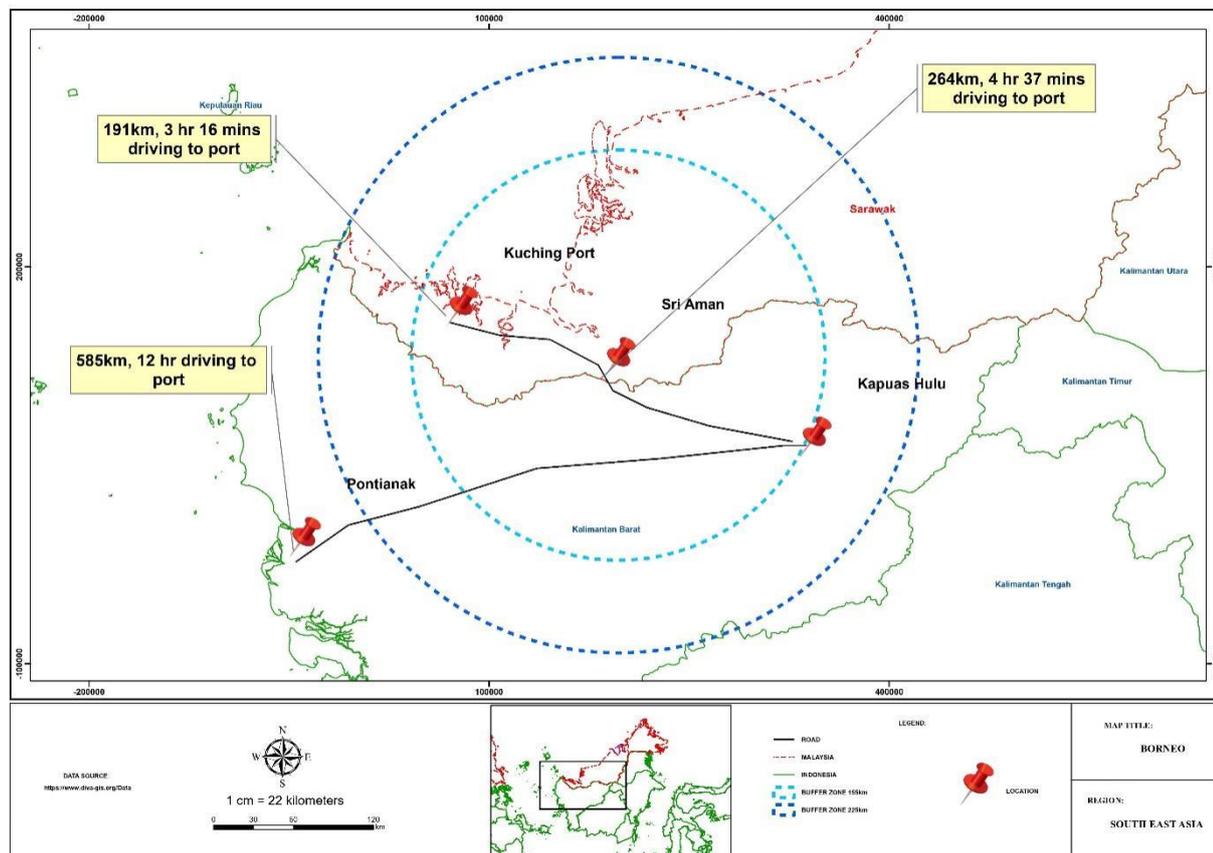


Figure 3-3: Distance to Major Ports from Kapuas Hulu Regency

Source: Frost & Sullivan

Note: Base map sourced from UNIMAS Holdings

Current trade activities throughout the Lubok Antu border consists predominantly of the importation of palm oil from Kalimantan by two major players Kencana Group and the Sinar Mas Group while exports are largely machinery used for palm oil extraction in Kalimantan (MPRA, 2019).

Kapuas Hulu Regency top three economic sectors are construction, agriculture (including crops, forest produce, and fisheries), and wholesale and retail trade contributing 22.3%, 22.0% and 11.3% respectively. Areas of opportunities in cross-border trade are primarily in the agriculture segment where agriculture products are transported to Sri Aman division for further processing before it is exported. At present trade is largely focused on palm oil imports where, prior to the temporary closure of the Lubok Antu border crossing due to COVID-19, RM400.6 million worth of crude palm oil was imported (Royal Malaysian Customs, 2020).

The agriculture sector in Kapuas Hulu Regency is relatively similar to Sri Aman division where farming activities are largely for subsistence. Similar factors impede the growth in value add of the agriculture sector. These are (1) High cost and low productivity of traditional farming methods; (2) Households are unaware of the market opportunities beyond their immediate surroundings, and (3) Lack of crucial market access components such as network linkages for processing and packing, certification, and pricing.

The proposed strategy to enhance market access through various initiatives aimed at enhancing collection centers and developing business networks has a broader application where it would lead to the development of agriculture not only within the Sri Aman division but across the border in Kapuas Hulu. The distance advantage to port, highlighted above, creates a natural advantage for goods to be shipped through Sri Aman division.

Kapuas Hulu Regency has a large capacity for agriculture, the land area earmarked for production forest and production forest for conversion amounts to 283,505 hectares (this excludes environmentally sensitive and protected areas) (CIFOR, 2013). In comparison the agriculture land in Sri Aman division is approximately 4.6 times smaller at 60,390 hectares.

3.2.1 Tariff Barriers

Trade barriers are an important consideration in the development of cross-border trade activities as it impacts the feasibility of carrying out such economic activities within the borders.

Trade between Malaysia and Indonesia is eligible for import duty exemptions under the ASEAN Trade in Goods Agreement (ATIGA) where a vast majority of goods are exempted from import duties with the exception of tropical fruits, tobacco and highly sensitive products such as rice. Under ATIGA, Tropical fruit import tariffs fall between 0% and 5% while rice is subjected to a 20% duty (MITI, 2020). For dutiable products an added exemption is provided for manufacturers that import raw materials for the export market (ASEAN, 2017). A limited number of agriculture's produce falls under the prohibited list of imports from Indonesia that includes cocoa pods, rambutans, pulasan, longan, and nam nam fruits (Royal Malaysian Customs Department, 2020).

From a tariff barrier perspective there are no major obstacles to cross-border trade as there are limited dutiable goods and provisions for tax exemptions for export processing activities.

3.2.2 Non-Tariff Barriers

Non-Tariff Measures are broadly described as negative measures that can have an impact on international trade flows. An analysis of the NTM on goods most likely to be imported from Kapuas Hulu regency for re-export that include vegetable and food products have the highest rates of prevalence in areas of (1) Sanitary and phytosanitary measures, (2) Technical barriers to trade - relating to technical regulations, standards, and (3) Export related measures – that include licensing and permits. These indicators point to a need to have a trade facilitation function that addresses harmonization across the above-mentioned areas of non-tariff measures.

The pre-requisite to the expansion of cross-border trade activities in addition to the current trade activities in palm oil and agriculture equipment is the development of the proposed Agro Park and Industrial Park that focuses on raising productivity and technology adoption of the agriculture sector, training and development, and the introduction of higher-value added activities in the processing of food.

SECTION 3.3 ECONOMIC DEVELOPMENT STRATEGY

The economic development plans for the Sri Aman Division will focus on the prospects of capturing export markets not only from the perspective of accessing markets within Malaysia but also that of countries abroad.



Figure 3-4: Economic Drivers

Source: Frost & Sullivan Analysis

3.3.1 Value Add and Productivity Approach

Traditional productive sectors in Sri Aman that include agriculture, livestock, and aquaculture are all perceived to be heavily reliant on labour intensive work. There is a push factor that drives the younger workforce to seek job opportunities in major cities which are able to offer higher paying and often less labour-intensive work. The availability of an older workforce in the traditional manual labour-intensive productive sectors is expected to decline as physical strength of workers reduces with age.

A key factor in ensuring the continued growth of the economy of the Sri Aman division is the creation of higher-value jobs that are able to support both the retention of existing young populations, the attraction of human capital from outside of the division to supplement the labour intensive but critical activities, and the creation of alternate opportunities for the ageing population segments. Initiatives that foster creation of business activities that create higher value-added activities are central to the strategy towards creating a more attractive and sustainable labour market in Sri Aman division.

The key to improving value-add and productivity in the current age is by integrating digital technology into traditional sectors. For instance, by introducing smart farming concept, farms can use technologies like IoT, robotics, drones and AI to increase the quantity and quality of products.

On the other side, digital services based economic activities such as global business services (GBS) has the potential to create white collar jobs and the nature of its business operations allows for delivery centers to be situated from any location with good internet connectivity. The global nature of this business segment coupled with the enablement of technology that will allow for access to clientele not only within Sarawak but also throughout the globe.

The lack of a well-developed logistics and marketing network are among the factors holding back agriculture production from trade outside of the Sri Aman Division. E-Commerce platforms can address this issue and improve the businesses growth.

3.3.2 Labour Force Strategy

For the Sri Aman Division to remain competitive as an employment market, a change of the economic structure is required to create higher value work that would contribute to the retention of local talent and attraction of workforce from across Sarawak. A three-pronged approach is proposed:

1. Raising the efficiency of productive sectors in order to reduce the dependence on low-skilled work while at the same time creating higher-value jobs that will contribute toward the retention of local populations
2. Creating white collar jobs through the introduction of digital services-based businesses
3. Supplementing labour intensive low-skilled work with foreign labour

Initiatives that are geared towards upskilling the workforce coupled with supplementing labour-intensive work requirements with foreign labour will aid the progression of local human capital towards higher value-added activities.

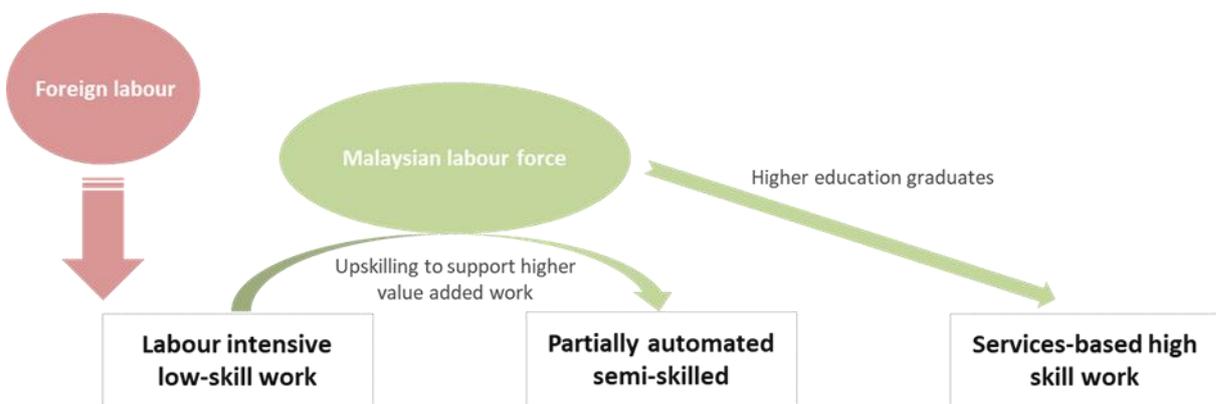


Figure 3-5: Labour Force Reorientation Strategy

Source: Frost & Sullivan Analysis

To support the progression of productive sectors towards higher value activities requires the following:

- The establishment of post-secondary education to develop technical skills relating to agriculture and tourism
- Skills training that are oriented towards improving the quality of local production including modern farming techniques, food processing, quality improvement, and export packaging
- The potential education setup needs to, at a minimum, include a skills training center

With the progression of Malaysian workforce towards higher-value added activities the supply of workers for labour intensive low-skill human capital is likely to decrease further.

Shortage in human capital is an inherent limitation the for-Sri Aman Division and the corrective recommendations are

- Adoption of larger scale agriculture
- Adoption of techniques that increase efficiency and achieve economies of scale

The shift towards higher value-added activities by means of downstream activities in the agriculture sector and the adoption of higher yielding farming methods will allow for the employment of fewer workers per tonne of production. This will enable employers to adjust remuneration in a manner that attracts a workforce from outside of Sri Aman Division.

3.3.3 Export Orientated Economy

The development of exports to the rest of Malaysia and abroad is one of the key strategies in increasing the economic contributions of the Division. The development of an export industry requires strong production volumes and is best achieved through collaborative initiatives that consolidate production volumes from not only within the Sri Aman Division but also from the surrounding Divisions such as Samarahan and Betong. An effective approach towards development of exports would be through a collaborative initiative with business associations which has access to investors and customers throughout Sarawak and overseas.

SECTION 3.4 DIGITAL ECONOMY STRATEGY

The current state of Sri Aman's digital economy is still needing more time to develop before it will be contributing significant value to the local economy. Amongst the inhibiting factors are:

- the current population demographic skewed towards the retired age-group (who inherently prefer off-line transactions)
- lack of comprehensive digital infrastructure to enable anything more than casual online presence, and
- no current understanding of Sri Aman's industries or businesses have a position within the digital value chain of the state or the region.

However, with the clear directions already initiated at a state level, there are synergistic alignments that can be realized to bring forward the Sri Aman digital economy towards something that may not only value add to its local economy and population, but for longer term integration into the state's digital economy aspirations.

The focus of Sri Aman's digital economy moving forward is summarized in a 3-prong approach:

1. Digital connectivity
2. Digital entrepreneurship
3. Digital catalyst

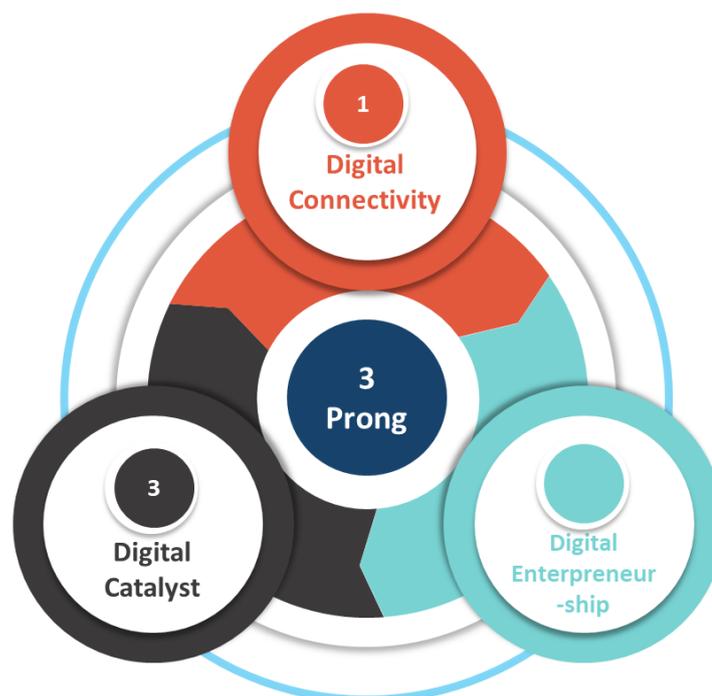


Figure 3-6: Digital Economy Strategy

Source: Frost & Sullivan Analysis

3.4.1 Digital Connectivity

Digital connectivity should be looked at from both from a supply, and demand perspective. From a supply angle, digital connectivity will enable Sri Aman to take advantage of a far wider market than is currently possible offline through e-Commerce. The most natural starting point is Sri Aman's current core productive sectors of agriculture and tourism. Besides that, with basic training and guidance, cottage industries may also offer their products to a wider consumer market through existing e-Commerce platforms as long as the basic enabling factors of stable internet access with decent speeds, and availability of local logistics connectivity are present within key locations in Sri Aman.

In terms of demand, digital connectivity will also encourage the development of a more informed Sri Aman consumer base which has access to a wider marketplace that provides more choices of products (and services as the case may be). These products may be of better quality and lower purchasing price-points compared to what is currently available off-line within the Sri Aman retail sector. Over time, the exposure of what is available online would necessitate a more competitive domestic retail space that would need to change its business models to keep up. Local consumers would also be able to find that balance of what needs to be purchase immediately through 'brick and mortar' shops, and what can be more cost effective to be purchased online – which may take time to be delivered and consumed – which would keep more money in the pockets for other economic spurring activities such as the occasional eating out, consumption of tourism activities, and the like.

3.4.2 Digital Entrepreneurship

In adopting a more strategic view of the role to be played by Sri Aman in Sarawak's digital economy value chain in the longer term (possibly beyond the 2030 timeline of this study), it is imperative that digital entrepreneurship should be initiated, encouraged, and nurtured from now.

Leveraging off digital technologies that are increasingly widespread and better understood today such as Big Data, IoT or the internet of things, AI or artificial intelligence, and other technologies that do not require physical proximity to the end market, it is very possible for innovation in the digital space that is created out of Sri Aman to service a demand that may be located anywhere.

Given the right physical environment (such as one that can be created within the Agro park being proposed as part of this study) including strong and reliable digital infrastructure availability, and strong government support and buy-in there may exist youths and other entrepreneurs that see the value to create and run a digital business while being located out of Sri Aman – for reason of family proximity for example, or the creative-types that yearn to be closer to nature and away from the cities.

Done right, digital entrepreneurship may likely be the mechanism that would allow Sri Aman's current economic profile to leap-frog intermediary stages of development to catch-up with what is possible and indeed necessary in a mature, vibrant and future-proof economic profile.

This is because digital technologies can drive economic growth through three channels. First, they can promote inclusion by enabling existing firms and entrepreneurs to serve markets that are currently underserved. Second, they can lower costs and increase efficiency for existing firms and entrepreneurs to make them more competitive. And third, they can encourage innovation and scale economies, allowing entirely new forms of business and entrepreneurship to emerge (World Bank Group, 2018).

3.4.3 Digital Catalyst

The previously recommended focus on digital entrepreneurship will require a strong starting point. For that, a possible catalyst sector that bridges the gap between the current type of sectors operating within Sri Aman, and that which would form what an ideal-state digital economy profile of Sri Aman should look like, may be in establishing Global Business Services businesses.

The GBS model, also referred to as business process outsourcing, is a segment of the business services sector that focuses on 'process efficiency improvement' and 'cost reduction' through various delivery models. For instance, via outsourcing to third party service providers or subsidiaries located in lower cost locations.

This bridging sector would bring higher-value add activities to Sri Aman than what is currently available, attract back youths that prefer to work in the services sector (which is currently almost entirely made up of wholesale and retail locally), while not requiring too niche or high-skilled talent but is still considered knowledge-worker jobs. The nature of GBS in some of the industries it services globally in real-time would also mean longer work hours (on multiple shifts to accommodate different time-zones) which may then create more vibrancy in the near-by retailers to take up that increased demand. The spill-over effect on the local community would be very positive if managed right, especially socially.

Finally, the enabling factors to be considered in summarizing what needs to be done to achieve the ideal-state digital economy profile of Sri Aman described above includes a focus on digitally relevant governance (for policy and other support), development of worker skills to work in a digital business, and the reduction of cost of digitization (which is perhaps the single biggest barrier to entry in existing business to go-digital) (Khazanah Research Institute, 2020).

SECTION 3.5 STAGED APPROACH TOWARDS ECONOMIC DEVELOPMENT

The strategic direction for the development of Sri-Aman’s economy is two pronged:

1. Strengthening the core capabilities or traditional productive sectors (near to medium term)
2. Development new avenues of economic growth that interlinks with the existing productive sectors (medium to long term)

The first focus area of the economic development model is to build upon its strength in agriculture and tourism with the developmental focus in the next 5 to 10 years orientated towards enhancing the productivity, variety of offerings, and addressing fundamental infrastructure gaps critical to increasing the efficiency of logistics.

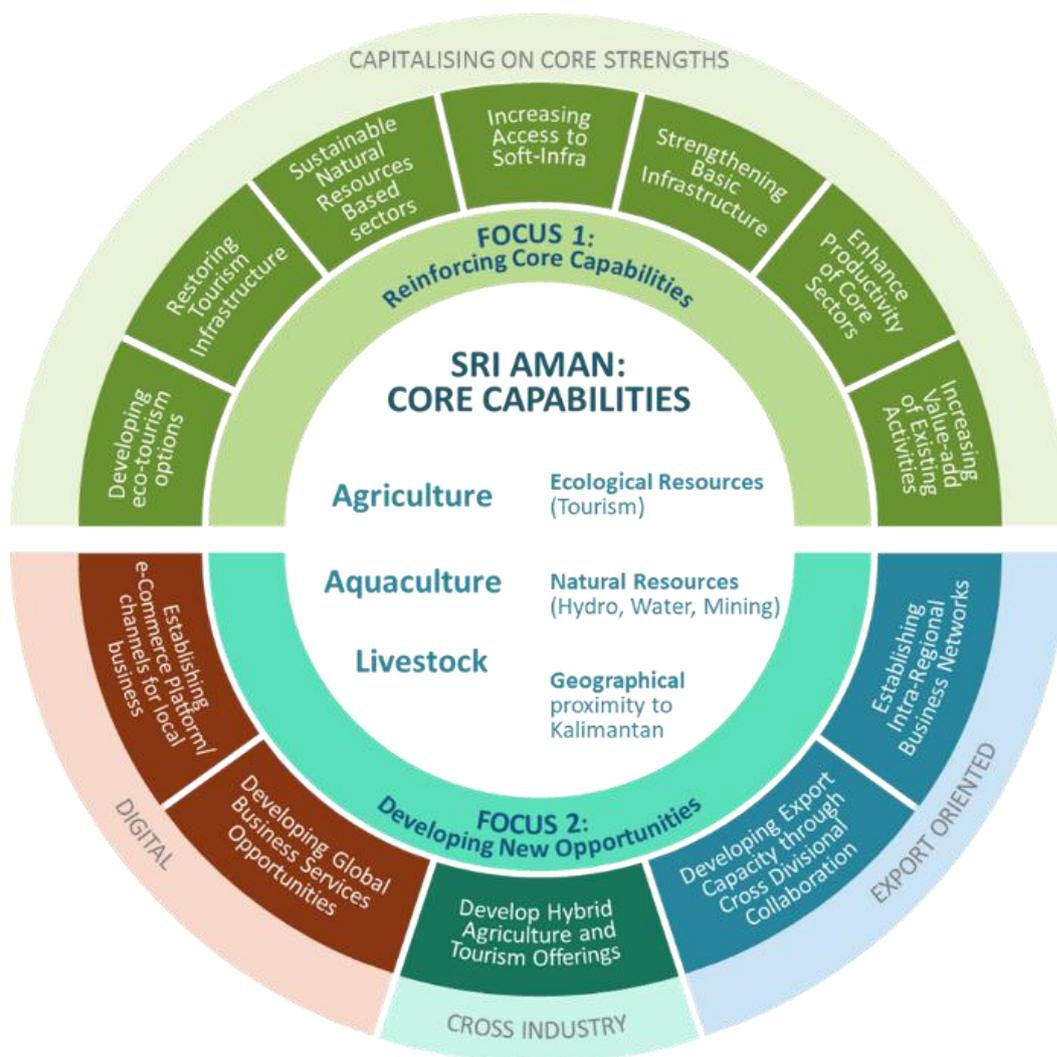


Figure 3-7: Economic Development Strategy

Source: Frost & Sullivan and UNIMAS Holdings Analysis

The subsequent focus area is the development of three key areas of opportunities that include digital services, cross-industry activities, and increasing exports.

1. Digital services - The establishment of digital services such as eCommerce platforms will facilitate greater market access for the core productive sectors of Sri Aman Division. Additionally, digital services may be developed as a standalone productive sector for instance in the provision of shared services/Global Business Services to clients in the regional and global markets.
2. Cross industry activities – Potential has been identified in cross productive sector type of activities for instance a hybrid of an agriculture farm and tourism attraction.
3. increasing exports - Emphasis is given towards the wholesale production and distribution for agricultural products with an outbound orientation and that of the e-Commerce sector as a catalyst to increase market access.

The manufacturing sector, in the context of the processing of agriculture produce, has also been identified as an area of potential development; processing of agriculture produce is a natural progression into value-added activities for the agriculture sector. While it is well developed for the palm oil sector there is much room for development for other forms of agriculture such as fruits, pepper, aquaculture produce, and rice.

Tourism is among one of the sectors in the Sri Aman Division that also has potential for further development.

SECTION 3.6 ECONOMIC DEVELOPMENT ENABLERS

The guiding vision for economic development in the Sri Aman Division is to create a smart economy characterized by high productivity and resilience. The economic development goals of the masterplan aim to achieve three core objectives that are (1) Increasing value-added/productivity of business activities, thus creating higher income for Sri Aman residents; (2) Introducing elements of economic resilience to create an economy that is sustainable in the long run; and (3) Ensuring inclusiveness of local communities in the overall development of the Sri Aman economy.

The development of recommendations to achieve the economic vision of Sri Aman division will be guided by eight key enablers of business. These include

- (1) Accessibility and adoption of technology and innovation in business operations;
- (2) Availability and accessibility to human capital;
- (3) Accessibility of regional and global markets to businesses operating in the Sri Aman Division;
- (4) Accessibility to various avenues of financing;
- (5) Availability and quality of physical infrastructure critical to business operations;
- (6) Availability of quality digital infrastructure;
- (7) Availability and structure of legal regulations that support the healthy development of enterprise activities; and
- (8) Availability and provision of incentives to support the individuals and businesses to adopt the proposed initiatives in this masterplan which will help them to grow.



Figure 3-8: Economic Development Enablers

Source: Frost & Sullivan and UNIMAS Holdings Analysis

3.6.1 Innovation and Technology

An innovation sparking environment provides direction for creative ideas. Therefore, for the Sri Aman division's overall quality of life and economy to advance, evolve and improve, innovation and adoption of technology is vital.

To help grow the individuals and businesses who typically have limited focus and spending on innovations and technology, it is proposed to expand the focus and role of the business incubation center to include entrepreneurship mentorship, incubation, and handholding. The incubation center should aim to foster entrepreneurship activities and equip new businesses with knowledge to develop and operate successful business which include innovation in smart farming, smart factory as well as adoption of 4IR technologies.

From the business survey conducted for this masterplan study, a majority (64%) of the respondents highlighted that entrepreneurship training and development is a must to have in the event an incubation center is established, followed by mentoring and guidance services for start-ups.

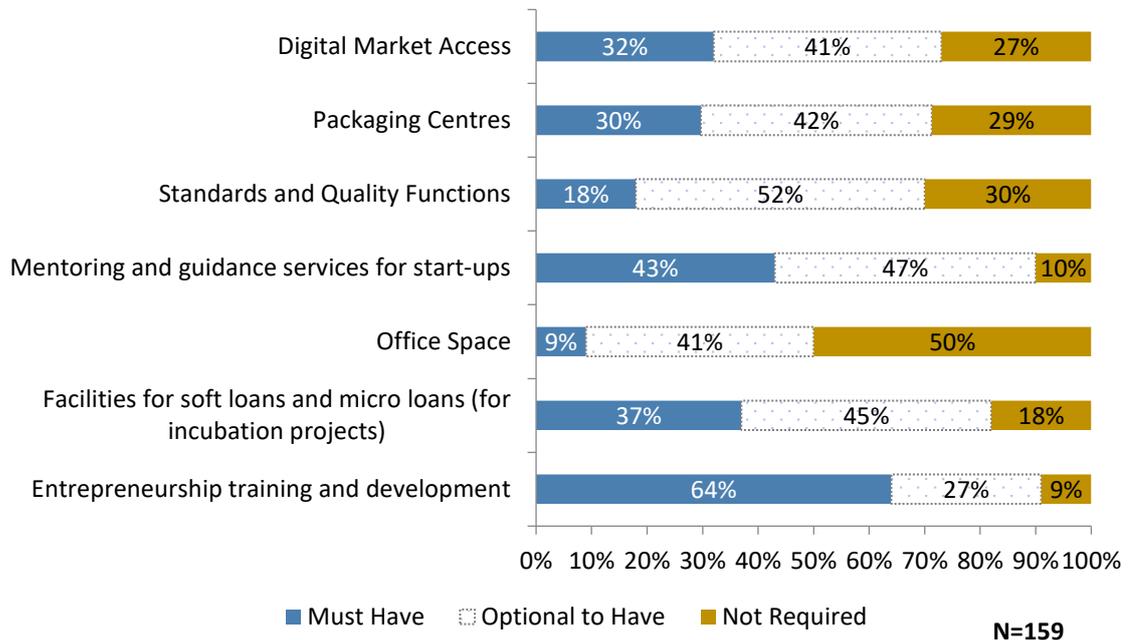


Figure 3-9: Services That Should be Offered in an Incubation Centre / Business Centre in Sri Aman to Help Nurture and Grow Local Businesses

Source: Business Survey Analysis, Frost & Sullivan

Over and above developing the core industries, identifying and establishing new productive clusters such as outsourced business services sector in Sarawak with first rural delivery center in Sri Aman and e-Commerce has the potential to increase job opportunities and increase the income level.

3.6.2 Human Capital

Human capital is arguably the most crucial element for success of any business. Therefore, it is of utmost importance to train the working population of Sri Aman to develop and acquire new skills as this can ultimately lead to improved productivity and higher economic growth.

In order to facilitate human capital development, it is proposed to establish a training institution which can focus on offering specialised skills needed to facilitate the move of agriculture, livestock, manufacturing and tourism into higher value-added activities.

The need for a training center is well articulated in the business survey conducted for this master plan study. A majority (42%) of the respondents out of 159 businesses indicated the need for a training center, while 34% of them highlighted a need for a vocational school/center.

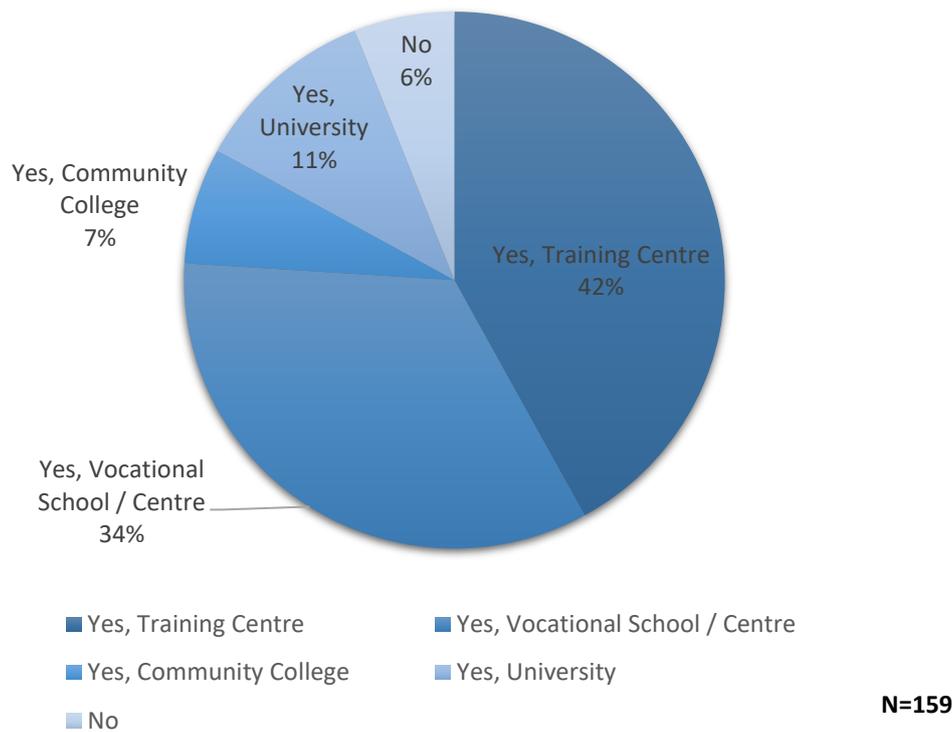


Figure 3-10: Need for Higher Learning Institutes

Source: Business Survey Analysis, Frost & Sullivan

3.6.3 Market Access

Market access is one of the biggest challenges faced by SMEs who are often confined to the local market due to their size/capacity, limited awareness of consumer demand outside the local territory, lack of spending on marketing and branding activities among other challenges. In order to assist businesses in the Sri Aman Division, improving their market access is important.

Multiple factors influence market access that include:

- 1) **Marketability of the products** – influenced by quality, packing, pricing, and certifications
- 2) **Logistics** - influenced by collection/consolidation, logistics suppliers, cost, and volume
- 3) **Business networks and trade facilitation**
- 4) **Branding and promotion**

From the business survey, 32% of the respondents cited that there must be a provision or guidance on digital market access in the proposed incubation center. There are opportunities for the Sri Aman division to use digital commerce as a tool to improve market access for products produced in the region. This is among one of the many strategies to bring products from the region to the rest of Malaysia and across the globe. At present, one of the key challenges of the agriculture sector is access to market where produce is largely not collected for further export outside of the division.

On the softer side, by establishing a working relationship with key Sarawak based business associations, the businesses can jointly develop, promote and match-make business opportunities for Sri Aman in the areas of agriculture, livestock, and tourism sector.



Figure 3-11: Elements of Access to Markets

Source: Frost & Sullivan Analysis; Images sourced from: unsplash.com/license – Royalty free photos

3.6.4 Physical Infrastructure

In order to assist businesses with their manufacturing, an industrial park is proposed which provides supporting facilities, office space, shared facilities among others. The proposed park will primarily focus on food processing and packaging, providing and servicing agricultural machinery, and recycling of waste arising from the food. In the long run the park will focus on other light manufacturing activities.

There is also a need to develop a logistics network in order to leverage on cross-border trade and to facilitate flow of goods by establishing synergistic linkages with Kapuas Hulu. This logistics network will also be utilised to connect the businesses located in the industrial park to other parts of Sarawak besides serving the local market.

Among one of the key improvements required for efficient business operations is the availability of good quality infrastructure. These factors are critical not only to ensure the sustained growth of existing businesses operating in the Sri Aman Division but also the key in attracting investors into the proposed “Industrial Park”.

The above views are echoed by members of the industry and are reflected in the Sri Aman Development Authority lab reports (Lab 1: Rakyat’s aspirations) published on the 9th of July 2020.

The following areas have been identified as key areas of improvement:

1. Development of a drainage and flood mitigation plan
2. Improving internet connectivity (4G)
3. Town planning with increase in number of public car parks
4. Improving the reliability of electricity supply
5. Improving the reliability of water supply

3.6.5 Soft/Digital Infrastructure

A rural digital commerce system will guide the strategies and recommendations for developing and expanding digital trade more systematically for the Sri Aman Division. From the business survey, close to 56% of the respondents indicated that the stability of telecommunication facilities is poor to very poor similarly 48% of them mentioned that the availability of such facilities is poor to very poor. Therefore, developing digital infrastructure is a high priority.

The business survey findings also highlighted a similar view regarding to the existing infrastructure in Sri Aman.

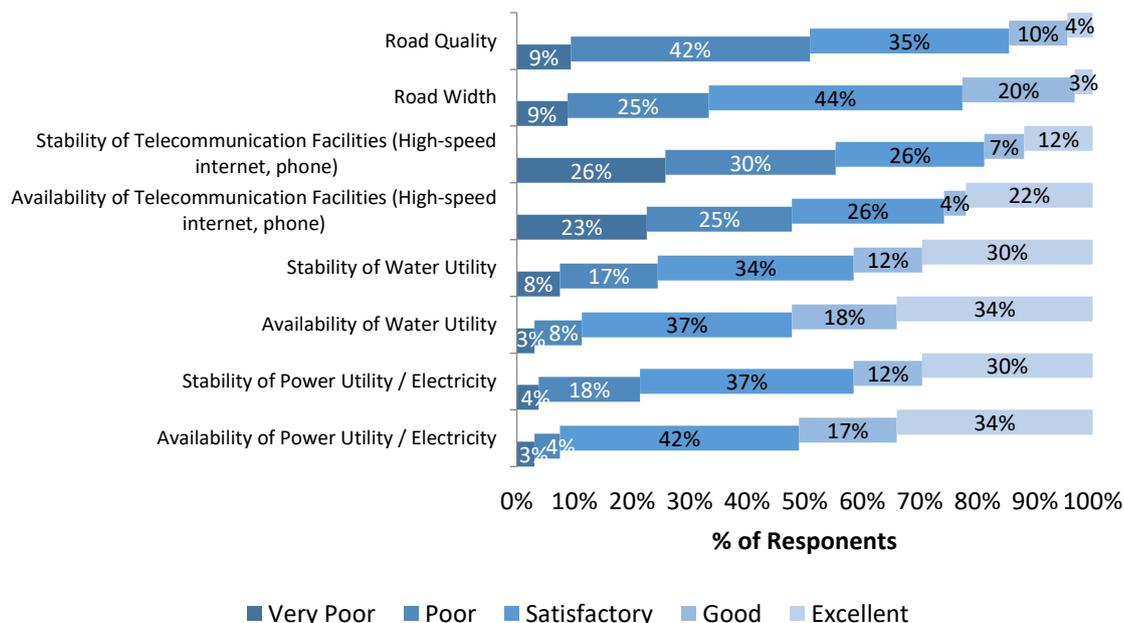


Figure 3-12: Reliability of Infrastructure in Sri Aman

Source: UNIMAS Holdings Analysis

3.6.6 Access to Financing

Small to micro enterprises typically face challenges in getting access to financing due to common factors such as the lack of available collateral, or proper business transaction records. Of the 159 businesses surveyed as part of the master plan study, 29% of respondents have indicated that they face difficulty obtaining micro financing of RM100, 000 and below as illustrated in Figure 3-13.

Access to financing is an important factor that drives the growth of enterprises especially with the development direction of the Sri Aman Division Master Plan that is geared towards raising the value added of economic activities.

Access to micro-financing is a business environment focus area that has been thoroughly researched and there are a multitude of supporting financial programs available. The focus of this Master Plan is to enhance access to micro-financing by facilitating SMEs in getting access to the programs through the establishment of one-stop application services as part of the incubator initiative. The incubator center will provide for services to apply for financing together training services that aim to educate applicants on proper financial management and business entrepreneurship skills; ensuring the highest probability of business success.

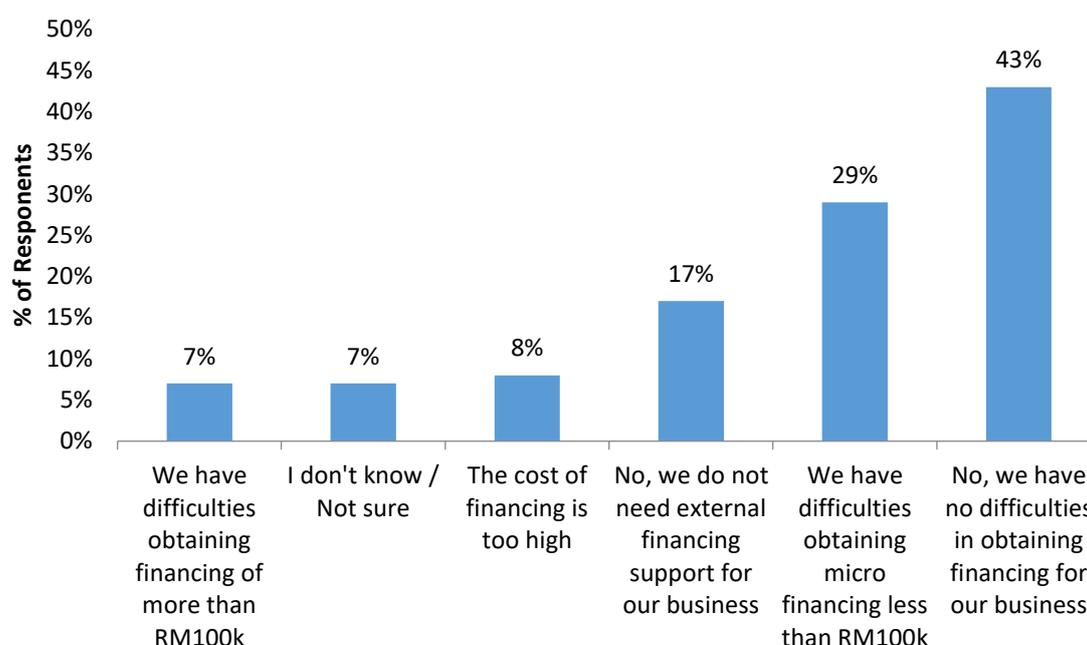


Figure 3-13: Challenges Faced in Obtaining Finance for Business

Source: Business Survey Analysis, Frost & Sullivan

No	Financing programme	Organisation
1	Soft loan scheme for automation and modernisation	MIDF
2	Soft loan scheme for services capacity development	MIDF
3	Soft loan scheme for services export	MIDF
4	Soft loan scheme for services sector	MIDF
5	Soft loan scheme for small and medium enterprise	MIDF
6	Business accelerator programme	SME Corp
7	Fund for food	Bank Negara Malaysia
8	Food park/Incubator (EPP8)	Agrobank Malaysia
9	Machinery and equipment financing (MAEF-i)	Agrobank Malaysia
10	Modal usahawanan 1 Malaysia	Agrobank Malaysia
11	Program Agropreneur Muda	Agrobank Malaysia
12	Skim kredit pengeluaran makanan-i	Agrobank Malaysia
13	Skim perusahaan kecil sederhana	Agrobank Malaysia
14	Term financing-i	Agrobank Malaysia
15	Export credit refinancing-i	EXIM Bank
16	Shariah-compliant SME financing scheme	SME Corp

Banks predominantly fund traditional sectors, thus creating a gap in avenues for SMEs venturing into new technology areas. It is therefore suggested to enhance access to soft loans for promoted activities particularly for those engaged in or wish to engage in modern farms, e-Commerce, livestock, as well as including agriculture processing, and export orientated production for micro to small enterprises through one-stop services.

The study also found a need to establish a Community-based Tourism New Venture Development Fund targeted at supporting the creation of community-based tourism offerings.

3.6.7 Legal and Regulatory Environment

During the study, one of the key issues was in regards to native customary land. The agricultural land was divided up into many small plots under native customary land in which private local investors are unable to purchase. In terms of aquaculture and fisheries, currently there is no licensing quota and as a result there is growing environmental degradation.

It was therefore proposed for the allowance of native customary land under the discretion of native landowners to consolidate ownership in order to facilitate and encourage greater domestic investments into the agriculture sector. At present, one of the challenges in establishing larger-scale farms that are able to achieve higher economies of scale is the lack of larger collective land plots.

It was also recommended to consider aquaculture/ fisheries licensing management to contain licensing for fisheries in order to reduce the environmental impact.

3.6.8 Incentives

Incentives and funding initiatives are aimed at fostering greater investments into desired economic activities and attracting early locators to economic zones. Incentives will be able to attract businesses that are involved in agriculture value-added activities such as consolidation, sorting, and processing to establish a presence in Sri Aman Division.

In order to attract the first round of investments, certain incentives are to be provided to attract the first five locators to the above proposed Sri Aman Industrial Park for the first five years of operations. The incentives are limited to only the first five locators as it is aimed at creating interest in Sri Aman and demonstrating the location to be a viable business proposition for agriculture value-added services.

Promoted activities

1. Processing of promoted crops include banana, pineapple, pepper, coffee, chili, sacha inchi oil, and premium rice
2. Processing of promoted livestock products including honey, birds' nests, and meat products
3. Processing and value-add for various types of high value fish e.g., Empurau, Shrimp

Incentives include:

1. Reduced or rental waiver for SME industrial park facility
2. Subsidised operational cost for electricity and water

Develop Sri Aman promoted economic activities list

The promoted economic activities list aims to serve as a guide for the provision of incentives, promotion of investments, and prioritization of infrastructure development funds for Sri Aman division.

3.6.9 Summary of Key enablers – Action Items

Shown in the Table 3-1 is the summary of the action items associated with the 8 key enablers.

Table 3-1: Summary of Key Enablers

Innovation and Technology	Human Capital	Market Access	Access to Financing
<p>Expansion of the focus and role of the existing business incubation centre to include skills training, entrepreneurship motorship, incubation, and handholding</p> <p>Establish new productive clusters focusing on outsourced business services sector in Sarawak with first rural delivery centre in Sri Aman and e-Commerce</p>	<p>Establish training institution (located near the proposed industrial park) to focus on specialized skills needed to facilitate the move of agriculture, livestock, manufacturing and tourism into higher value added activities</p>	<p>Establish working relationship with key Sarawak based business associations to jointly develop, promote and match make business opportunities for Sri Aman in the areas of agriculture, livestock, and tourism sector.</p> <p>Small traders e-Commerce market access point (Public, Private, Partnership) located within the incubation center, aims to assist local retailers and traders in bringing their products online</p>	<p>Enhancing access to soft loans for promoted activities (include agriculture processing, modern farms, e-Commerce, livestock, and export oriented production) for micro to small enterprises through one-stop services</p> <p>Establish a Community-based Tourism New Venture Development Fund targeted at supporting the creation of community-based tourism offerings</p>
<p>Establishment of an industrial park for micro small, medium business with primary focus on food processing and also logistics. In the long run the park to focus on other light manufacturing</p> <p>Develop logistics network to leverage on cross border trade and to facilitate flow of goods by establishing synergistic linkages with Kapuas Hulu</p>	<p>Development and facilitation of digital economy activities to support greater regional and global market access</p>	<p>Native customary land (NCR) conversion to general titles for agriculture and livestock activities</p> <p>Aquaculture / fisheries licensing management to contain licensing for fisheries in order to reduce the environmental impact</p>	<p>Promoted sectors incentives for early locators (Industrial park locators)</p> <p>Incentives include rental and basic infrastructure fee exceptions and subsidies</p> <p>Develop Sri Aman promoted economic activities list which aims to form the basis for incentives, investment promotion, and managing industrial park locators</p>

Source: Frost & Sullivan Analysis

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PART 4 **SPATIAL DEVELOPMENT CONCEPTUAL PLANS**

SECTION 4.1 **PRIORITIES AND STRATEGIES**

The Sri Aman Master Plan is defined through a higher-order strategy delineated by the State of Sarawak, SEAC, policies and agenda delineated at the Federal Government, and the international multilateral cooperation instruments such as the SDGs and the NUAs. At the regional level the BIMP-EAGA is a well-established platform for regional cooperation within Borneo.

The Master Plan strategies call for the establishment of a new concentrated urban center, with suitable commercial and service functions. At the same time, it falls in line with the need to create green recreation and conservation areas as purported by the green corridor and green belts policies for the development of Towns and centers in the Division. The overall land use philosophy for Sri Aman is for:

- Protection of unique and sensitive environmental areas and resources;
- Promotion of efficiency in land and resource utilisation;
- Promotion of mixed and multi-functional development;
- Prevention of urban sprawl and ribbon development along the main traffic corridors radiating from the main traffic corridors i.e. the Pan Borneo and the Second Trunk road (Coastal Highways);
- Allow formation of green and preservation areas taking advantage of existing water bodies (rivers, lakes and streams) in the planning area;
- Encourage Transit Oriented development (TOD) to complement the proposed public transport station and/or intermodal interchange linking Simanggang and its peripheries.

4.1.1 Broad Land Use Master Plan Strategies

4.1.1.1 Economic

The land use strategy was formulated upon the basis of an integrated land use and transportation plan that optimises the potential of the main economic drivers - urban development, agricultural modernization, and eco-tourism - through adjacency of operations, complementary land uses, strategic linkages (roads, utilities, waterways) and preservation of the natural environment throughout the supply and value chain.

4.1.1.2 Development

4.1.1.2.1 *A supporting network of economic drivers and equity through Hierarchy of urban centers*

All the towns on each hierarchy level of urban centers are based upon a polycentric spatial structure that promotes balanced development throughout Sri Aman division. Each of the towns following their role in the hierarchy level will help to produce economic significance and become an economic driver for nearby towns in terms of agricultural service centers.

4.1.1.2.2 *Promotion of an efficient land use planning and utilization in the urban area.*

All the towns in the division shall be planned to achieve efficiency in land use arrangement, circulation and public activities. Urban areas need to be compact to minimise carbon footprint and to promote infill development where possible. Pedestrianisation and transit-oriented development shall be promoted. With an abundance of streams and rivers, the possibility of more intermodal transport facilities shall be considered in appropriate areas.

4.1.1.3 Social Infrastructure

The social infrastructure in the Sri Aman Division refers to the community facilities, services and networks including schools, hospitals, sports facilities and community and cultural complexes. The coordination of community services and facilities is considered and incorporated in land use planning. Social infrastructure should be provided in sequence with new residential development, particularly in greenfield areas located in outlying and fringe localities with high service and transport needs.

In the next decade, there will be a need for additional schools, sports facilities and hospital beds in the Sri Aman Division. The majority of the household heads are demanding the setting-up of higher educational institutions within their localities.

Cultural spaces, centers, and facilities play an important role in providing a place for community events, functions, meetings, and festivals, used by a range of different cultural groups and creating a sense of place and identity. Cultural heritage is a powerful development asset that can help attract tourists, bring revenue, regenerate local economies, promote inclusion, boost cultural diversity and reinvent territorial identity. In Sri Aman, it is important to preserve and promote Iban culture by labelling the place as the Iban cultural stronghold of Malaysia.

The following are the overall recommendations and strategies:

- Introduce tropical design guidelines for educational and community buildings

- Location of educational and community facilities should be within the designated urban footprint.
- Promote cultural programs and events centered around the strong ethnic diversity.
- Initiate a catalyst project: The Iban Cultural Centre.

4.1.1.4 Environment

The following key environmental strategies underpin the holistic and integrated land use strategy:

4.1.1.4.1 *To translate and adapt the global environment and development agenda.*

The extensive economic, social and environmental threat impacts arising from forecasted climate change scenarios require balanced growth and development models, directed by principles and actions set out under the UN SDGs and adapted to Sarawak's and Sri Aman's regional and local conditions and economic growth opportunities. The land use planning strategy of Sri Aman has taken into account the existing and forecast environmental concerns that will affect natural ecosystems, social wellbeing and economic productivity. The land use strategy will take into account existing and proposed TPAs, development constraints and mitigation /adaptation measures associated with flood prone areas, and the importance of protecting extensive areas suitable for carbon storage.

4.1.1.4.2 *To translate and adapt the Malaysia Overall Regional Development Framework.*

The government of Malaysia has committed to the total reduction of carbon dioxide (CO₂). During the United Nations Climate Change Congress 2009 (COP-Conference of Parties 15) in Copenhagen - December 2009, Malaysia, had committed to the reduction of its carbon emission rate up to 40 % from the current rate. Following that in COP 21 – Paris, November 2015, Malaysia had increased its stake to 45% with the support from the international community. This commitment on CO₂ reduction, commitment to green and green technology initiatives would also be relevant to Sarawak and Sri Aman and will affect the state physical development, environment and energy planning policy. As shown below are some of the land use measures to be taken to reduce the CO₂ emission.

- Encouraging public transport use through land use planning
- Parking standards - set by local authorities to specify the minimum and maximum number of spaces permitted for particular types of new development
- Development densities and mix - encouraging less motorised personal travel through new land use development and the management of existing land use in such a way as to bring origins and destinations closer together in order to help reduce private transport trips

4.1.1.4.3 *To identify and earmark all environmental and ecologically sensitive areas as Land Use commitment.*

In addition to all the TPAs (existing and proposed), there may be additional areas that must be protected and preserved. Some of these areas have a functional role as buffer against floods and catastrophic wind as well as carbon stores for the world. CO₂ reduction could not only work as a cut on fossil fuel consumption but the maintenance of, as much as possible, the carbon bank within a country and its territorial waters.

4.1.1.4.4 *To take advantage of Natural and Physical Features and cultural heritage as Land Use planning assets.*

Sri Aman is blessed with an abundance of natural assets which include, rivers, lakes and mountain ranges. The protection and conservation of these areas is not only environmentally justified but, just as crucial, they are aesthetic assets that help form the identity and character of the Division and towns for their residents and an attraction for visitors. An example of where the tangible and intangible

importance of the natural landscape or urban environment aesthetic can be destroyed is illustrated in Figure 4-1. The human scale of Serian's town center has been destroyed and alienated by a highway wall. The imposing structure has restricted pedestrian connectivity and the natural edges of the river.



Figure 4-1: Serian Planning Disaster

New ideas such as green development, and its “smart and competitive city” development framework have also been formalized in the forms of the Low Carbon City Framework (LCCF) and other policy framework that have been adopted at the National level. In Sarawak, an attempt to decentralize some of the tasks and responsibilities for development has also been mooted with the introduction of relevant agencies such as URDA, HDA, and soon SADA (for Sri Aman). All these will have certain influence and repercussions on the land and socioeconomic development in Sri Aman.

4.1.1.5 Smart City Simanggang

Simanggang, as a Divisional centre, is in a unique position and has great potential to be planned as a smart city. With state government substantial investment in digital infrastructure gearing up to enable Sarawak to become a digital powerhouse in the future, it is timely now for Simanggang to take advantage of its rudimentary nature to adopt the underlying Smart City ideas and principles. This is in line with the nation and state government desire to embrace technological innovation in the economic growth and development. Smart city shall be the tools in Sri Aman's overwhelming desire to create substantially better communities, better urban living and working conditions. Moves towards this overarching goal of integrating efficiency, liveability, economic viability and sustainability in urban developments through the adoption of technology and innovative planning and urban design principles and standards.

The conceptual plan of Simanggang town has taken into consideration all the Smart, Liveable and Sustainable agenda. The proceeding paragraphs highlight some of the key strategies:

- Protection and Management of Riparian corridor- With the availability of digital infrastructure, monitoring and surveillance of these natural resources would be easier with realtime data capture and distribution;
- TOD & POD- Transit and pedestrian oriented development would be better realized with accurate and timely data sharing. Public transit schedule – time and frequency would be more reliable and easily accessible to the public;
- Modern Agriculture- Planting of fruits and vegetable would no longer dependent on inherent soil suitability. Modern precision agriculture can be implemented even at a smaller individual and neighbourhood scale using new techniques. The creation of agrarian clusters and neighbourhood will

be feasible. Covid 19 has presented us with this opportunity to embark on modern and innovative urban farming to mitigate food security issue.

4.1.2 Riparians Corridors

One of the most important and abundant resources in Sri Aman is the river. Riparian corridors are capable of bringing economic benefit at the same time as environmental benefit. Riparian areas are lands that occur along watercourses and water bodies. Typical examples include floodplains and stream banks. They are distinctly different from surrounding lands because of unique soil and vegetation characteristics that are strongly influenced by the presence of water.

General indicators of riparian areas include:

i. Vegetation

The kind and amount of vegetation differ from adjacent upland vegetation because more water is supplied to plants from the associated watercourse or water body.

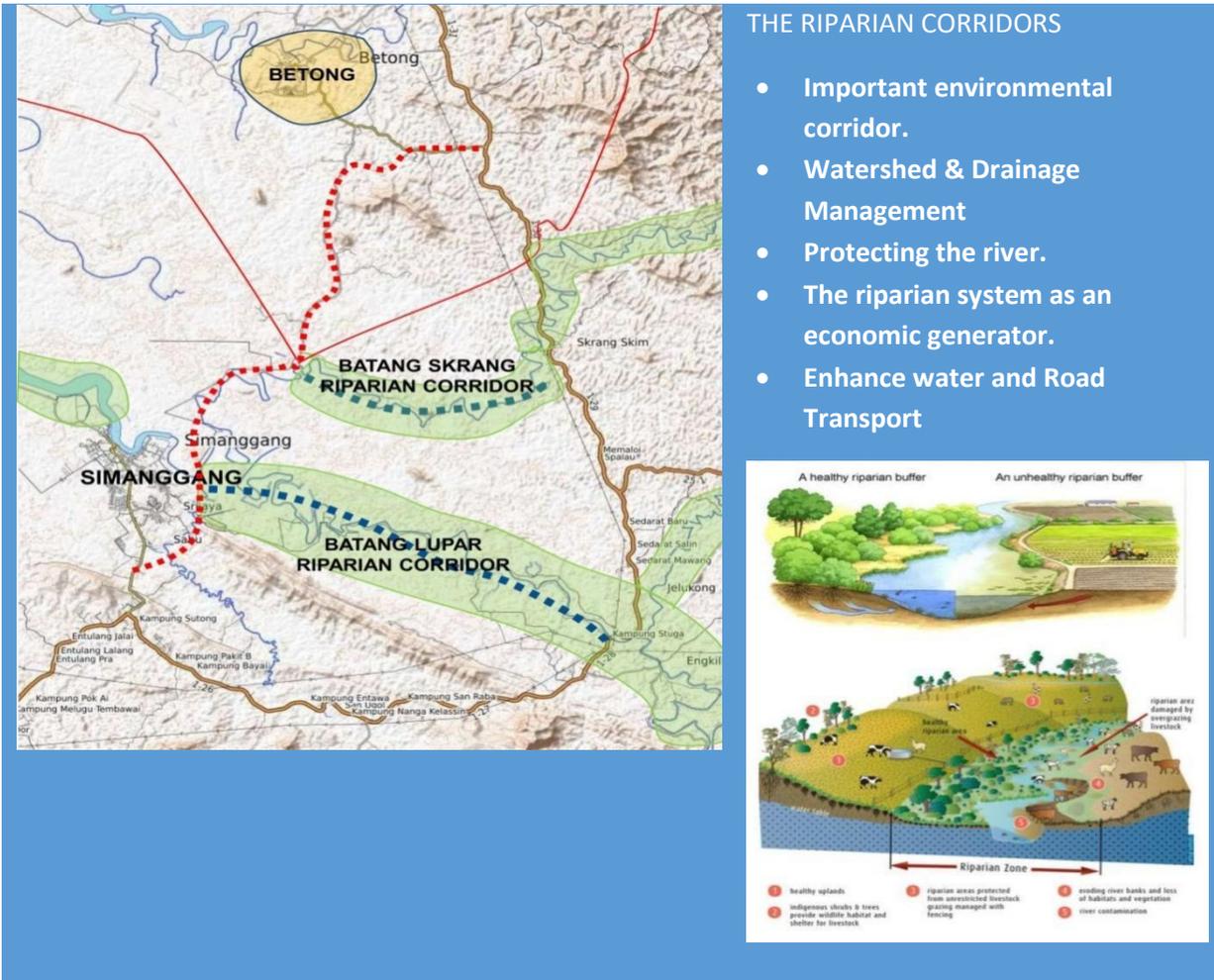
ii. Soil

Soil in natural riparian areas consists of stratified sediments of varying textures that are subject to intermittent flooding or fluctuating water tables that may reach the surface. The duration of soil wetness depends on the water levels of the adjacent water body.

iii. Water

Riparian areas are directly influenced by water from a watercourse or water body. They occur along natural watercourses or next to natural lakes and constructed water bodies such as ditches, canals, ponds, and reservoirs.

Riparian corridors concept could help control point and non-point pollution sources on Batang Lupar. The corridors and riverbank reserves help with the retaining and utilizing of nutrients and reducing sediment. Riparian corridors are also important recreation and scenic values. Riparian areas are relatively small and occur in conjunction with watercourses however, it could be vulnerable to severe alteration and damages caused by human activities. Riparian areas unique ecosystem providing food supply, cover, and water for a large number of animal species. At times, riparian corridors also serve as migration routes and habitats for a variety of fauna and wildlife. Trees and grasses in riparian areas stabilize stream banks and reduce floodwater velocity, resulting in reduced downstream flood peaks. Alluvial aquifers help maintain the base flow of rivers in Sri Aman in humid areas because of high water tables. This base flow is important in drier seasons as streams loses water. Base flow help maintain water table deep beneath the stream.



THE RIPARIAN CORRIDORS

- Important environmental corridor.
- Watershed & Drainage Management
- Protecting the river.
- The riparian system as an economic generator.
- Enhance water and Road Transport

Figure 4-2: Riparian Corridors Upstream of Simanggang

Source: Daya Rancang

SIMANGGANG TOWN CONCEPTUAL PLAN



Simanggang Proposed New Bridges & Ring Road

- The new planned and committed Batang Lupar 2 cable-stayed bridge spanning over 400m of the river will create a new shorter link to Betong and north Sarawak and opens up new opportunities and areas to develop, which will need proper planning and control.
- This new bridge alignment, if linked properly with new and existing peripheral roads, will create a Ring Road around Simanggang and create a good dispersal route and a more complete transportation network. This is indicated in yellow with another shorter proposed bridge at Batang Undop. This new ring alignment which includes some currently approved and committed Sarawak Government projects to be implemented can spur further growth and expansion of Simanggang town.
- Another main advantage of this outer ring road would be to equally distribute potential growth areas of Simanggang town to both sides of Batang Lupar. These bridges and ring road system is of strategic importance to trigger and enhance growth of Simanggang from its current locality to the new undeveloped north, east and south of current Simanggang town centre.
- This ring road also recognizes Simanggang is also the convergence point of two important rivers into Batang Lupar; Batang Skrang and Batang Undop.
- The internal road network (shown in red) is also an approved and committed road projects (new & upgrading) to provide better traffic circulation within Simanggang town as well as to improve connectivity of Simanggang town to its peripheries and outer regions.

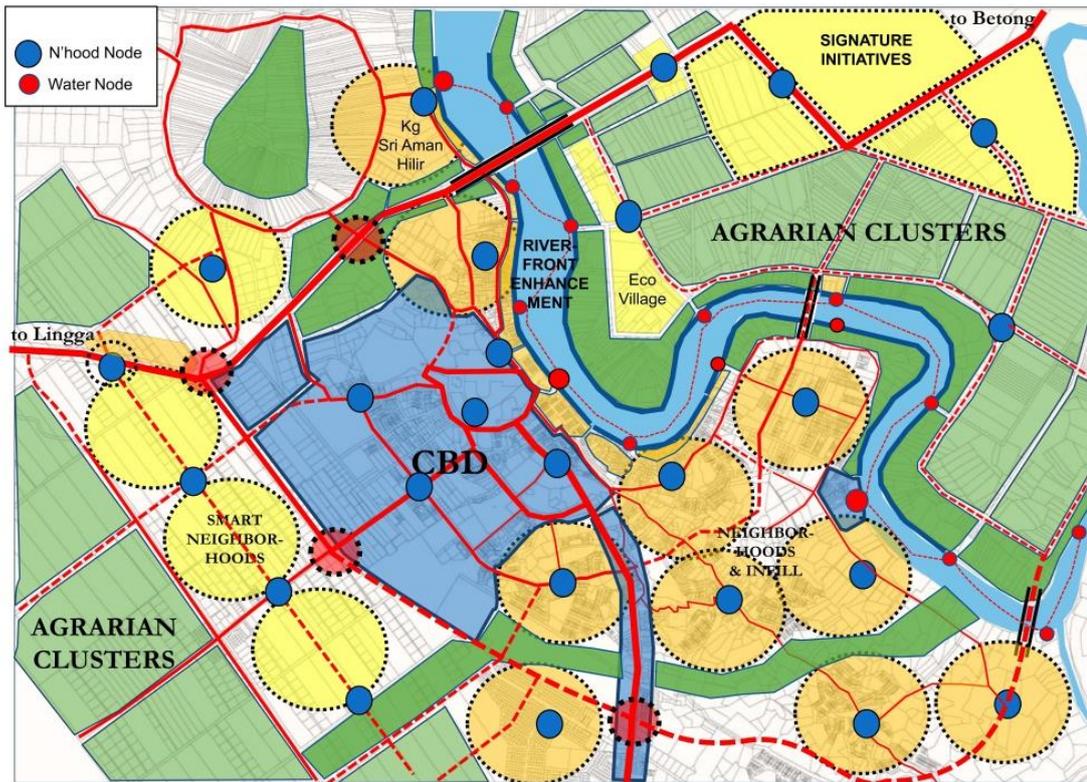
Simanggang CBD and Smart Neighborhood



SMART NEIGHBORHOODS & 10 PRINCIPLES OF SMART GROWTH

- Mix land uses
- Take advantage of compact building design
- Create a range of housing opportunities and choices
- Create walkable neighborhoods
- Foster distinctive, attractive communities with a strong sense of place
- Preserve open space, farmland, natural beauty, and critical environmental areas
- Strengthen and direct development towards existing communities
- Provide a variety of transportation choices
- Make development decisions predictable, fair, and cost effective
- Encourage community and stakeholder collaboration in development decisions

SUSTAINABILITY & BIO-DIVERSITY



Source: Daya Rancang

- The overall growth structure of Simanggang town is built on Smart and Sustainable city and Neighbourhood principles. As the state is embarking on its Digital Agenda, the use of modern technology will enable the planning and development of more innovative urban centres and neighbourhoods. As the state advanced in the ICT area, some of the Smart City ideas and concepts such as Smart Mobility, Smart Community, and Smart Living can be achieved. Layout design of a neighbourhoods shall promote compact and walkability. With the availability of AI,

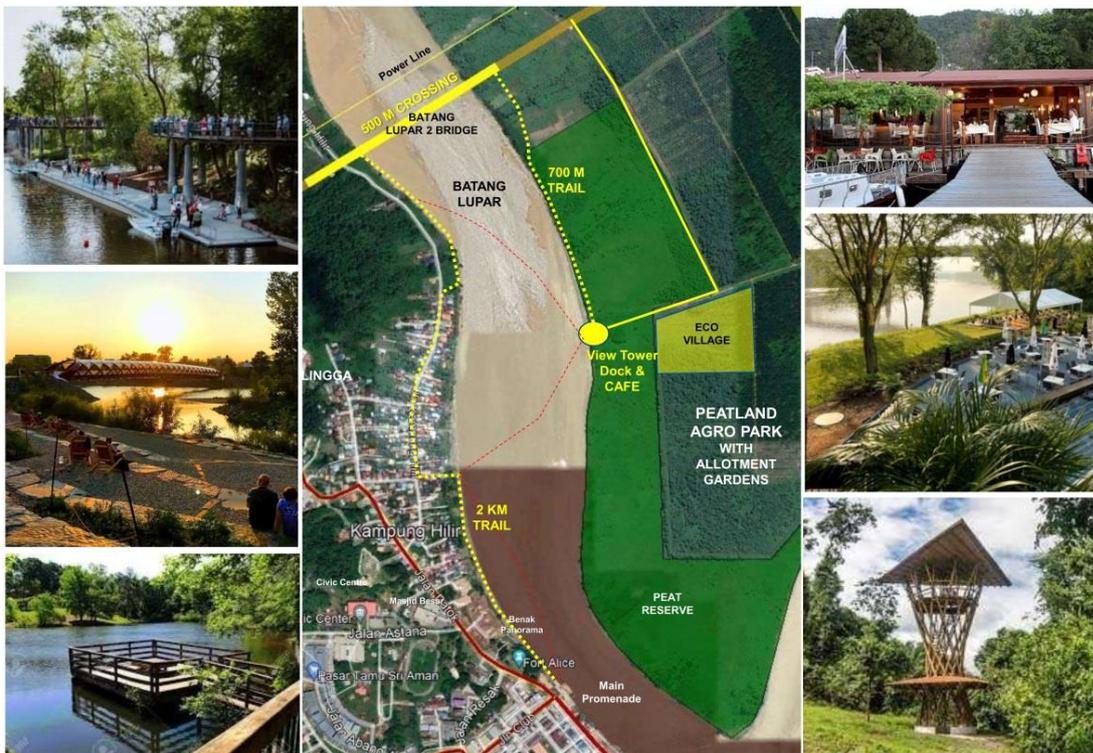
this will be supported by smart and efficient public transport system & network. The appreciation for TOD and POD (Transit Oriented and Pedestrian Oriented) development would be imaginable venture for a place like Simanggang. This overall planning framework for Simanggang Town would not only capture Smart City ideals but it also answers the call of the global SDGs agenda.

Greater area of Simanggang urban design strategy shall evolve to accommodate the following functions:

- The Riverfront CBD as Administrative center
- Cultural and Economic Centre
- Enhancing Architectural and Landscape Character. History and Heritage as Assets.
- A Centre for Trading, Education, Wellness, Recreation, Training and Living
- Home for The Benak Festival, Iban Cultural Center, and River and Agro based events
- Agrarian Clusters as Showcases
- Springboard to the Riparian Corridor
- Forming Ring Road system for future growth

The idea is to restructure the existing development by creating nodes that link them together for public transport in the future. There is a potential to create another link from west side at Kampung Hilir of Simanggang towards east side and this can be organized by creating a ring road.

Enhancing the River: Simanggang Waterfront



Source: Daya Rancang

- Being situated along Btg Lupar, Simanggang has the advantage of water access. The Simanggang Concept Plan also promote greater use of Batang Lupar for riverine transport mode. Similar to Kuching City, Simanggang town has a potential to value add its existing river and waterfront for multi-modal nodes for transport services for locals and tourists.
- The waterfront shall be the heart and soul of Simanggang town. Suitable enhancement steps to take advantage of the bridge crossing by enabling seamless pedestrianization along the riverfront to cross the bridge on the other side shall be one of the key strategies.
- Smart growth overall approach is to encourage a mix of building types and uses, diverse housing and transportation options, development within existing neighborhoods, and robust community engagement.
- Smart environment and environmental conservation practice is applied by preserving a Peatland Corridor along the river and introducing the concept of Peatland Agro Park in the form of allotment gardens that are more suitable to peat soil in the inner layer. These two will work hand in hand in maintaining the river' biodiversity and provide a natural source of organic food for Simanggang.
- The proposed Eco Village will be a pilot program to this Sustainable Community project which will be easily accessible once the new bridge is completed.
- A pedestrian and cycle trail is proposed to link the town's Main Promenade to the new iconic bridge and across the river to a boat dock, Café and Viewing Tower near the Eco Village which will give a panoramic view of Simanggang and the new bridge. This proposed 3.2km river trail will be part of Simanggang's vision as a Healthy Recreational and Educational City and a potential iconic tourism draw.
- Proposed View Tower and boat dock is to enhance the Simanggang current riverfront values by anchoring the trail connecting Simanggang CBD and Simanggang North areas. It functions additionally as a main entrance to connect the tourist or residents of Sri Aman with eco villages.
- Proposed peat land agropark near the echo village is to achieve a sustainable peat land use. This could secure long term food sources for the villages and simultaneously achieve food sustainability goals.

4.1.4 Enhancing Informal Economic Sectors



Figure 4-5: Informal Economy Sector in Urban City of Indonesia

The informal economy can be a problem in urban planning, especially in cities with rapid urbanization. Businesses that operate on streets and other public spaces are often regarded as eyesores and unwanted activities. However, we should not overlook the importance of the informal economy.

The influx of migrants seeking employment from rural areas surrounding urban agglomerations also helps fuel the development of the informal economy. Since the formal sector cannot support such a large number of jobs, the informal economy takes over as the primary source of employment. Without the economic opportunities provided by such initiatives, the poor will undoubtedly become a greater burden on city governments.

It is also worth noting that the informal economy is not just for the poor in cities. Many middle-class people profit immensely from economic activities that take place outside of the formal sectors. Accommodating the informal sector in urban spaces will minimize conflict between urban authorities and the informal sector, as well as the environmental issues that come with it, and will ultimately speed up urban development and improve quality of life in many urban areas.

SECTION 4.2 HIERARCHY OF URBAN CENTERS

Urban centers and settlements require transformative commitments for sustainable urban and settlement development that ensures all areas of the province achieve social and economic benefits through a unified and collective spatial development strategy, for which the overarching objectives are:

- To develop integrated and collaborative networks of urban center hierarchies that build upon and enhance existing locational attributes – governance, services, agriculture, cross-border trade and business, SEZs, tourism and transportation.
- To identify viable self-sustaining growth areas of which urban centers are the economic drivers to provide the essential foundation for social inclusion and ending poverty.
- To highlight social and spatial infrastructure provision within urban centers that revitalize traditional economies, attract new development investment in a timely and integrated manner, and raise the quality of urban and settlement living through smart and green city development.
- To plan for balanced urban development that is environmentally sustainable, resilient, and fully respectful of agriculture's importance as the economic, social, and cultural heart of the province.
- To set realistic urban development scenarios that set the framework for future development control governance under the provinces spatial and land use planning framework.

Table 4-1: Hierarchy Level Centre

High Level Centre	Simanggang - Sri Aman; food processing, manufacturing, servicing of agricultural equipment, residential and affordable housing, social infrastructure, and expanding the provision of financial, commercial and governance services to establish an efficient and timely supporting service sector. A case can also be made for investment in the knowledge economy in association with the University and private sector R&D for establishment of a technological park.
Medium Level Centre	Lingga - tourism and agro/aqua produce service center
	Pantu - new development area, complementary and connectivity development with Lachau
	Lachau - manufacturing and logistics center, complementary and connectivity development with Pantu
	Lubok Antu - cross border trade is paramount, and stimulus measures to expand that should be of division and state significance. Possible SEZ consideration, plus new industrial manufacturing enterprises and logistics
	Engkilili - agro produce service center
Low Level Centre	Temudok - support center for Simanggang
	Sungai Tenggang - support center for Lachau and intra division links
	Lesong - support center for Pantu
	Bakong - support center for Lingga
	Skrang - support center for Engkilili
	Banting – support center for Lingga

Source: EPU Sarawak, Frost & Sullivan and UNIMAS Holdings Analysis

The strategies for urban centers and settlement system are based on a polycentric spatial structure that promotes balanced development throughout Sri Aman division. Four main growth areas, each with interconnected urban and rural centers should be enhanced through the upgrading of hard and soft infrastructure. The sketch plan in Figure 4-6 shows a notional hierarchy of centers for urbanization and the relationship between them. This may aid in defining the exact purposes of the 'CAN Clusters,'

'Corridors,' 'Simanggang Center,' and growth / development areas as depicted on the Sri Aman Master Plan. Table 4-1 provides brief descriptions of the functions of different urban centres.

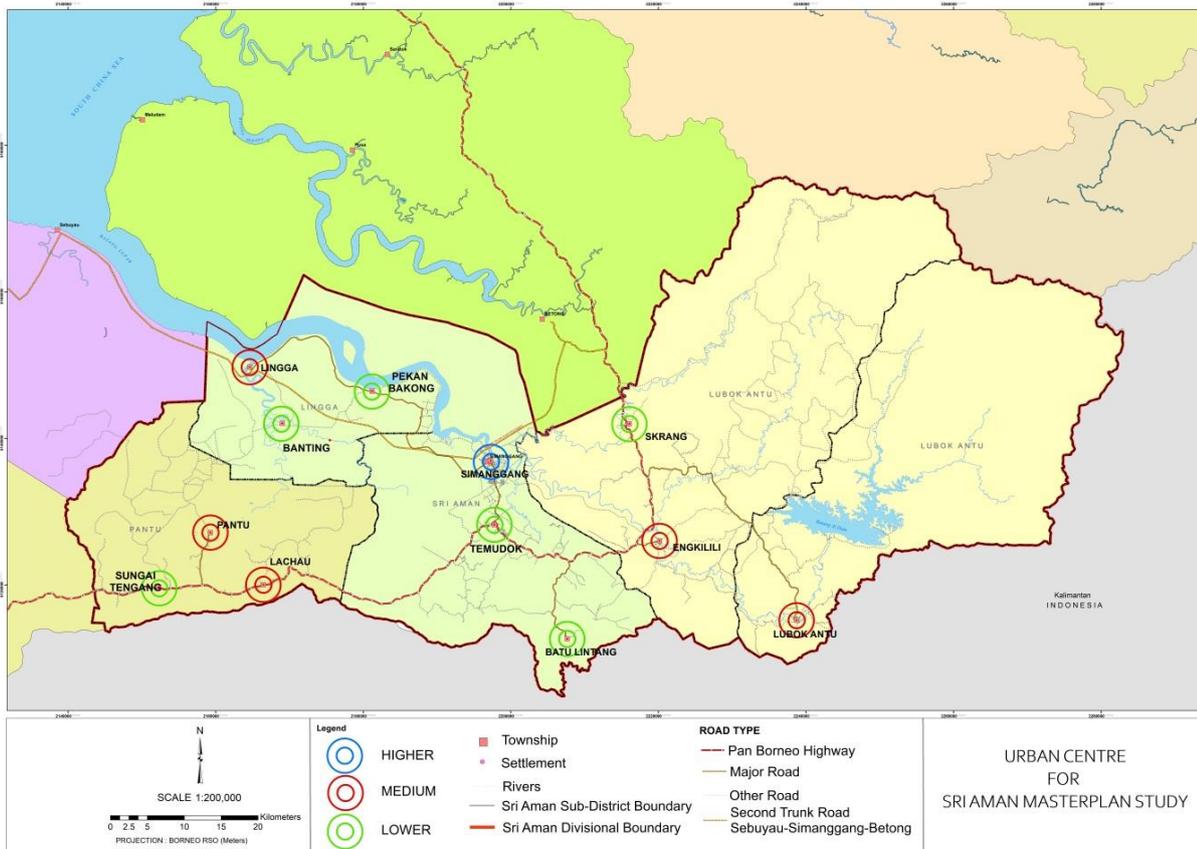


Figure 4-6: Sri Aman Urban Centres Hierarchy

Source: EPU Sarawak

SECTION 4.3 INFRASTRUCTURE

4.3.1 Roads and Transportation

The roads and transportation initiatives have been developed in the context of spatial development with the objectives of:



- To develop comprehensive and coordinated multi-modal transport network so as to the sustainability of future economic activities which include efficient mobility of population regardless of traveling purpose and geographical location.



- To ensure the movement of cargo within the study area and external areas are not only efficient and reliable, but also cost-effective by providing appropriate facilities including collection centre (freight consolidation and bulk breaking centre) & Collection, Processing and Packaging Centre (SPPC) .

Based on the geographical conditions and respective proposals from economic sector developments, the main transport modes identified in the study area are mainly road based. However, some initiatives for riverine and air transport are also included:

4.3.1.1 Key Strategies

In order to achieve the said objectives, it is desirable to focus on the following strategies.

Strategy 1: The External Connectivity

- ❖ The external connectivity is critical for the study area and the improvement of regional accessibility is vital to ensure the sustainability of its economic growth.
- ❖ The setting up of two collection, processing and packaging centres (CPPC) to coordinate and enhance logistic efficiency is proposed. One will be at Temudok and one at Lachau.
- ❖ Public transport with adequate services to facilitate passenger movement and tourism activities. Intermodal transit with riverine linkages to be developed for settlements that are not connected by roads.

Strategy 2: Strengthen Intra Sri Aman Connectivity

- ❖ Improve personal mobility for work, school, business or social regardless of transportation modes used. Formulate policy and strategy to promote the usage of public transport and reduce the dependency on private vehicles/ boats.
- ❖ Enhance inter-urban mobility to ensure economic activities between major towns in the study area are well connected. Urban facilities such as bus connections and urban-suburban public transport systems should be improved to foster a strong connection between communities in the study area.
- ❖ The current river waterfront developments of Simanggang is to be a main feature of the Division capital. Engkilili, Pantu and Lingga, which each have a different character, are to be provided with cycle track and pedestrian network in the medium to long term.

Strategy 3: Improve Riverine Connectivity where roads are not available

- ❖ The improvement of riverine transport for the communities upstream of the Batang Ai Dam is proposed. Most of these communities are in Totally Protected Areas where we recommend that roads are not constructed in order to preserve these areas. Accordingly, these communities need to be afforded a level of public transport that is commensurate to that being provided to other communities in Sri Aman. The rural water taxi will provide this service, connecting children to schools, people to clinics and allowing travel to other parts of the Division.

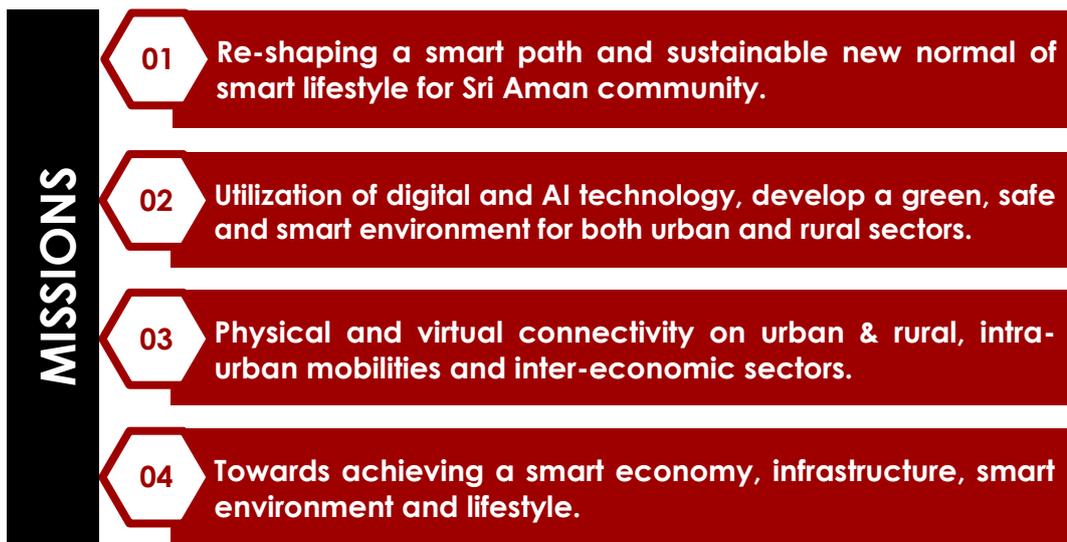
Strategy 4: Simanggang City Centre Roads and Facilities

- ❖ The micro-mobility of the urban centre and promenade of Simanggang’s river waterfront should be strengthened with comprehensive pedestrian system to become a walkable and non-motorized green central business district (CBD).
- ❖ Setting up smart centre to monitor the city on management of all road users, safety/ security, utilities, and environment management, etc.

Smart infrastructure will form part of the Smart City Concept for Simanggang. Planning for the 10-minute walkability town centre in context of smart infrastructure and urban design elements with pedestrianised bridge across the Batang Lupar River will enhance place making, which allows residents and visitors alike to enjoy their gathering places. Smart infrastructure in addition to sustainable environmental measures, agrarian communities concept living, smart education in CENTEXs and other centres of excellence, emphasized Iban cultural heritage attractions shall encompass the SMART City concept for Simanggang in the future, realising the digital economy development thrust of the State.

4.3.1.2 Sri Aman SMART CITY

In line with the target of Sarawak cities in working towards Smart City lifestyle, the Master Plan of Sri Aman shall take initial steps to equip its development on the same direction. The mission in this respect is as listed below:



Source: Daya Rancang

4.3.1.2.1 Base Data Collection and Dissemination

Establishing a Smart centre within Sri Aman would make use of super Apps to gather, centralize, process and disseminate data to individuals regardless of their locations. The sources of base data include: -

- A series of CCTV installed on/off-street and at public buildings. These include collected data on urban pedestrian, vehicular movements, traffic signal control coordination and on/off-street parking.
- Demand and supply information uploaded by respective business operators, industries and transport operators of freight and passengers (real time and/or prescheduled).

The processed information will be disseminated: -

- to residents (regardless of locations) by smartphone via superApps
- via Variable Messages Sign (VMS) installed along the roadside which transmitting message to relevant drivers
- to relevant authorities for the purpose of enforcement and criminal prevention.

BASE DATA COLLECTION AND DISSEMINATION

Data collected by a series of on-street and off-street CCTV which then transmitted to "Smart City Centre". The processed data will be disseminated to:

SuperApps to individuals regardless of their locations

01

Multiple functions of VMS (Variable Message Sign) on-street

02

Business operators, public transport and e-hailing

03

Crime prevention agencies

04

Source: Daya Rancang

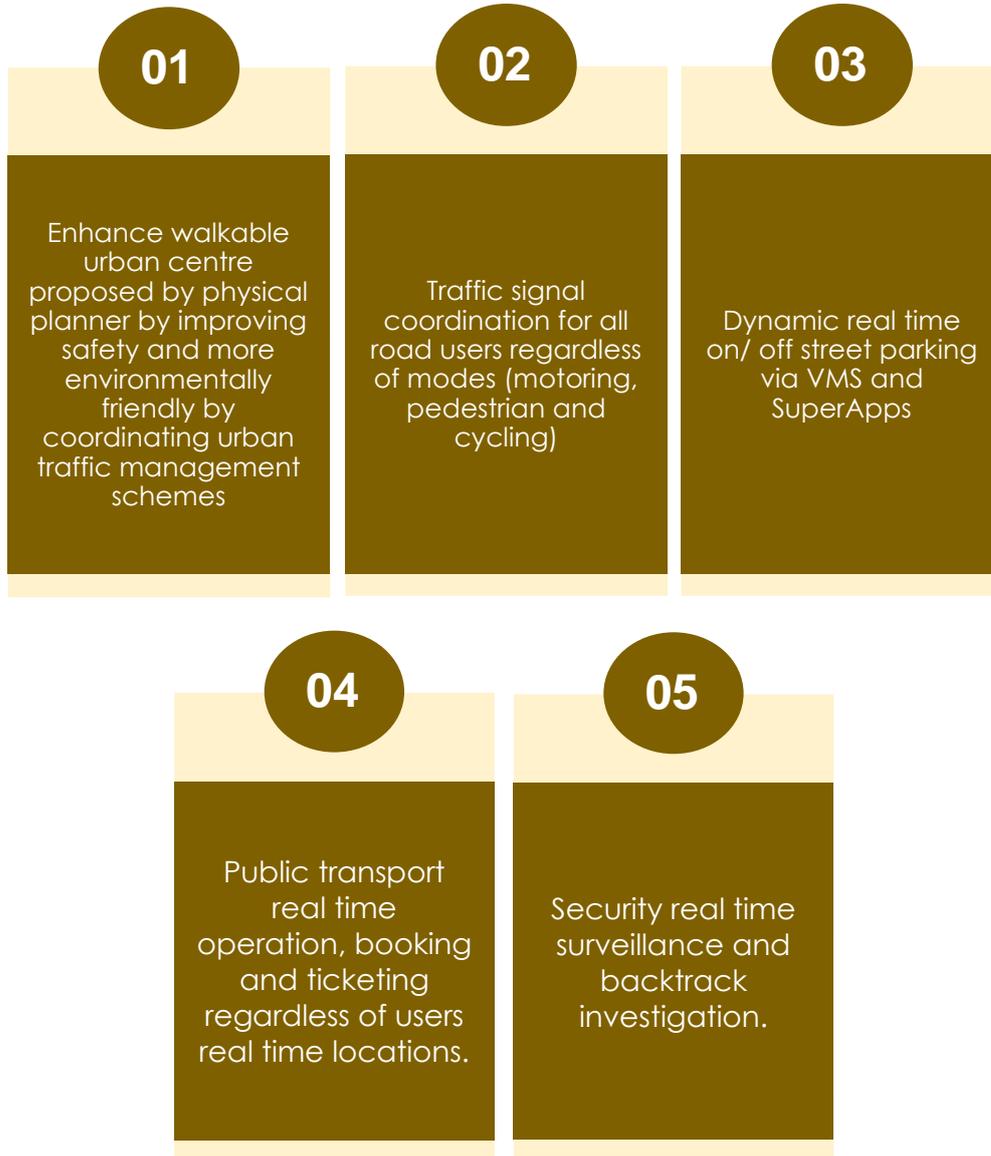
4.3.1.2.2 The Anticipated Achievements

In order to progress towards a smart community and lifestyle with relevant infrastructure adjustments, it will be necessary to achieve the following: -

- Enhanced mobility within urban centres, in line with the vision of achieving a green and walkable CBD that is a safe, pleasant and user-friendly environment for all roads users regardless of modes of travel
- Coordinated traffic control by considering non-motorized road users such as pedestrian, cyclist, old citizen and disable people
- Dynamic real time on/ off street parking and traffic condition via VMS and superApps

- Public transport real time operation, booking and ticketing regardless of users' real time locations
- Security real time surveillance and backtrack investigation
- Coordinated, efficient and cost-effective freight and passenger movements

ANTICIPATED ACHIEVEMENTS



Source: Daya Rancang

The micro-mobility of the urban centre and promenade of Simanggang's river waterfront should be strengthened with comprehensive pedestrian system to become a walkable and non-motorized green central business district (CBD).

Smart infrastructure will form part of the Smart City Concept for Simanggang. Planning around the concept of a 10-minute walkable town centre in context of smart infrastructure and urban design elements with pedestrianised bridge across the Batang Lupar River will enhance place making, which allows residents and visitors alike to enjoy their gathering places. Smart infrastructure in addition to

sustainable environmental measures, agrarian communities concept living, smart education in training centers, will help Simanggang realise the digital economy development thrust of the State.

4.3.2 Drainage and Irrigation

4.3.2.1 Drainage and Flooding

There are a large number of drainage issues across the Sri Aman Division, covering serious flooding issues, minor flooding, local drainage problems, and road inundation affecting access.

There is an urgent need to understand the cause of these issues (local or catchment based?) and develop strategies to address the issues. This will be a major exercise and we have recommended an appropriate study be undertaken, and have allocated a budget to address the priority flood affected sites.

4.3.2.2 Riverbank Erosion

Riverbank erosion can have a devastating impact on floodplain farms, adjacent infrastructure, and residential and commercial buildings. Riverbank erosion has a number of causes and is often not well understood. As for the flooding issues this matter needs investigation involving a river engineer and geomorphologist as a minimum. We have recommended an appropriate field investigation be undertaken, and have allocated a budget to address the priority erosion affected sites.

4.3.2.3 Irrigation

There are a number of agricultural projects proposed under SAMP that will benefit from an irrigation system. In particular, it is proposed to expand the areas of rice paddy which requires flood irrigation for high levels of production. Further, it is proposed to double crop this padi each year. This means that water for flooding the padi must be available 'on-call' and not subject to the vagaries of the weather.

SECTION 4.4 UTILITIES

4.4.1 Water Supply

JBALB is planning and working towards the provision of clean, potable water to all settlements in Sri Aman. It has an extensive mains water supply system that covers most of the Division. This is supplemented by the Sarawak Alternative Water Supply (SAWAS) scheme that provides local water supply to remote villages that are outside the practical reach of the mains network.

The SAMP projects are expected to add approximately 11.2 ML/d to water demand in the Division.

4.4.2 Electricity

Sarawak Energy Berhad (SEB) operates the Batang Ai Hydro Electric power station in Lubok Antu District. This provides a significant proportion of the power that is fed into the state-wide grid. SEB has a number of planned projects that will help to stabilise the electricity network and cater for increasing demand, particularly in the urban areas.

The SAMP projects are expected to add approximately 150 MW to power demand in the Division.

4.4.3 Telecommunication

The proposed action plans have the following objectives:

- To increase the exchange centre capacity based on future developments and population increase
- To ensure blanket coverage of Sri Aman with 4G wireless network coverage
- To require that all future Greenfield sites have fibre optic cable installed

SACOFA Sdn Bhd will play an important role to construct telecommunication tower(s) and provide remote areas wireless/cellular infrastructure. This will enable the promotion of IT knowledge, in line with the national vision to provide 100% telecommunication coverage nationwide including Sri Aman Division, which is consistent under the Malaysia Communication and Multimedia Commission.

The over-riding strategy in Sri Aman is to connect people and communities with services and markets, no matter where they live. Sri Aman can only develop fully once it has adopted the digital economy. The key to this is providing blanket wireless access for mobile phones and internet.

4.4.4 Waste Management

4.4.4.1 Solid Waste Management

Strategies to manage the collection and disposal of solid waste in Sri Aman cover a number of themes:

- Increase collection coverage

- Improve / upgrade existing landfill sites
- Establish new landfill site to meet high sanitary standards and current best practice
- Reduce waste in the community
- Improve waste management in remote settlements
- Establish a viable recycling industry

4.4.4.2 *Liquid Waste Management*

There is no centralized sewerage collection and treatment system in Simanggang or in other settlements in Sri Aman. Generally domestic liquid waste is passed through a septic tank system (individual or communal) before discharging to the stormwater drains, and thence to the local rivers. At this stage there are no plans to introduce a collection system and treatment plant for Sri Aman. However, the SAMP has a number of recommendations with respect to the management of liquid wastes in the Division.

- Localised sewage treatment plants Commercial and institutional establishments
- Industrial effluent treatment systems for industrial premises
- Establish downstream treatment for remote communities

4.4.4.3 *Recycling Industry*

We recommend that a feasibility study should be undertaken into setting up a waste recycling centre in the Sri Aman Division to service segregated waste from Kuching and Sibul, as well as neighbouring Divisions and Sri Aman itself.

The Study should also establish the appetite of private enterprise businesses to be a part of this venture. It will also investigate suitable sites, including the site proposed in this report.

SECTION 4.5 HOUSING

Access to appropriate housing is an important component of the social and economic well-being of a future sustainable local community. A range of housing options are needed to meet the needs of the current and future community in the Sri Aman Division. Housing options include detached houses, terraced house, and free-standing houses in rural areas such as longhouses, homestays, hostels and shelters. Housing need is influenced by a range of factors including changing life-cycle needs, socio-economic circumstances and occupations, specific needs of the local population, and the needs for short-term and emergency accommodation.

4.5.1 Desired Sustainable Outcome:

- Livable, and sustainable residential communities supported by a quality infrastructure that promotes living in the tropics
- To ensure that future residential development takes place within the designated urban footprint
- To retain the residential low-density character of the Sri Aman Division
- To promote agrarian communities and agrarian activities within the existing and future residential areas
- To enhance the traditional architectural and landscape character
- To ensure quality urban services and infrastructure
- To incorporate tropical climate responsive design guidelines and codes as part of the future residential development

Based on the existing growth pattern, the Sri Aman Division will require additional housing for 22,000 people which translates to 5400 additional dwellings (based on an average household size in Malaysia which is currently 4.1 people per household). Taking into account the future development prediction and the Sri Aman Division will require additional housing for 41,230 people which translates to 8,300 additional new dwellings.

Based on information from the Real Estate and Housing Developers Association (REHDA) Malaysia for low to medium residential density (the average is 25-35 dwellings per hectare) and based on the additional 8,300 new dwellings predicted for the Sri Aman Division by 2030 (on the assumption that the population increase will be 41,230 in the next decade) around 290 hectares of land has to be designated for new residential development. The preferred scenario future housing demand based on a population increase of 8,300 dwellings by 2030 is shown in Table 4-2.

Table 4-2: Future Housing Demand

Future Population Increase by 2030	Additional Dwellings	Land Designated for Future Residential Development
A projected population increase by 41,230 (based on predicted growth as a result of new development)	8,300	292 ha

Source: Daya Rancang

All new urban residential development in the region will be located within the designated urban footprint. This includes new low-density housing estates and low-cost residential terraced housing for

migrant workers. Based on the information from the Sarawak Housing Development Corporation terraced housing is the preferred type for affordable and social housing targeting low-income brackets and migrant workers. The Sarawak Housing Development Corporation will increase the amount of affordable and social housing development to 10% of the total housing development as a result of the increased influx of population to Sri Aman.

Rural residential development will be limited to the existing appropriately zoned areas to ensure that a range of regional planning objectives can be achieved. An adequate supply of broad hectare rural residential zoned land for the preferred pattern of development in Sri Aman will be provided as part of this plan.

It is also essential to promote agrarian urbanism. It is an emerging movement based on the idea of integrating sustainable food systems and education with the design of the urban environment. Agrarian urbanism featuring detached and terraced houses with hobby farms and orchards in the backyards could become a unique phenomenon of the future residential environment in the Sri Aman Division.

4.5.2 Future Residential Layouts

In terms of future residential layouts, there are two concepts proposed for the new residential neighbourhoods in Sri Aman

- The traditional residential neighbourhood layout
- The agrarian community layout based on the Radburn concept

4.5.2.1 Traditional Residential Layout

The traditional residential layout is based on the standard subdivision and distribution of collector roads. The housing types will include both detached and terraced housing. The neighbourhood centre containing basic shops, post office, community centre, places of worship and a school will be located in the middle of the neighbourhood within a comfortable walking distance from each residence. The traditional residential neighbourhood layout is appropriate for the working migrant population

A typical example of a traditional residential neighbourhood layout is shown in Figure 4-7.

4.5.2.2 The Agrarian Community Layout (the Radburn Concept)

As the world's population increases and the amount of farmland shrinks, there must be a shift in how people shape their urban environments. Urban agriculture programs can help local communities both economically and socially. They allow people to have a more immediate connection to their food, as well as help to stimulate the local economy. Besides, more direct access to fresh vegetables, fruits, and meat products through agrarian urbanism can improve food security and food safety



Figure 4-7: Traditional Residential Layout Based on a Walkable Distance to The Neighbourhood Centre

Source: Daya Rancang

Agrarian urbanism is not a new phenomenon in urban planning. The period between the 9th and the 13th century in Southeast Asia witnessed the dominance of the Khmer Empire. Angkor, the capital of the Khmer Kingdom, with a population of 1 million was a typical agrarian urban community. The whole city was connected by a network of canals, used for irrigation purposes and, the majority of houses were aligned along the waterways. Each house was self-sufficient as it had a vegetable yard, a fruit garden and in many instances also animal husbandry.

It was envisaged that there will be 292 ha of new residential development land in Sri Aman and therefore there is a potential to promote agrarian urbanism. It is essential to promote green urban neighbourhoods within the urban footprint where each household would be equipped with a vegetable garden and fruit orchard. The agrarian residential layouts will be based on the Radburn concept.

The Radburn concept was initiated in 1929 by architect Clarence Stein, when the superblock was conceived for the new town of Radburn, in New York State. At a time, car ownership in the USA was at levels that were not to be reached for another 25 years in Europe. This proposed layout set out to completely separate pedestrians from vehicles while still using conventional single-family houses. It excluded all through movement from a two-square-mile block of development that was surrounded by a 350-foot-wide (100-metre-wide) wide reservation accommodating arterial roads with a limited number of access roads into each superblock. The design is typified by the backyards of homes facing the street and the fronts of homes facing one another, over common yards.

In the future agrarian residential neighbourhoods of Sri Aman, the common green areas facing the houses will be designed for lettable urban farming parcels. Therefore, each owner-occupier will be allowed to lease the land at the rear of his/her property for urban farming. This will allow all residents to engage in urban farming and horticulture. The centre of each agrarian neighbourhood will be designated for a small neighbourhood centre comprising retail outlets, a children's playground, places of public worship, a primary school, eating places, and a small community centre. The neighbourhood centre will be located within a comfortable 10–15-minute walking distance from each residence. Neighbourhood centres can be located in the centre or at the edge of the neighbourhood.

The principles of the Radburn concept are shown in Figure 4-8.

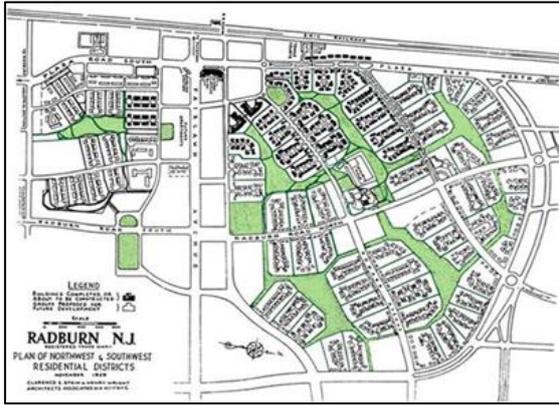


Figure 4-8: Basic Principles of the Radburn Concept

Source: Daya Rancang



Figure 4-9: Proposed Agrarian Residential Community Model Layout with The Neighbourhood Centre Located in The Middle of The Neighbourhood

Source: Daya Rancang



Figure 4-10: Proposed Agrarian Residential Community Model Layout with The Neighbourhood Centre Located at The Edge of The Neighbourhood

Source: Daya Rancang

Examples of different types of proposed model layouts for the agrarian residential community (based on the Radburn concept) are shown in Figure 4-9 and Figure 4-10.

4.5.3 The Rural Areas: Longhouses

It is critical to ensure that existing traditional longhouses are adapted to new modern functions. However, the external façade, form and character of the longhouses must be preserved. It is also important to encourage adapting the longhouse for homestay tourism accommodation. The majority of longhouses will be located in the rural areas although it is envisaged to designate larger blocks for that residential type within existing urban areas.

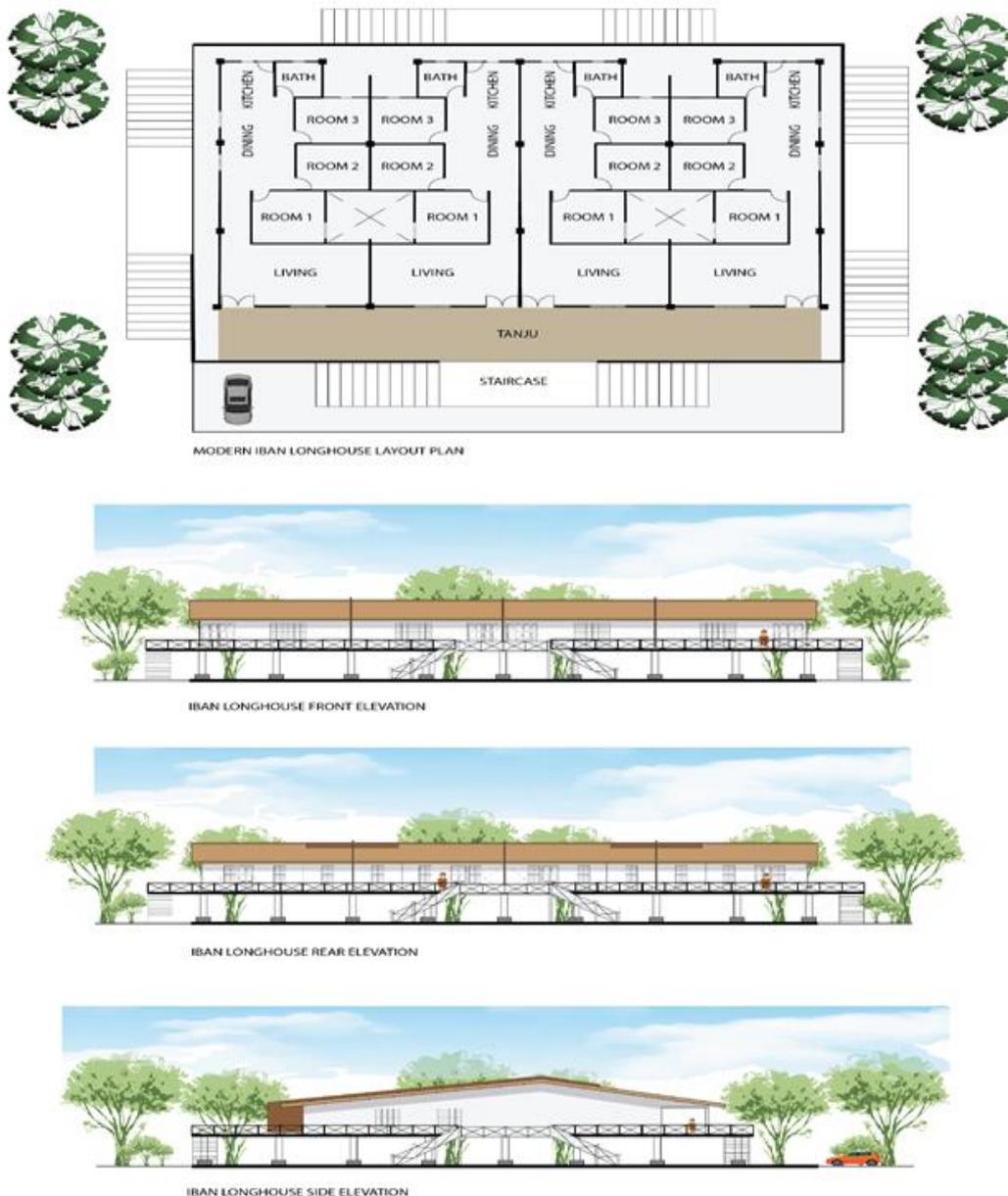


Figure 4-11: Proposed Modified Iban Longhouse. The Proposed Floor Plan (Above) and Elevations (Below)

Source: Daya Rancang

It was proposed to adopt the function of the modern longhouses while still meeting contemporary lifestyle requirements. Each living unit will be equipped with a kitchen and toilet. The common area can be used for social gathering purposes. The building materials can be also adapted to match current trends. The structural posts can be made from steel and the roof should be from corrugated iron or similar materials. An example of a modern longhouse is shown in Figure 4-11.

4.5.4 Form-Based Codes

Any future statutory local plan for urban centres in Sri Aman must be equipped with residential form-based design codes to ensure quality architectural design for the buildings and urban design measures for public areas around the buildings. Form-based codes are a planning tool that regulates development using a physical form rather than land use. It aims at contributing to a better quality of life by fostering preferred building outcomes and a high-quality public realm. Only design form-based codes can ensure a local unique quality, tropical climate responsiveness and preservation of the local culture. Form-based codes have been used widely in residential neighbourhood planning in North America, Europe and Australia. They also have been used in residential master-planned communities in Southeast Asia. The form-based codes should support the local stator plans and address the following:

- Setbacks
- Height and bulk
- Rooflines
- Façade treatment
- Preferred materials
- Frontage treatment and fences

4.5.5 Addressing Climate Change and Pandemics

Although Sarawak has yet to be significantly affected by climate change, it should still be strongly acknowledged in the process of planning and designing of new housing estates. The Sri Aman division recognises the highly valued tropical character of the region and the built environments and lifestyles that have evolved as a result of it. Universal building design sparked by neoliberalism and property led development are not suitable forms for this part of Sarawak. There is a need to adapt and provide better opportunities for enjoying the local tropical way of life. Tropical design principles underpin and reinforce good sustainable design. Incorporating tropical design principles into future development will reflect the local culture, the tropical climate and sense of place and identity

In the Sri Aman Division, climate change challenges include increased air temperatures, increased extreme weather conditions and flooding.

Overcoming these challenges is one of the key tasks facing decision-makers, urban planners and designers. Ensuring mandatory passive sustainable design for all residential buildings and sustainable urban design principles for entire residential neighborhoods is the only way to achieve physical, social and economic desired green environmental outcomes.

Statistics from around the world have indicated that COVID is prevalent in highly dense urban areas. However, there are exceptions to this rule. During the first wave, the low-density region of Lombardy in Italy was much worse hit than any major urban centres. In Sabah, the first cases of the second wave started in the rural districts of Lahad Datu, Papar and Penampang before they spread to major urban centres of the state. Therefore, it is essential to address the issue of future pandemics as part of the future housing strategy for the Sri Aman District.

As part of the Master Plan, it is essential to identify a set of urban planning and urban/architectural design measures, drawing recommendations to help mitigate the negative impact of an epidemic lockdown thereby improving community well-being. The planning and design measures should address total and partial lockdown implications and promote spaces for individual orchards, vegetable gardens, hobby farms, community engagement. Future adaptive designs and strategizing available empty lands for temporal activities should also be considered.

Design Strategies in a Traditional Malay House

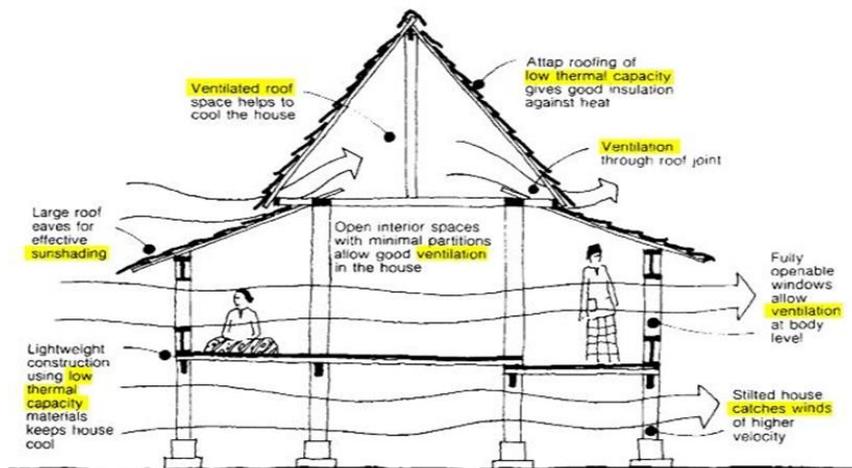


Figure 4-12: Design and Planning Measures to Address Climate Change and Pandemics for The Internal and External Building Areas

Source: Daya Rancang

Preventive planning and design measures for future residential areas addressing the impact of climate change and pandemics include:

- Tropical climate-responsive passive architectural design -ensure natural cross ventilation for all indoor spaces
- Location and orientation
- Landscape design
- Walking distance
- proximity to essential facilities

Examples of planning and design measures to address climate change and pandemics are shown in Figure 4-12.

4.5.6 Water Resources

The sustainable management of the water cycle is crucial to the ecological health of the region. The region’s waterways support a wide range of natural ecosystems including World Heritage areas. Additionally, water is necessary for urban development, irrigation, power generation, recreation, and cultural and social activities. The ongoing need for water must be balanced with the needs of the environment. Further, residents will need to adapt to climate variability. Based on current demand projections, the region will need more potable water by 2030 to meet future urban and rural growth.

A key challenge in planning for future urban growth is ensuring efficient use of our precious water supplies and reducing water consumption through improved management of water demand. One of the proposed strategies to achieve a sustainable and efficient water management system is the introduction of water sensitive urban design.

4.5.6.1 Water Sensitive Urban Design

Water sensitive urban design (WSUD) is an approach in planning and designing residential urban areas to make use of this valuable resource (storm-water) and reduce the harm it causes to our rivers and creeks. Water sensitive urban design (WSUD) uses better urban planning and design to reuse stormwater, stopping it from reaching our waterways by mimicking the natural water cycle as closely as possible. Elements of water sensitive urban design are shown in Figure 4-13.

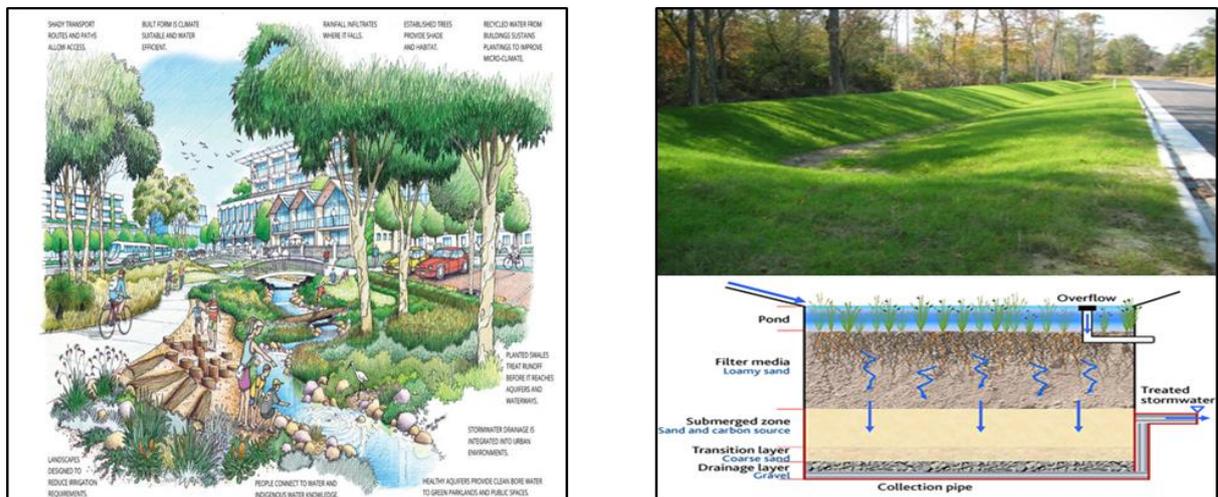


Figure 4-13: Elements of Water Sensitive Urban Design

Source: Daya Rancang

4.5.7 Waste

Urban growth will place pressure on local governments to deal with the waste generated by an increasing population. Local governments in the region are already actively seeking ways to manage waste more efficiently. Specific initiatives include reviewing options to promote reduction, re-use and recycling of wastes together with improved coordination of waste management strategies. Local government amalgamation may result in further coordination of waste strategies. The proximity principle—fostering and encouraging local solutions for waste management and resource recovery—

will be encouraged where feasible. The focus will be more on providing local facilities rather than regional, such as transfer stations. Recycling and other waste recovery facilities may need to be regional to achieve economies of scale and for proximity to transport infrastructure. Landfill facilities should also be regional but these are the least preferred method on the waste hierarchy

4.5.8 Recommended Policies

- Allow for the interrelation between the housing demand and future population forecasting
- Integration between neighbourhood residential planning and land use planning.
- Ensure well-functioning and sustainable urban infrastructure for all new residential neighbourhoods. The future demand for infrastructure services including water supply and electricity should be calculated as part of the supporting Priority Infrastructure Plans.
- Locate residential areas within the designated urban footprint -the creation of compact low-density sustainable residential environments based on an 800m walkable neighbourhood. Provide for separation between vehicular and pedestrian movement.
- Creation of agrarian sustainable residential communities centred around common urban farming areas and based on an 800 m walkable neighbourhood.
- Introduction of tropical climate responsive design elements for new residential dwellings and all common areas within the new residential neighbourhoods.
- Ensure an appropriate range and mix of dwelling types and sizes are provided in new residential developments including the agrarian residential communities. The two dominant housing types include the detached house and terraced house.
- Preservation of existing tropical climate-responsive traditional longhouses in rural areas and promotion of new modern longhouses based on local Iban building culture and tradition. Incentives for the regeneration of old traditional houses.
- Introduction of water cycle management supported by water sensitive urban design schemes as part of the new residential neighbourhood design and development.

4.5.9 Basic calculations

With 8,300 additional dwellings required to cater for a growing population of 34,000, 10% of that number will be designated for affordable housing, developed by Sarawak Housing Corporation and targeting mainly migrant workers from Indonesia. With an estimated construction cost of RM79,000 per house, the construction of 8,300 houses will cost approximately RM 700 million. However, the costs will be market based and should not need to be borne by the Government.

SECTION 4.6 SELECTED URBAN CENTRE CONCEPTUAL PLANS

Planning is essential in order to provide efficient allocation and distribution of resources and the promotion of economic growth and balanced development. The spatial planning principles include:

- Preparation of land use master plan which integrates with related sectors to ensure efficiency and functionality of sectors and activities as a whole;
- A spatial strategy that is aligned with the economic and business development plan that caters to the Sri Aman Division's future development needs as well as making Sri Aman attractive to potential investors.
- Preparation of an integrated supporting sector plans i.e. transport in order to facilitate and smoothen the movement of goods and services within the Sri Aman Division as well as from/to Sri Aman Division from other regions and hinterlands;
- To formulate conceptual urban design for special areas to support the strategic physical and development plan to ensure desirable and sustainable growth towards the future.
- To propose strategies for Simanggang and other suitable towns with historical values and adjacent to the water bodies to be developed as heritage, cultural and tourist waterfront towns and regional centres for nature, culture and heritage tourism;
- To explore opportunities to develop TODs and intermodal facilities for suitable towns
- To formulate spatial policies that are relevant to the Sri Aman Division in consideration of climate change adaptation and mitigation policies at the National level - Delineation of these policies would be consistent with the interconnected nature of development and environmental policies. The suitability of adaptation and mitigation or a combination of both would be explored to ensure Sri Aman is in tune with the needs and requirements of the State. In essence the takeaway shall include the following elements:
 - 1) A Sri Aman Division Environmental Management Plan with appropriate guidelines to ensure all proposed development will adhere to strict preventive and mitigating measures so as not to compromise the environmental values and assets presently available in Sri Aman;
 - 2) Identification and demarcation of all environmental and ecologically sensitive areas- In addition to all the TPAs (existing and proposed), there may be additional areas that may be pertinent to be protected and /or conserved. These areas are sometimes function as buffer against floods and catastrophic wind as well as carbon store for the world. CO₂ reduction is not only work on a cut on fossil fuel consumption but maintaining as much as possible carbon bank within an area and its territorial waters. This would also contribute to CO₂ reduction.

We are in a challenging time. With uncertainty in the successful methods of curbing the spread of Covid-19, much of the engines for economic growth and development have been put on hold leaving many either unemployed or with substantial losses in their income. Spatial planning of the Sri Aman Division shall look at the Covid-19 pandemic as a lesson and shall make the Sri Aman Division better prepared should another similar "disaster" emerge in the future.

4.6.1 Sri Aman (Divisional)

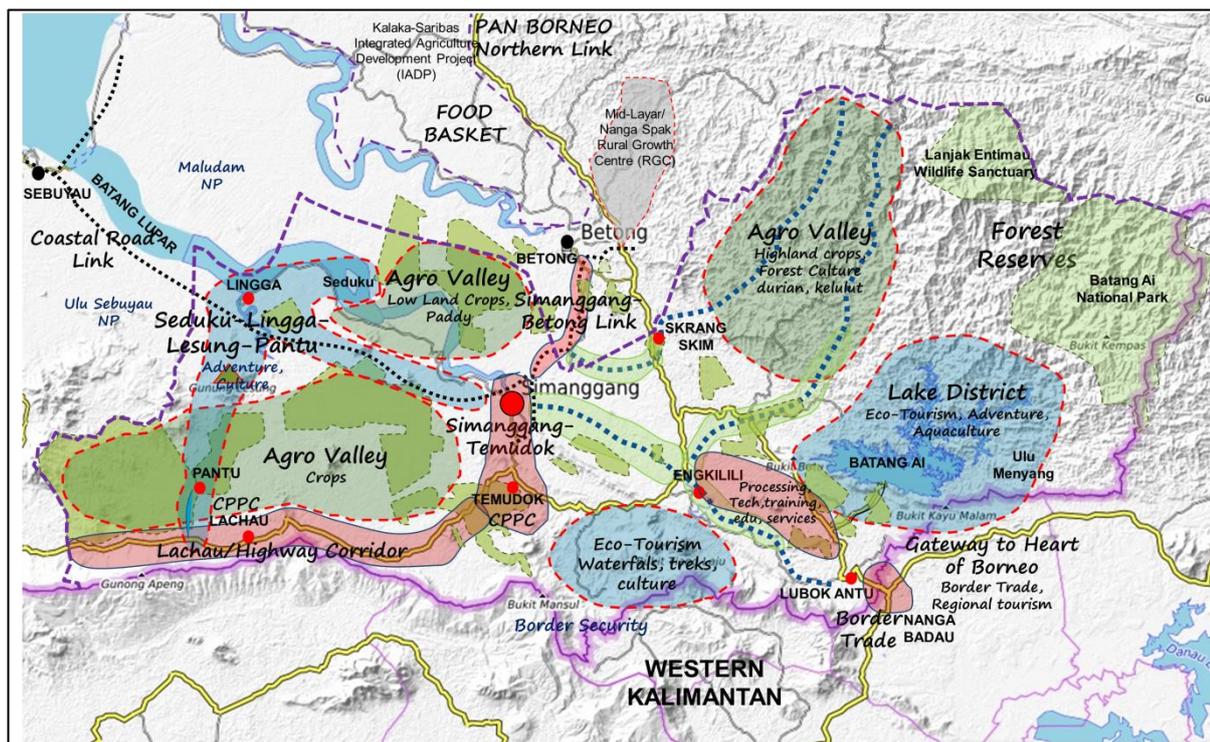


Figure 4-14: Integrated Region Spatial Strategies of Sri Aman Division

Source: Daya Rancang

The study area was comprised of an area that covers approximately 546,600 ha. The division is comprised of four districts; Sri Aman, Lubok Antu, Pantu and Lingga and one sub-districts; Engkilili.

The spatial strategies of Sri Aman that are shown in Figure 4-14 are presented but not limited to the following:

- Realising the potential that will be brought about by the development of the proposed coastal road and the 2nd trunk road (to be completed by 2025) linking Kuching to other major Cities along the coastal region of Sarawak.
- Realising and optimizing the benefits and growth potential of the proposed future crossings connecting Simanggang and Betong.
- Enhanced Tourism development at Batang Ai
- Cross Border trade of Lubok Antu-Kalimantan
- Preservation of natural ecosystems, village and settlement economic rejuvenation and rural resilience measures, and ecotourism - nature based and adventure tourist activities

Sri Aman's overall spatial strategies are primarily used for agricultural and tourism projects. The tourism corridor for Pantu, Gunung Lesong, Lingga, and Pulau Seduku stretches from the west and north of the map. Another corridor is located in the south of Engkilili, where ecotourism, waterfall, trails and forest culture are found. The Batang Ai Lake District has good opportunity for expansion in tourism and aquaculture.

Secondary development corridor is located at Simanggang which is the capital town of Sri Aman Division. The strategy is to connect Simanggang Town with Temudok area. The other secondary development corridor is Lingga corridor where the road already exists from Simanggang to Lingga town. However, this can become part of an important tourism circuit once the connection is extended to Banting, Gunung Lesong and Pantu.

Simanggang and Temudok serve as major growth centres in Sri Aman division's central region, as well as supporting various elements that will serve as major sources of supply and support for other centres.

The economic development focal point will be in Simanggang Town, while the new growth centre, new industrial area, and CPPC will be in the Temudok area.

Pantu and Lachau are two growth centres with the potential to drive and provide services in the western region of Sri Aman. The proposed corridor in the west region of Sri Aman Division is to make Pantu as a gateway to connect to Lingga via Gunung Lesong and then to Pulau Seduku. Lingga and Pantu will be correlated with the agriculture and fishing industries, whereas Gunung Lesong will be correlated with the tourism industry.

The Second trunk road will link Simanggang and Betong bypassing the Borneo Highway. The design focus of Simanggang Town is to develop a riverfront and its environment, as well as to structure the neighbourhood in order to create a small centre for connecting urban transportation.

4.6.2 Districts

A service center is an organizational unit which provides a specific service or product to users principally within the administrative community. Service centers in the districts play a very effective role in the lives of the community. This can be considered from the aspects of medicine, education, market centers, transportation, etc. At end of the year 2021, Sri Aman has upgraded two sub-districts namely, Pantu and Lingga to district level. These districts consist of small bazaar, government office, post office, open market, storehouses, and petrol station.

4.6.2.1 Pantu

Pantu is a small district located in Sri Aman, Sarawak. It is 65km from Simanggang Town and 139km from Kuching City. The Pantu area covers three small towns, namely Pantu, Sg. Tenggang and Krangas and the Jaong, Lachau and Ran areas. Among the service centers available in Pantu are business centers, education, small markets as well as infrastructure facilities and road network connecting the surrounding areas.

Under the SAMP Pantu District will have a large-scale specialist rice project introduced, covering 6,000 ha. Additionally, in the substantial areas of Sacha Inchi, Rambutan and Durian were proposed. These projects, among others, will supply the CPPC at Lachau. Further the new and upgraded road network will mean that Pantu District will be much more accessible, providing connection to Lingga District and its features.



Figure 4-15: Shophouses at Pantu Town Area

Source: UNIMAS Holdings

4.6.2.2 Lingga

Kampung Lingga is a village located in the Sri Aman Division, Sarawak. It is a rural village that possesses major cultural heritage appeal. The distance between Lingga and Simanggang Town is approximately 50 kilometers. Among the services available in Lingga are a small market, clinic, schools, infrastructure facilities and roads connecting the surrounding areas. However, at present it is only accessible from Simanggang with no satisfactory alternative access/egress roads.



Figure 4-16: Shophouses and Petrol Station in Lingga

Source: UNIMAS Holdings

SAMP is proposing to develop the Gunung Lesong – Lingga Tourism Precinct. There are a number of agricultural projects planned for this area also, including mechanised paddy project, and pineapple plantations. The construction and upgrading of roads in the subdistrict will provide a connection to Pantu allowing a tourism circuit route to be created.

4.6.3 Sub-District & Service Centres

A service center is an organizational unit which provides a specific service or product to users principally within the administrative community. Service centers in sub-districts play a very effective role in the lives of the community. This can be considered from the aspects of medicine, education, market centers,

transportation, etc. Sri Aman has one sub-district namely Engkilili. The service centers consist of small bazaar, government office, post office, open market, storehouses, and petrol station.

4.6.3.1 Engkilili

The town of Engkilili is located about 35 km from Simanggang and 60 km from Lubok Antu. Presently, business centres, infrastructure services, and a network of paved roads link the surrounding areas. Two reasons can be accorded for Engkilili becoming the focus of visitors. Pekan Engkilili is about four kilometres from the Wong Ajong Waterfall. Engkilili has benefited from having a range of government services based there that are not available in some other centres such as Lubok Antu.



Figure 4-17: Commercial Area at Engkilili

Source: UNIMAS Holdings

A number of new agriculture projects are to be established in Engkilili, the products from which will supply the CPPC in Temudok.

It is also planned to have a new hospital based there.

SECTION 4.7 SPECIAL DEVELOPMENT AREAS

4.7.1 Batang Ai Lake District

The recommendations for Batang Ai focus on leveraging the area's natural assets to further develop tourism and expand aquaculture. Key pillars of the plan are Tourism, Fisheries, Conservation & Biodiversity, plus the existing Power generation. Expansion of these core sectors will generate employment and opportunities for local communities.

4.7.1.1 *Conserving Valuable Environmental Assets*

Land set up aside for conservation should be expanded with the gazettment of proposed extensions to Batang Ai National Park and the gazettment of the Ulu Sungai Menyang as a national park or another form of protected area. Protecting these natural assets will assist orangutan conservation efforts and lead to positive global publicity for Sarawak. It will also enable further development of high yield ecotourism activities in upriver areas. Orangutan treks will form a key component of this.

4.7.1.2 *Tourism Facilities*

The establishment of a new Rainforest Field Studies Centre within Batang Ai National Park will enable Sarawak to target the lucrative SAVE Tourism niche. The existing longhouse resort should be completely rebuilt to better cater to the needs of today's travellers. Other tourism projects include new fish restaurants at the lakeside, a campsite, a recreational fishing zone and a floatplane terminal.

The floatplane terminal should be located close to the Longhouse Resort. The Sarawak Hydro Lake Study suggested a location closer to the main tourist boat jetty. This would be inconvenient for hotel guests as they will land on the lake and then have to take a ferry to the resort.

4.7.1.3 *Enhance River / Lake Transport*

Improving river transport for tourism and local communities is important. The plan proposes setting up a fuel supply station at the lake and regular clearance of log jams and debris in upriver areas. The fuel station will be useful for local communities.

Provision of water taxi service to meet the needs of upriver communities will be important. It will facilitate transport of children to schools, people to clinics and allowing travel to other parts of the Division.

4.7.1.4 *Lakeside Tourism Development*

Setting aside sufficient land for the future development of lake tourism is an important element of the plan for Batang Ai. During the SADA Labs there were various suggestions to develop lakeside tourism projects such as hotels, golf courses and holiday homes at Batang Ai. Other planning studies have also proposed developing tourism around the lake.

Many of the suggested lakeside projects are currently not economically viable. The pandemic has devastated tourism in Sarawak and the industry faces a long road to recovery. At present, new lakeside hotels and other developments at Batang Ai will not attract sufficient demand to justify the investment.

However, such developments may become viable in 10-15 years' time, i.e. beyond the master plan period.

The plan therefore proposes that the government sets aside land at Batang Ai for the future development of lakeside tourism. Any future development would need the full agreement of Sarawak Energy who manage the catchment area of the reservoir. Market feasibility studies for hotels and other projects would need to be conducted. Future lakeside tourism developments would also need to pay particular attention to shoreline stability and preserving the catchment.

Much of the western side of the lake will be used for aquaculture. As such, the plan proposes that the lakeside land stretching from the current Batang Ai tourist jetty to the Aiman Longhouse Resort is reserved for future tourism development.

4.7.1.5 Aquaculture Expansion

Batang Ai's aquaculture industry is set to grow with the lake having a capacity to accommodate around 24,000 fish cages. With this growth comes the need for better planning and facilities to serve the needs of the inland fisheries industry at Batang Ai.

Proposed new facilities and infrastructure to support the fisheries industry at Batang Ai include a bio-security control point & laboratory and a fisheries processing and packaging centre. It is envisaged that smart farming systems and remote monitoring and management will become increasingly important for aquaculture at Batang Ai.

4.7.2 Gunung Lesong



Figure 4-18: Gunung Lesong in Sri Aman

Source: UNIMAS Holdings

Gunung Lesong National Park was established in 2013 and is a lesser-known hiking destination for visitors, featuring waterfalls and natural pools. Gunung Lesong is located south of Lingga. It will be a key component of the Gunung Lesong – Lingga Tourism Precinct that will include heritage assets at Banting, and the riverside market town of Lingga.

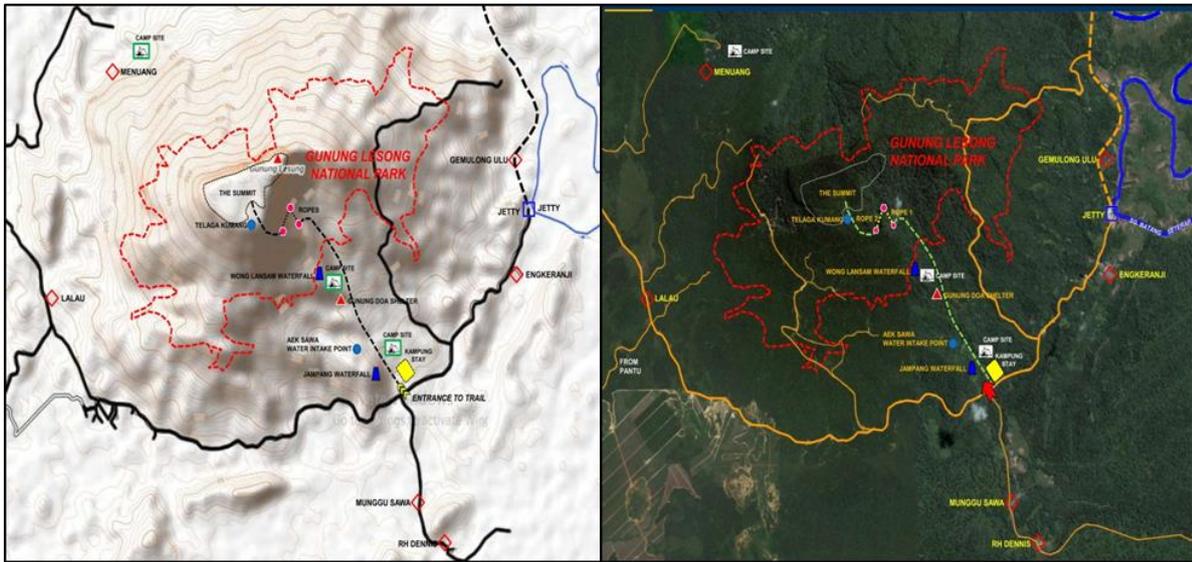


Figure 4-19: Topography and Satellite Image of Gunung Lesong

Source: UNIMAS Holdings

As illustrated in Figure 4-20, plans at Gunung Lesong include upgrading the summit trail, and accommodation facilities adjacent to the entrance.

The accommodation will be in the form of a Kampung Stay with the modern character of Iban longhouse. The location for this Kampung Stay is at Kampung Munggu Sawa, adjacent to the entrance to the summit trail.



Figure 4-20: Modern Concept of Kampung Stay at Gunung Lesong

Source: UNIMAS Holdings

With the modern concept of Kampung Stay, the tourists are provided with accommodation facilities without the need to live with the host and have the opportunity to experience the cuisine of Kampung Stay by the local entrepreneurs and the culture in the surrounding area.

Additionally, a number of camp site locations will be established to cater for this increasingly popular approach to adventure tourism.

4.7.3 Temudok Agriculture and Industrial Park

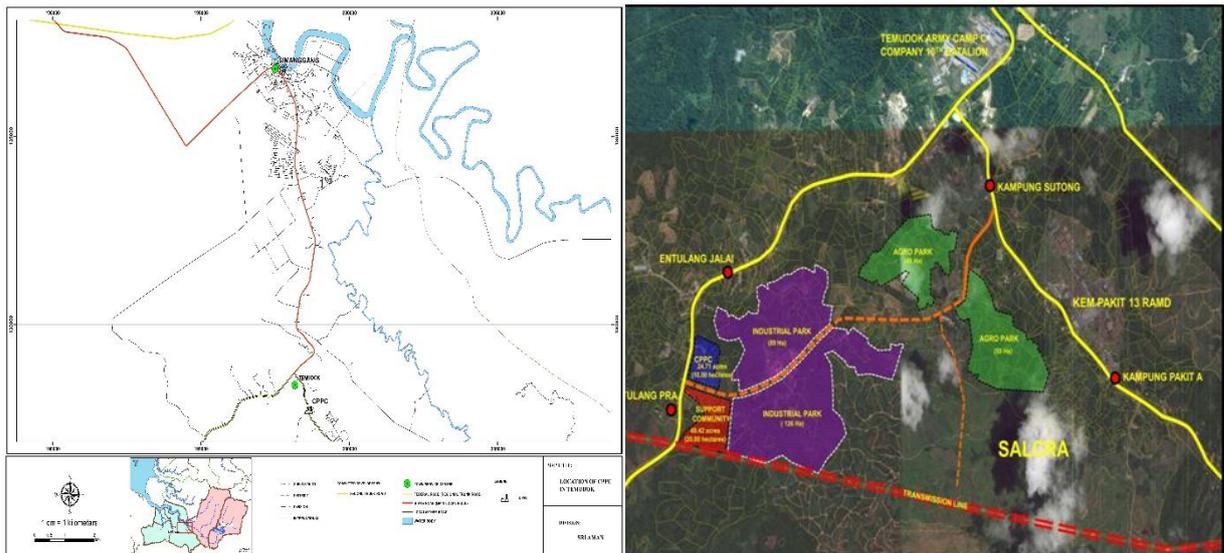


Figure 4-21: Topography and Satellite image of Temudok Area

Source: Frost & Sullivan, 2021

Notes: Base map source from UNIMAS Holdings

Temudok is located near the junction of the Pan Borneo Highway and the main feeder road to Simanggang. It is central to the whole Sri Aman Division, both geographically, and in terms of transportation routes.

It is only 12 kilometres from Simanggang, the Division capital. Thus, there will be good access to a substantial workforce, for which it will create many employment opportunities, particularly for skilled and semi-skilled workers.

It is proposed to use this strategic advantage to make Temudok a hub for development activities in the region.

4.7.3.1 Crop Processing and Packaging Centre (CPPC)

There will be a new CPPC established at Temudok which will support agriculture projects being established in Sri Aman, Engkilili, and Lubok Antu subdistricts. It will be complemented by a second CPPC that will be established in Lachau to cater for the Lingga and Pantu districts.

4.7.3.2 Industrial Park

Industrial parks are critical for the development of small and medium-sized businesses in Sri Aman. In order to deliver employment and economic growth, governments, private developers, and industrial companies must establish long-term, profitable conditions for industrial development

An industrial park covering approximately 200 hectares will be established in Temudok. The proposed park will primarily focus on food processing and packaging, providing and servicing agricultural machinery, and recycling of waste arising from the food processing. In the long run the park will focus on other light manufacturing activities.

Potential industries that can be established in the Industrial Park include:

- 1) Oil Palm refinery – Under the SAMP projects approximately 16,700 hectares of new or replaced planting of oil palm will be established. The production from these areas will require a new oil palm mill to be established. Since the land areas identified for the oil palm are smaller parcels scattered across the Engkilili and Lubok Antu subdistricts, it makes sense to provide a centralized location, and Temudok is well suited for this.
- 2) SAMP is proposing about 10,000 hectares of coconut plantation development. Downstream processing of a range of coconut products can be undertaken at the Temudok Industrial Park.
- 3) There is potential for the establishment of a fertilizer production factory to provide for the agricultural developments in the region.
- 4) Nursery facilities can be established for coconut, banana, durian, coffee, rambutan, and various other crops being established in the Division
- 5) Facilities for selling and servicing of agricultural machinery
- 6) Facilities for selling and servicing of farm transport vehicles

4.7.3.3 Agropark

An agriculture technology park (or Agropark) was proposed to be established at Temudok. It will have an area of approximately 200 hectares allocated for this purpose.

The Agropark will have compact, modern farms that develop, adapt and showcase advanced smart technologies and techniques. The park will focus on the cultivation of high-value crops and commodities such as red chili, rock melon, mushrooms, specialist fruit and vegetables, and others.

The Park will have 3 components:

- Smart Farming in the fields of agriculture
- Smart farming in the fields of livestock
- Smart farming in the fields of aquaculture

The park will involve participation of private sector/young entrepreneurs

4.7.3.4 Fisheries Research Hatchery in Temudok

The development of a Fisheries Research Hatchery at Temudok is proposed for the development of seed production capability that would enable production of disease-free seed supply. The hatchery will also be equipped with biosecurity and fish health monitoring systems to check/screen all inputs to ensure a disease-free environment. The hatchery is estimated to produce about 10 million fish fingerlings which would be used to supply the cage culture in Batang Ai Reservoir.



PART 5 **KEY SECTORAL PROJECTS**

This section provides a summary of the key projects in each of the productive sectors as well as for the infrastructure and utilities sectors.

While these projects are only summarized here, the details for each project are provided in Volume C of this Report.

Volume C provides details of all proposed projects in the SAMP, in addition to the ones included in this Section.

SECTION 5.1 AGRICULTURE AND LIVESTOCK

Sri Aman will be recognised as a key contributor to Sarawak's food basket owing to the high concentration of priority agricultural areas. Food agriculture production within Sri Aman will be focused on local and domestic consumption as well as exports in line with the food basket programme.

5.1.1 Strategies for the Development of the Agriculture Sector in Sri Aman

Strategic direction for the agriculture sector in Sri Aman will include:

- 1) Protection of rice producing areas, particularly irrigated paddy areas should be prioritized. Irrigation schemes and production improvement efforts should be implemented to help move Sri Aman towards rice food self-sufficiency targets. Develop an agriculture industry base on sustainable development goals (SDG) to preserve delicate balance of environment and ecosystem.
- 2) Develop Sri Aman as a central Food Basket Division, to meet domestic demand (SSL) and value-added processing industries
- 3) Create and produce demand driven products, for high quality, high value and safe food products for export to the region; With the development of Pan Borneo Highway and the Second Trunk Road improving linkages to Kuching and Sibu in the near-term will provide access to markets not only in those towns but also for export.
- 4) Venturing into High-Tech Agriculture & New Growth Areas
- 5) Improve supply chain management and ecosystem
- 6) Improved farm income for the rural population
- 7) Improve key enablers such as human capital, R&D, business and financial Services, physical & marketing infrastructure & logistics, market Information & Channel, and advisory and regulatory services.

5.1.2 Basis for Project Proposals

5.1.2.1 Emerging Trends in Agriculture

The agriculture development of Sri Aman will factor in a number of emerging trends impinging on the agriculture sector

Some of the emerging trends in agriculture development that is relevant to Sri Aman are highlighted in this section.



Figure 5-1: Emerging Trends in Agriculture Development: Challenges to Sri Aman Agriculture

Source: Daya Rancang

5.1.2.1.1 Concern for Sustainable Agriculture

Sustainable agriculture must nurture healthy ecosystems and support the sustainable management of land, water and natural resources, while ensuring world food security. To be sustainable, agriculture must meet the needs of present and future generations for its products and services, while ensuring profitability, environmental health and social and economic equity

5.1.2.1.2 Rise of Consumerism: Impact of Consumer Demands and Trends

One of the most obvious consumer trends is a dramatic increase in the consumption of fresh foods, particularly meat, fish, fruits and vegetables. With this new eating habits, the per capita consumption of rice has reduced and substituted with other forms of calories intake such as bread and potatoes. This change is the result of the well-publicized value of a high-fiber diet and healthy food consumption.

5.1.2.1.3 Globalization of Trade: Shift of Economic Drivers from Domestic Consumption Driven to Exports Driven

Trade has grown remarkably over the last century. The integration of national economies into a global economic system has been one of the most important developments trends of the last century. This process of integration, often called Globalization, has materialized in a remarkable growth in trade between countries.

Sarawak in general and Sri Aman in particular with its small population base should integrate itself in the global trade and become the food basket for the world. These would include the ASEAN Economic Community and BIMP-EAGA markets.

5.1.2.1.4 Aging Farming Population & Urbanization

Over the last couple decades, the urbanization of Malaysia has been increasing at an incredible speed as more and more people are coming to settle down in the cities. This is a commonly occurring trend not only in Malaysia but all over the world. The urban population in Malaysia increased from 51 percent in 1991 to 73 per cent in 2011 and expected to increase to 85% in 2030.

Then incredible trend in urbanization has a number of consequences to agriculture especially an aging farming population in the rural areas. Malaysia is faced with an ageing farming community. In MADA, for example, the majority of farms are small (average farm size is 2 hectares) and the farming community is elderly (average age of farmers is more than 60 years. In Sri Aman, according to the social economic survey, majority are within their middle to late 50s, which is in line with the demographic profile of Sri Aman division that is edging toward the aging population.

5.1.2.1.5 Emergence of New Business Model: Cooperative Farming

Most successful agricultural undertakings in China, Cambodia, Australia, Holland, US and New Zealand are owned by cooperatives like Sunkist, Rabbobank, Murrumbidgee Rice Growers Cooperative (Australia) and New Zealand Dairy Board to name a few.

The issues of scale and ageing farmers have led to farming not being approached as a business with profit maximisation objectives. In this context, farmers have had little incentive to invest in new forms of mechanisation, comply with international food safety standards or adopt good agricultural practices, such as the precise application of fertilisers.

The main focus here was small scale farmers. The aim is to remove various barriers and restrictions in small farmers that made them unable to increase revenues and returns from their farm operations ie from fragmented and small-scale farms to integrated, clustered and large scale agribusinesses

Farms will be re-organised to form large and economical clusters supported by modern infrastructure and central management. Sufficient scale of upstream production in turn enables expansion into downstream products. In the farming of fruits, a cluster of approximately 1,000 hectares will be able to support a sorting and packaging plant and processing of second grade produce into snacks, purees, and juices.

5.1.2.1.6 Innovations in Smart Farming & IoT – Driven Agriculture

Smart Farming is an emerging concept that refers to managing farms using modern Information and Communication Technologies to increase the quantity and quality of products while optimizing the human labor required.

Among the technologies available for present-day farmers are:

- **Sensors:** soil, water, light, humidity, temperature management
- **Software:** specialized software solutions that target specific farm types or use case agnostic IoT platforms
- **Connectivity:** cellular, LoRa, *etc.*
- **Location:** GPS, Satellite, *etc.*
- **Robotics:** Autonomous tractors, processing facilities, *etc.*
- **Data analytics:** standalone analytics solutions, data pipelines for downstream solutions, *etc.*

Smart Farming and IoT-driven agriculture are paving the way for what can be called a Third Green Revolution. Many countries are already gearing themselves into this area of technology

The Sarawak Digital Economy Strategy 2018-2022 published by the State Service Modernisation Unit sets out Sarawak's approach to harnessing the digital economy. These include enablers such as:

- Digital infrastructure
- Cyber security
- Talent development
- E-commerce
- R&D in digital technology
- Digital innovation entrepreneurship
- Digital government

To this end, the Sarawak Multimedia Authority (SMA) and the Sarawak Digital Economy Corporation (SDEC) have been established to ensure the proper development of the digital economy strategy. The SMA's role is to be a one stop agency that provides policy recommendations and facilitates the digital economy programme and projects, whereas the SDEC's role is to implement the development of the communication and multimedia activities.

The Strategy has defined a number of sector specific objectives and 47 strategic actions, with some programme examples that can be implemented. Enablers and their strategic actions are also identified. One of the sector specific strategic actions relate to the development of the agriculture sector.

The Digital Economy Strategy proposes to utilise the Internet of Things (IoT) to streamline activities at Collection, Processing and Packaging Centres (CPPC) and employ intelligent supply chain management to rationalise logistics within the agriculture sector. The Strategy also proposes to use IoT and geospatial systems for agricultural planning and operation support of agro parks and anchor farmers to optimise utilisation and distribution of agricultural land.

Smart Farming represents the application of modern Information and Communication Technologies (ICT) into agriculture, leading to what can be called a Third Green Revolution. Following the plant breeding and genetics revolutions, this Third Green Revolution is taking over the agricultural world based upon the combined application of ICT solutions such as precision equipment, the Internet of Things (IoT), sensors and actuators, geo-positioning systems, Big Data, Unmanned Aerial Vehicles (UAVs, drones), robotics, etc.

Sarawak's agriculture sector can be transformed with the application of smart farming methods.

For examples four methods of smart farming that can be implemented are

- Precision Farming
- Agricultural Drones
- Livestock Monitoring
- Smart Greenhouses

Precision Farming and Agricultural Drones may be adopted to manage the big areas of land in an efficient and effective manner through the use of computers with less labour.

a) **Precision Farming**

- make farming procedure more accurate and controlled using sensors, autonomous vehicles/hardware, control systems, robotics, etc.
- Maximisation / Optimisation / Soil variability / Yield Improving / Water Efficiency
- Sensors in soil (near to plants) - data is sent to gateway via short-range communication data exchange between user and gateway via long-range communication (cellular)
- Farm management system used - applied in fruit segment, e.g. vineyard - 100 sensors per hectare reported to increase production by 15% and reduce fertiliser use by 20%

b) **Agriculture Drone**

- Assess crop health / irrigation / planting / soil & field analysis
- Benefits: Ease of use, time-saving, crop health imaging, integrated GIS mapping, increase yield

c) **Livestock Monitoring**

- Collect livestock data: Location / well-being / health. Example: Monitor / find sick the sick livestock, identify the location, separate them to avoid spread of disease

d) **Smart Greenhouse**

- Enhance the production/yield by controlled environment – monitoring / controlling via IoT Intelligent monitoring / climate control / No human intervention
- Sensors: acquire environmental parameters (temperature, pressure, humidity, light)
- Actuators: control environment (fan, water valve, sprinkler)
- Cloud server: Remote access / connect to IoT Data Processing –Apply control action for optimal / cost-effective solutions without human intervention



Figure 5-2: Smart Farming at Rampangi Agropark Using IoT, Sensors & Mobile Applications

5.1.2.2 The Agriculture Supply Chain

The food supply chain is a complex network covering production, processing, distribution, retailing and consumption.

The concept of Supply Chain Management is based on two core ideas. The first is that practically every product that reaches an end user represents the cumulative effort of multiple organizations. These organizations are referred to collectively as the supply chain.

The second idea is that, most organizations in the supply chain are stand alone. Few businesses understand, much less are able to manage, the entire chain of activities that ultimately delivered products to the final customer. The result was often disjointed and ineffective supply chains.

Supply chain management is the active management of supply chain activities to maximize customer value and achieve a sustainable competitive advantage. It represents a conscious effort by the supply chain firms to develop and run supply chains in the most effective & efficient ways possible. Supply chain activities cover everything from product development, sourcing, production, and logistics, as well as the information systems needed to coordinate these activities.

The organizations that make up the supply chain are “linked” together through physical flows and information flows. Physical flows involve the transformation, movement, and storage of goods and materials. They are the most visible piece of the supply chain. But just as important are information flows. Information flows allow the various supply chain partners to coordinate their long-term plans, and to control the day-to-day flow of goods and material up and down the supply chain.

A typical supply chain management for agriculture is depicted in Figure 5-3.

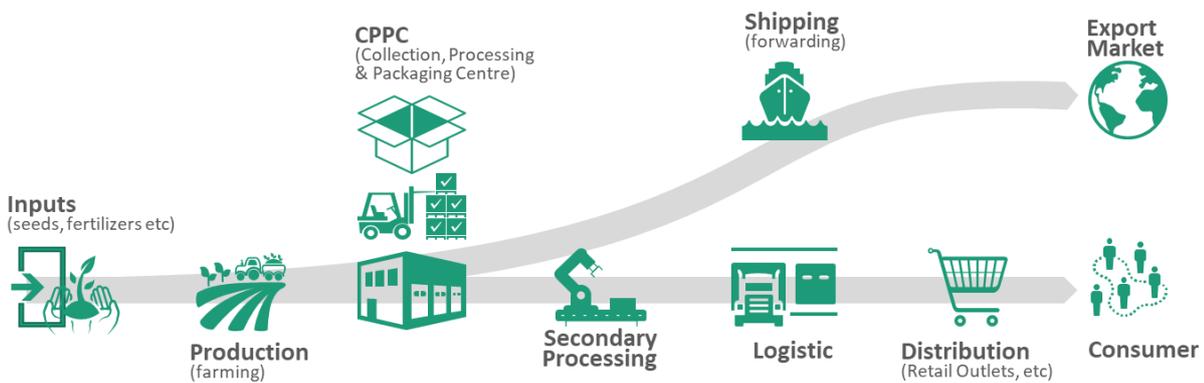


Figure 5-3: The Agriculture Food Supply Chain

Source: UNIMAS Holdings, 2021

The value chain in agriculture involves primary activities, post-harvest handling, processing, distribution/ logistics.

Primary activities are defined as activities that are directly concerned with the production or delivery of a product or service. The activities are conducted by the supply chain actors which includes smallholders, private players, middlemen, retailers, etc.

Postharvest activities such as packaging, grading of food and proper storage are done in this stage. From this stage, food stuff can be either translated into value-added products through processing or be sold directly at retails or traded.

Processing – raw materials are then value added to be translated into processed food such as canned food, beverages or cordial.

Distribution follows post-harvesting and processing, whereby goods are then distributed to various marketing outlets to be sold to consumers.

The movement of goods from production to the end of the value chain is supported by **logistic** movements.

Figure 5-4 depicts a typical supply chain in Nelson’s ‘Corn in a Cup’ Business Venture.

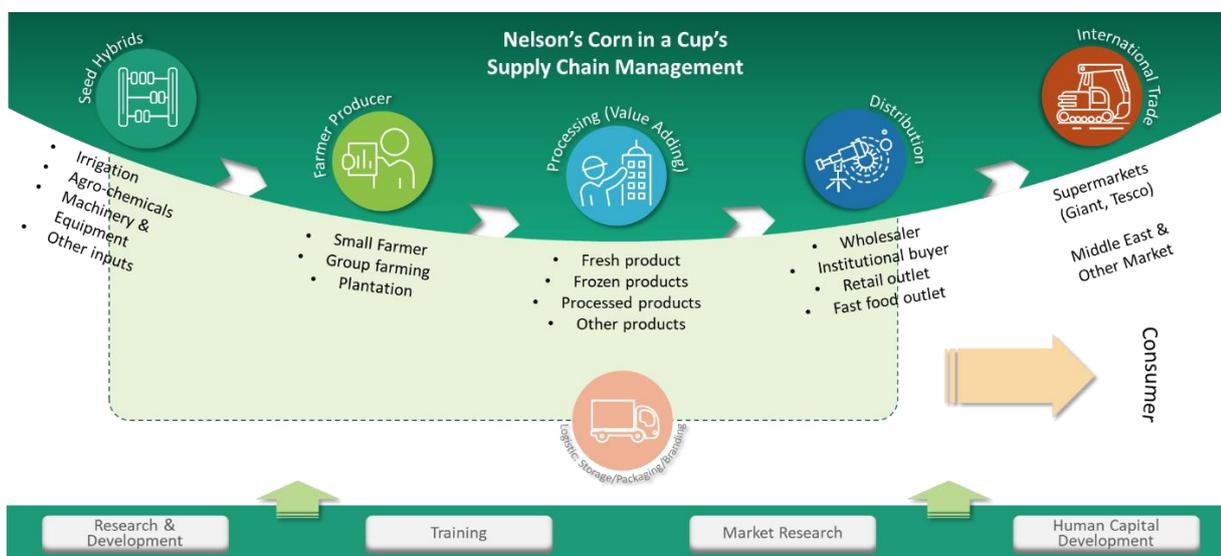


Figure 5-4: Nelson's Corn in a Cup's Supply Chain Management

Source: Daya Rancang, 2021

Currently, the basic facilities and infrastructures for an efficient supply chain are inadequately provided if not still lacking, particularly in rural areas. These include farm roads, water resources, power supply, ports, and fish landing complexes, storage and other processing facilities.

Poor road networks and basic facilities have affected not only the supply chain/ marketing of agricultural products, but also the delivery of farm inputs and other services.

The agriculture food crop sector is mainly dominated by the smallholders. Small-scale farming currently being conducted, such as paddy, livestock, fruits, vegetables, and herb cultivation, have resulted in high production cost, inconsistent quality of output, low yield and hence low income for farmers.

The issue of lack of scale and the inability to provide a constant and large supply of produce that meets quality standards in turn results in supply chain & marketing challenges. Fruits, vegetables and livestock farmers currently do not have the capability to directly access large markets as they are unable to meet continuous demand. They sell their produce at local markets or through middlemen which limits the price they could get for their produce. These couple with poor transportation network results in an inefficient supply chain management.

Critical success factor for an efficient supply chain include:

1. Control over an entire supply chain from input to market
2. Have ready market – demand & market
3. Government intervention:
 - a. Funding – subsidy, grant, loans
 - b. Legislation - Accreditation, Import permit, SPS, Certification, Zoning (such as ZIA, TKPM/A)
 - c. Incentives – Tax holiday, ITA, Infra
 - d. Social programme
4. Attractive financial profitability over entire supply chain
5. Risk management – disease, market & economic instability
6. Good infrastructure such as Collection, Processing & Packaging Centres (CPPC), digital connections, roads, ports etc

The development of an efficient supply chain is a prerequisite for the development of the agriculture sector in Sarawak and Sri Aman. This surely must be the major concern of SADA in the future development of the Sri Aman agriculture sector.

Under the Sarawak Digital Economy Master Plan, efforts are being made to establish efficient distribution system for agriculture inputs and products involving

- IoT for Collection, Processing and Packaging Centre, Collection Centers (Processing, Distribution), Intelligent
- Supply Chain Management, Logistic

In line with globalization, efforts were also made to develop new export markets and expand existing ones for agriculture produce and products. This is done through collaboration with domestic and international Investors and venture capitalist, branding, and e-Commerce.

5.1.3 Review of Project Proposals under SADA Labs

The SADA Labs conducted in 2020 had made a number of proposals for the development of agriculture in Sri Aman. These proposals include:

- 1) Development of Batang Lupar Paddy areas covering an area of 5,100 ha. This project is a committed project under the Federal Ministry of Agriculture & Food Industries (MAFI) to develop Batang Lupar as a granary area of Sarawak.
- 2) Development of the food basket area in Sri Aman (Pineapple, Coconut, Rambutan & Banana) covering an area of 3,629 hectares.
- 3) Development of commodity crops (Oil Palm, Rubber, Pepper & coffee, Grain Corn) covering an area of 23,364.24 hectares.
- 4) Livestock development especially cattle & poultry.
- 5) Establishment of 3 Agroparks in Pantu (Rambutan/ mixed fruits), Sg Tisak, Sri Aman (Pineapple & Banana & Lingga (Pineapple & Banana) covering an area of 1,280 ha.
- 6) Establishment of 3 Collection Centres in Lachau, Pantu & Batang Air (Aquaculture).
- 7) Improvement of 4 Existing Drainage Schemes covering an area of 1,124 ha.

The total budget estimated for these projects is hefty RM1,462,146,000. As shown in Table 5-1.

Table 5-1: Budget for Agriculture Projects under SADA Lab

Focus Area	RM
1 Commodity Crops	444,226,000
2 Food crops	706,121,000
3 Ecosystem	311,800,000
Total	1,462,146,000

Source: SADA Lab, 2020

5.1.3.1 Basis for the Selection of Projects

In reviewing the proposals by SADA Lab, a number of factors were taken into account i.e.

1. The project proposals must be economically feasible, financially viable and environmentally sustainable.
2. The proposals must take into account the resources in the Division. These include availability of suitable land for agriculture.
3. In choosing the types of projects, location of projects and business models, the following factors were considered:
 - Soils & soil suitability classification for each crop
 - Existing projects already undertaken by SALCRA, FELCRA, LCDA, SLDB, NCR projects & projects by private sector
 - Environmentally sensitive areas (ESA) both in the coastal and inland areas
 - Forest reserve & national parks
 - Available NCR land or land subjected to NCR claim
 - Watershed areas & buffer zone requirement for water intake points (8 km radius)
 - Labour availability & productivity

- Irrigation & drainage schemes under IADA and DID
 - Zoning of areas for each crop to allow for economies of scale
4. Appropriate business model to undertake the implementation of the proposed projects
 5. In order to ensure economies of scale and to allow the use of mechanization and new technologies such as smart farming, choice of project areas must be sizeable.

The consultants have undertaken a number of GIS layering of the above factors to determine the suitable areas and acreage for the proposed projects, as well as appropriate business models to implement the project proposals.

The consultants have also closely examined the enablers to spur the development of the agriculture sector. These include infrastructure development such as roads, irrigation & drainage & utilities, logistics, technology, R&D, skilled manpower, incentives, and market & supply chain.

Based on the above review criteria of SADA project proposals, some of the projects have been scaled down while others have been removed due to technical considerations. Some project proposals were relocated due to the unsuitability of the proposed location. There were also new projects proposed. These include projects in the newly annexed area of Sebuyau, in the new Pantu District.

5.1.3.2 *Projects That Were Removed Include:*

- Rubber and pepper: rubber has a long gestation period of 6 years and commodity prices are generally low. Pepper also has problems with diseases and low commodity prices besides being labour intensive. Base on socio-economic survey undertaken, farmers generally do not have preferences on these two crops.
- Commercial grain cultivation: this was removed due to the fact that corn grain is not suitable in Sri Aman due of the high rainfall throughout the year without distinct dry months. Yields will be generally low i.e. 2-4 MT/ ha, compared to yields from importing countries e.g. Argentina of 12 MT/ha, and quality of corn will be affected because of the high rainfall during the maturity period. Also, generally the cost of production of grain is higher than the costs of import. An alternative option is the cultivation of sweet corn not only for the domestic market but also for export.
- Agropark in Pantu, Lingga and Simanggang. These proposed Agropark are located in deep peat areas and in the case of Pantu is located in 13 villages and thus not suitable for Agro Park. Instead, the Agro Park will be located in focused agricultural areas and on good soils in Lachau and Temudok.

5.1.3.3 *Projects That Were Relocated Include:*

- Collection Processing & Packaging Centre (CPPC). The consultant is of the opinion that only two CPPCs are required for the whole of Sri Aman Division. This CPPC is will located in the priority agriculture areas such as Lachau and Temudok. The CPPC will be built on need basis by the various Anchor Companies, and will be based on modular design, depending on the number of takers.
- Agro Parks. These Agro Parks will be relocated to priority agriculture areas such as Lachau and Temudok where the quality of soil is better.

5.1.3.4 New and Reformulated Projects

Based on resource availability, new & reformulated projects were also proposed and include:

- Batang Lupar IADA
- Specialty rice cultivation in Pantu District
- Pineapple TKPM in Sebuyau in the new Pantu District
- Cultivation of sweet corn
- Cultivation of Sacha Inchi
- Swiftlet Farming in Lingga & Processing at CPPC
- Durian Cultivation in Lubok Antu District & Sebuyau, Pantu District
- Apiculture (Honeybee) in Lubok Antu
- Agroparks for vegetables using high levels of technology ie Smart Farming in Lachau & Temudok
- Oil Palm under SALCRA in Sebuyau, in the new Pantu District

The area and location of the proposed projects are based on land suitability and availability.

5.1.4 Proposed Agricultural Development Plans for Sri Aman

A list of the proposed agricultural projects is shown in Table 5-2 and Figure 5-5. The projects are expected to involve a budget of RM1,149.40 million (inclusive of Federal Budget of RM337 million for the Batang Lupar Granary Project).

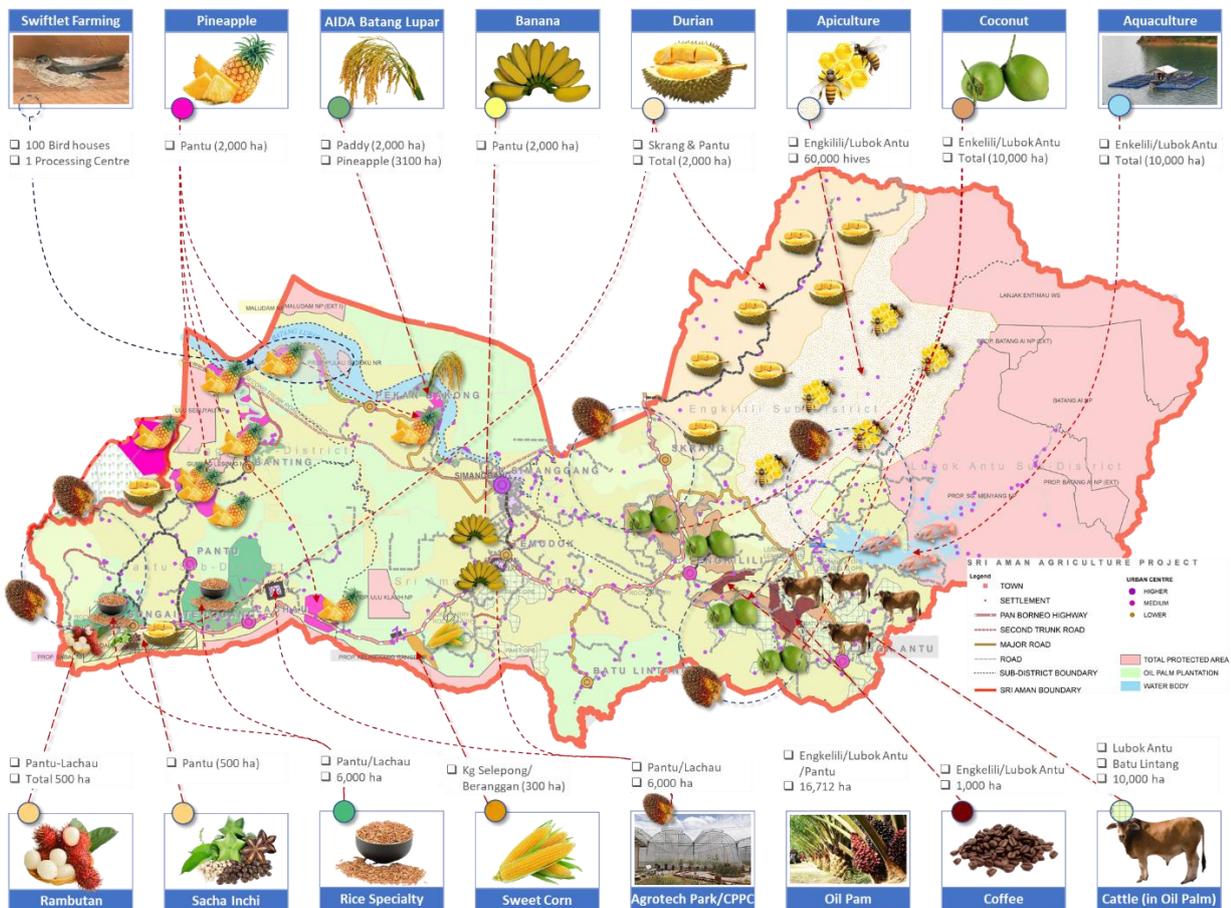


Figure 5-5: Project Proposal Mapping

Source: Daya Rancang

Notes: Base map source from UNIMAS Holdings

Table 5-2: SAMP Agriculture Project Proposals

Proposed Projects		AREA (ha)	Budget RM million	Employment Generation
1	Batang Lupar Integrated Agriculture Development Area (IADA) - Paddy 2,000 ha - Pineapple 3,100 ha	5,100	Committed Project (337.00) (Federal Budget)	182 655
2	Pantu Specialty Rice Project	6,000	360.00	600
3	Development of the food basket area in Sri Aman • Pineapple: 5,000 ha • Coconut: 10,000 ha • Durian: 3,000 ha • Rambutan: 500 ha • Banana: 500 ha • Sweet Corn: 300 ha	19,300	203.00 50.00 100.00 30.00 2.00 7.50 13.50	2,500 1,200 1,500 250 300 200
4	Development of commodity crops in NCR land • Oil Palm: 24,712 ha • coffee: 1,500 ha • Sacha Inchi 500 ha	26,712	534.40 <i>510.90</i> <i>13.50</i> <i>10.00</i>	2,323 4000 500
5	Livestock Development (Cattle) through Systematic Cow Calf Management in Oil Palm Plantations	10,000 ha (2,000 heads)	5.00	100
6	Swiftlet Commercial Farming in Lingga • 100 Bird houses • 1 Processing centre		15.00	150
7	Apiculture (Honey Bees)	60,000 hives	2.00	300
8	Establishment of 2 Agrotechnology Parks • Lachau (200 ha) • Temudok (200 ha)	400	10.00	800
9	Establishment of a Collection Processing & Packaging Centres (CPPC) • Lachau (10 ha) • Temudok (10 ha)	20	20.00	100 110
Total			1,149.40	15,770

Source: Daya Rancang

A brief summary of each project, budget requirement and employment generated are described as follow. Details of each project & implementation plan are covered in Volume C of this study.

5.1.4.1 Food Basket Programme

The development of food basket programme include paddy, pineapple, coconut, durian, rambutan, banana, sweet corn, apiculture, and vegetable/ short term crops in Agro technology parks, covering an area of 25,300 ha.

5.1.4.1.1 Batang Lupar Integrated Agriculture Development Area (IADA)

<ul style="list-style-type: none"> The Batang Lupar project, is a committed project under the Ministry of Agriculture Malaysia. An area of 5,100 hectares has been gazette as a granary area. The project areas are located in narrow strips along the Batang Lupar River and the Batang Lingga River covering an area of 5,100 ha. However, only part of the granary areas is suitable for commercial farming i.e. those on gley soils i.e. about 2,000 hectares are suitable for paddy. It is proposed, the rest of the areas about 3,100 hectares (about 60%) which on peat soils and not suitable for commercial paddy cultivation be converted to pineapple cultivation as an exit plan for paddy farmers since these soils are more suited for the planting of pineapple. 	<i>Location:</i>	Batang Lupar
	<i>Size (ha):</i>	Paddy: 2,000 ha Pineapple: 3100 ha
	<i>Budget (RM million):</i>	337
	<i>Potential Employment:</i>	837

5.1.4.1.2 Pantu Specialty Rice Project

<ul style="list-style-type: none"> It is proposed that the granary rice project be expanded to the Pantu District where about 6,000 ha of land is found suitable for wet paddy cultivation. With suitable small-scale irrigation development, these areas can be made suitable for double cropping of paddy. The project will be dedicated to the production of specialty red rice. Other high value local varieties such as Bubok & Mamut will also be promoted Processing & export will be undertaken by anchor companies such as Nestle under the Cooperatives Contract Farming Scheme Mardi Warna 98 can also be used to produce downstream products such as flour, biscuits, cakes and baby food, not only for local market but also for premium products abroad The project will be based on the Cooperative Estate Management farming model 	<i>Location:</i>	Pantu Lachau
	<i>Size (ha):</i>	6,000
	<i>Budget (RM million):</i>	360
	<i>Potential Employment:</i>	600

5.1.4.1.3 Pineapple

<ul style="list-style-type: none"> The project involves the development of 5,000 hectares of pineapple in Pantu. The plantation is an initiative to promote the production of MD2 pineapple for the international market. It uses high technology and large-scale commercial farming and offers local farmer-entrepreneurs and local community the opportunity to increase their income through contract farming arrangements with an anchor company. Other varieties can also be planted for the local market e.g. N36, Morris & Josephine. The project will involve the establishment of a seed garden to produce certified MD2 planting material by the Anchor Company. The project is a fully integrated pineapple value chain, involving nurseries, plantations and a Collection, Processing & Packaging Center (CPPC). The project will be implemented by the using cooperative contract farming business model with private sector as Anchor Company. The project will be implemented by using the Cooperative/ Estate Management Farming Model with private sector as Anchor Company. 	<i>Location:</i>	Pantu
	<i>Size (ha):</i>	5,000
	<i>Budget (RM million):</i>	50
	<i>Potential Employment:</i>	2,500

5.1.4.1.4 Coconut

<ul style="list-style-type: none"> The project will involve 10,000 hectares of coconut cultivation in the Engkilili Lubok Antu Valley. The coconut plantation will be developed with LCDA (PELITA) as the lead agency and DOA as supporting agency. The project will adopt the Nucleus Estate Land Consolidation Model of NCR land involving LCDA and anchor companies. The project will involve planting of hybrid coconut varieties that can yield about 22,000 nuts per hectare per year. The coconut plantation will be developed with PELITA/SLDB/DOA as the lead agency. The project will adopt the Ladang Rakyat concept of management involving anchor companies and planting of hybrid coconut varieties that can yield about 22,000 nuts per hectare per year. The project will also involve the establishment of MATAG seed garden. The project will be provided with the necessary infrastructure such as drainage and farm roads. The marketing of coconuts and intercrops will be organised through anchor companies or farmers' cooperative. 	<i>Location:</i>	Engkilili Lubok Antu
	<i>Size (ha):</i>	10,000
	<i>Budget (RM million):</i>	100
	<i>Potential Employment:</i>	1,200

5.1.4.1.5 Durian

<ul style="list-style-type: none"> The project will be focussed on Skrang Valley & Pantu covering an area of 3,000 ha and involving 1,500 households. Each household to be allocated 2 hectare for (90-100 durian trees). They can adopt the mixed cultivation concept involving three types of durian clones on the 60:20:20 ratio, namely 60%% Musang King and 20% each from the other varieties (eg D24, IOI or XO). The development of durian will involve the participation of smallholders as outgrowers and anchor company for processing at the CPPC Temudok. The development of durian will involve the Centralised Model (Anchor Company-Outgrower Model) i.e the participation of smallholders as outgrowers and anchor company for processing and marketing at the CPPC Temudok. 	<i>Location:</i>	Skrang Valley Pantu
	<i>Size (ha):</i>	3,000
	<i>Budget (RM million):</i>	30
	<i>Potential Employment:</i>	1,500

5.1.4.1.6 Rambutan

<ul style="list-style-type: none"> The project will be focused in the Lachau area covering an area of 500 ha and involving 250 households. Each household to be allocated 2 ha. The project will involve the cultivation of rambutan (Anak Sekolah Variety R191). The project will be implemented by the local farmers under the group farming / cooperative concept. The development of rambutan will involve the Centralised Farming Model participation of smallholders as outgrowers and anchor company that will operate the CPPC in Lachau. 	<i>Location:</i>	Pantu-Lachau
	<i>Size (ha):</i>	500
	<i>Budget (RM million):</i>	2
	<i>Potential Employment:</i>	250

5.1.4.1.7 Banana

<ul style="list-style-type: none"> The Banana Agro-Based project will be divided into 2 components: upstream and downstream activities. The project will involve an area of 500 ha of banana cultivation involving the Nipah/Kapok variety and Lang/Sekaki variety. Each farmer to be allocated with 2 ha of land for the planting of bananas on a group or cooperative farming basis. About 250 farmers will be involved in the project The development of banana will involve the Centralised Farming Model i.e. the participation of smallholders as outgrowers and anchor company that will operate the CPPC in Temudok. The farmers will sell their bananas to the CPPC for processing into banana chips (kerepek pisang). 	<i>Location:</i>	Engkilili
	<i>Size (ha):</i>	500
	<i>Budget (RM million):</i>	8
	<i>Potential Employment:</i>	300

5.1.4.1.8 Sweet Corn

<ul style="list-style-type: none"> The project will involve about 300 hectares of sweet corn cultivation with high yielding hybrid varieties such as Thai Supersweet, Honey Jean, which can yield about 30,000 cobs per hectare per season of 2.5 months. The project will be based on the Nucleus Estate Land Consolidation Model involving LCDA. The marketing of sweet corn will be organised through anchor companies or farmers' cooperative. Processing of the sweet corn will be undertaken at the CPPC in Temudok. 	<i>Location:</i>	Kg Selepong Beranggan
	<i>Size (ha):</i>	300
	<i>Budget (RM million):</i>	13.5
	<i>Potential Employment:</i>	150

5.1.4.1.9 Agrotech Park

<ul style="list-style-type: none"> The Agrotechnology Park will house modern farms that develop, adapt and showcase advanced smart technologies and techniques. The park will focus on the cultivation of high-value crops/commodities such as red chili, rock melon, mushrooms, fries and others under smart farming technology. The Park will have 3 components ie <ul style="list-style-type: none"> Smart Farming in the fields of agriculture Smart farming in the fields of livestock Smart farming in the fields of aquaculture The park will involve participation of private sector/young entrepreneurs. 	<i>Location:</i>	Lachau Temudok
	<i>Size (ha):</i>	200 each location
	<i>Budget (RM million):</i>	10
	<i>Potential Employment:</i>	800

5.1.4.1.10 Apiculture

<ul style="list-style-type: none"> The project involves encouraging rural people and private sector to utilize the forest areas for honey production (apiculture) through the use of good strains of honey bees or kelulut. Focus area will be the seven villages and longhouses in the Skrang Valley & Engkilili/Lubok Antu Coffee areas. The project will be implemented involving anchor company and the local farmers. About 600 farmers/entrepreneurs will eventually be trained to become beekeepers (outgrowers) each having minimum of 100 hives/colonies. The project involves the Centralised Farming Model (Anchor company-Outgrowers Model). Processing of honey will be undertaken collectively at the CPPC in Temudok SME Industrial Park by Anchor Company. 	<i>Location:</i>	Skrang Valley Engkilili/Lubok Antu Valley
	<i>Size (ha):</i>	60,000 hives
	<i>Budget (RM million):</i>	2
	<i>Potential Employment:</i>	300

5.1.4.2 Industrial Crops

Development of commodity crops (Oil Palm, Coffee & Sacha Inchi) covering an area of 18,012 hectares on NCR land.

5.1.4.2.1 Oil Palm

<ul style="list-style-type: none"> The project involve the establishment of a number of oil palm plantations in the area totaling 16,712 ha. The development will be SALCRA as well as MPOB on NCR land under the concept of concept of Nucleus Estate Land Consolidation Farmer Model. The development of the oil palm plantation would probably require the establishment of one palm oil mills with capacity 60-80 tons ffb/ hr. The biomass generated from the mills can also be used for the production of bio-fertilizer. 	<i>Location:</i>	Lubok Antu Engkilili Pantu
	<i>Size (ha):</i>	24,712
	<i>Budget (RM million):</i>	511
	<i>Potential Employment:</i>	2,323

5.1.4.2.2 Coffee

<ul style="list-style-type: none"> The project will involve the cultivation of coffee of the Liberica variety (Kopi dayak). The project will be implemented by the local farmers around their villages. Each household to be allocated 0.25 ha. Coffee will be planted around the villages especially hill soils on slopes of less than 25°. The project involves the Centralised Farming Model (Anchor company-Outgrowers Model). The development of coffee will involve the participation of smallholders as outgrowers and anchor company. The anchor company will operate the Collection, Processing & Packaging Centre (CPPC) in Temudok, and processing & marketing of coffee beans. The project will be integrated with apiculture for fast return. 	<i>Location:</i>	Engkilili Lubok Antu
	<i>Size (ha):</i>	1,000
	<i>Budget (RM million):</i>	13.5
	<i>Potential Employment:</i>	2,000

5.1.4.2.3 Sacha Inchi

<ul style="list-style-type: none"> Sacha Inchi is suitable to be planted in Sri Aman along the hillside. The local farmers are already venturing into this crop in Pantu. Sacha Inchi is a labour-intensive new crop in Pantu. Since this is a pilot project, the target acreage for Pantu is 500 ha. The project is based on a contract farming cluster development approach, involving Anchor Company. The anchor company pioneering the project in Pantu is 'Sarawak Sacha Inchi Valley Sdn Bhd.' To cope with future demand for Sacha Inchi oil, the acreage can be expanded in the future, especially in Pantu & Lubok Antu District, Simunjan District in Samarahan and Serian Division where soils (especially podzolic soils) and terrain are suitable. The seeds of inchi have high protein and the oil is rich in the fatty acids omega-3, omega-6 and omega 9 The project will be implemented under the group farming /cooperative concept. 	<i>Location:</i>	Pantu
	<i>Size (ha):</i>	500
	<i>Budget (RM million):</i>	10
	<i>Potential Employment:</i>	500

<ul style="list-style-type: none">• The development of Sacha Inchi will involve the participation of smallholders as outgrowers and anchor company who will operate the CPPC in Lachau.		
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5.1.4.3 Livestock and Swiftlet Farming

5.1.4.3.1 Livestock (Cattle): Systematic Cow Calf Management in Oil Palm Plantations

<ul style="list-style-type: none"> Cattle integration in oil palm plantation offers one of the best options towards increasing local beef and dairy supply. The integration of cattle in oil palm is a form of mixed farming where the combinations of the two commodities can be synergized in order to optimally utilize the same piece of land. The two commodities, when properly integrated can contribute towards sustainable food production system. Assuming a stocking rate of 1 cattle in 5 hectares, the carrying capacity will be 2,000 animals. 	<i>Location:</i>	Lubok Antu Batu Lintang
	<i>Size (ha):</i>	10,000
	<i>Budget (RM million):</i>	5
	<i>Potential Employment:</i>	100

5.1.4.3.2 Swiftlet Commercial Farming in Lingga -Seduku

<ul style="list-style-type: none"> The project involves upgrading of the swiftlet farming industry in Lingga/Seduku base on SOP developed by the Department of Veterinary Services. This include licensing, use of RFID, and GAP. This project consists of 100 bird houses in Lingga & Seduku and 1 bird nest processing unit in CPPC Lachau The project will involve 50 communities/clusters. To enable the project to proceed smoothly, government has to provide infrastructures such as bird house, road, water and electricity. The project will be implemented on the cooperative farming model involving rural communities. 	<i>Location:</i>	Lingga
	<i>Size (ha):</i>	100 bird houses
	<i>Budget (RM million):</i>	15
	<i>Potential Employment:</i>	150

5.1.4.4 Establishment of CPPCs

5.1.4.4.1 CPPC Lachau & Temudok

<ul style="list-style-type: none"> The whole district would likely require 2 Collection, Processing & Packaging Centre (CPPC) complex. This should be located in Lachau and Temudok or at the Trans Borneo Road junction to Sri Aman. An area of 10 Ha each are identified in Lachau and Temudok. The CPPC in Temudok will be located next to the Temudok Agro-Park. This will minimize handling & transportation of perishable high value crops in the Park, especially vegetables & short term fruits. The CPPC will also facilitate further processing of the crops grown in the Sri Aman/ Engkelili/ Lubok Antu (e.g. coconut) in the Industrial Park to be established in Temudok. The government will provide basic infrastructure for the CPPC but actual construction of the CPPC will be by participating Anchor Companies. The construction of the CPPC will depend on production volume and should be built in a modular fashion based on needs. The CPPC will act as a nerve centre for the following activities: <ul style="list-style-type: none"> - Sorting & grading, 	<i>Location:</i>	Lachau Temudok
	<i>Size (ha):</i>	10 each location
	<i>Budget (RM million):</i>	20
	<i>Potential Employment:</i>	210

<ul style="list-style-type: none"> - Primary & secondary Processing - Packaging - Cold Chain services Retail & export management - Distribution <ul style="list-style-type: none"> • The CPPC would act as one-stop centre for services like sanitary & phyto-sanitary (SPS) certification, custom documentation, extension & advisory services, information centre, and GAP and HACCP certification and accreditation. • The CPPC will also be connected through the exchange portal to trading houses, supermarkets, exporters etc for efficiency, production planning, inventory control and trading, and negotiations. 		
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5.1.4.5 Volume and Value of Production at the Farm Level & CPPC

5.1.4.5.1 Farm Level

The expected volume and value of production at farm gate prices in 2035 is summarized in Table 5-3. The proposed projects are expected to generate about RM1.57 billion of production in 2035.

Table 5-3: Expected Volume & Value of Production at Farm Gate Prices in 2035

Project Code	Project	Area (Ha)	Volume of Production in 2035 (At farm gate)	Value of Production in 2035 (RM million, at farm gate)
AG1	Batang Lupar Integrated Agriculture Development Area (IADA)			
	i. Paddy	2,000	20,000 metric tonnes	24.00
	ii Pineapple	3,100	75,000 metric tonnes	150.00
AG2	Pantu Specialty Rice Project	6,000	60,000 metric tonnes	120.00
AG3	Pineapple	5,000	140,000 metric tonnes	280.00
AG4	Coconut:	10,000	200 million nuts	300.00
AG5	Durian	3,000	30,000 metric tonnes	210.00
AG6	Rambutan	500	4,000 metric tonnes	8.00
AG7	Banana	500	22,500 metric tonnes	22.5
AG8	Sweet corn	300	18,000,000 cobs	5.40
AG9	Apiculture (Honey Bees)	60,000 hives	271,800 kg honey	27.18
AG10	Agrotechnology Parks at Lachau & Temudok	400 ha	32,000 metric tonnes	224.00
AG11	Oil Palm	27,712	370,600 metric tonnes (FFB)	148.24
AG12	Coffee	1,000	20,000 metric tonnes (berries)	30.00
AG13	Sacha Inchi	500	1,000 tons (dry seeds)	15.00
LV1	Livestock Development (Cattle) in Oil Palm Plantations	10,000ha Oil Palm	2,000 animals	10.00
LV2	Swiftlet Commercial Farming	100 Houses	2.4 Tonnes of raw bird nest	14.40
	Total			1,566.32

Source: Daya Rancang, 2021

5.1.4.5.2 CPPC Level

The total expected turnover of CPPC operations in 2035 is estimated at RM1.88 billion ie RM 682.9 million for CPPC Lachau operations and RM1,199.83 for CPPC Temudok operations

CPPC Lachau

The expected turnover of operations at CPPC Lachau by types of operations is shown in Table 5-4.

Table 5-4: Expected Turnover of Lachau CPPC Operations

CPPC Lachau	Annual Expected Volume in 2035	Annual Estimated Revenue, 2035 (RM mil)	CPPC's Profit; 25% of Revenue, 2035 (RM mil)	Final Product of CPPC
1. Paddy/Rice mill	39,000 mt	117.00	29.25	Rice
2. Pineapple	140,000 mt	420.00	105.00	MD2 Pineapple
3. Swiftlet	2.4 mt	14.40	3.60	Edible Birds Nest (EBN)
4. Rambutan	4,000 mt	12.00	3.00	Rambutan Anak Sekolah
5. Sacha inchi	370 mt	55.50	13.87	Standardize Oil
6. Vegetables/Fruits	16,000 mt	64.00	16.00	Fresh Vegetables & Fruits
		682.9	170.72	

Source: Daya Rancang

CPPC Temudok

The expected turnover of operations at CPPC Temudok by types of operations is shown in Table 5-5.

Table 5-5: Expected Turnover of Temudok CPPC Operations

CPPC Temudok	Annual Expected Volume in 2035	Annual Estimated Revenue, 2035 (RM mil)	CPPC's Revenue; 25% of Revenue, 2035 (RM mil)	Final Product of CPPC
1. Apiculture (Honey)	271,800 kg	40.77	10.19	Honey Kelulut
2. Coffee	2,520 mt	37.80	9.45	Roasted Coffee beans
3. Coconut	200 million nuts	400	100	Dehusked coconut
4. Durian	30,000 mt	600	150	Fresh Whole Durian
5. Banana	7,425 mt	48.26	12.06	Banana Chips
6. Sweet Corn	18 million cobs	9.00	2.25	Fresh Corn
7. Vegetables/ fruits	16,000 mt	64.00	16.00	Fresh Vege & Fruits
Total		1,199.83	299.95	

Source: Daya Rancang

5.1.4.6 Strategic initiatives Prioritization Matrix

A **prioritization matrix** is a simple tool where a set of criteria were created and used to score the **projects**. The aim is to prioritise projects so that projects that are most important can **be implemented first**. The prioritization matrix for the proposed Sri Aman agricultural projects is shown in Table 5-6.

Table 5-6: Strategic initiatives Prioritization Matrix

LOW HANGING FRUIT (High Impact, Easy to Implement)	BIG BETS (High Impact, Difficult to Implement)
<ul style="list-style-type: none"> • Batang Lupar Paddy • Batang Lupar Pineapple • Pantu Pineapple • Sweet Corn • Sacha Inchi • Apiculture 	<ul style="list-style-type: none"> • Pantu Specialty Rice Project • Coconut Project • Durian • Coffee • Swiftlet Farming • Cattle Integration in Oil Palm Plantation • Agrotech Parks • CPPCs
MAYBES (Low Impact, Easy to Implement)	NOT WORTH THE EFFORT (Difficult to Implement, Low Impact)
<ul style="list-style-type: none"> • Rubber • Pepper • Rambutan 	<ul style="list-style-type: none"> • Sago • Grain Maize

Source: Daya Rancang

5.1.5 Business Model Canvas and Farming Model

5.1.5.1 Business Model Canvas

The **Business Model Canvas** is a **business** tool used to visualise all the building blocks of a **business**, including customers, route to market, value proposition and finance. The Chart below (Figure 5-6) provide a synopsis of the business model canvas for the proposed agriculture projects in Sri Aman.

 Key Partners	 Key Activities	 Value Proposition	 Customer Relationship	 Customer Segment
<ul style="list-style-type: none"> • SADA • MANRED • DOA/DVS • DID • Anchor Company (AC) • Contract Farmer (CF) / Cooperative Operator (CO) 	<ul style="list-style-type: none"> • Infrastructure Development • Crop Cultivation • Processing • Packaging • Distribution 	<ul style="list-style-type: none"> • Secured supply to customers • Income to local participants 	<ul style="list-style-type: none"> • Door to door delivery 	<ul style="list-style-type: none"> • Downstream Processors • Processors (CPPCs) • Local Markets (Wholesale market, supermarket, retail shop, hotel). • Export Markets
	 Key Resources		 Channels	
	<ul style="list-style-type: none"> • Seed/Planting Materials • Agriculture Input • Mechanization • Smart Farming System • Technicians & Workers 		<ul style="list-style-type: none"> • Collection Centre • Agreement between Anchor Company and CF/CO 	
 Cost Structure		 Revenue Stream		
<ul style="list-style-type: none"> • Infrastructure including land development • Building, equipment computer, software • One-off assistance to farmers • Mechanization • Operating cost • Land lease & finance cost • Processing costs • Distribution, marketing, promotion 		<ul style="list-style-type: none"> • Sale of agricultural products • Sale of planting materials • Sale of semi-processed products • Sale of standardize extract • Sale of essential oils 		

Figure 5-6: Business Model Canvas for Agriculture Projects

Source: UNIMAS Holdings

5.1.5.2 Farming Models

Three types of business model were proposed for the projects in the Sri Aman Division:

1. The Centralized Farming Model (Anchor Company - Outgrower Model)
2. Cooperative Farming Estate Management Farming Model
3. Nucleus Estate NCR Land Consolidation Model

5.1.5.2.1 The Centralised Model (Anchor Company – Out Growers Farming Model)

The model involves a number of elements:

- Involves a centralized processor (Anchor Company) and/or packer buying from a large number of small farmers called outgrowers
- Is used for tree crops, annual crops, poultry, dairy. Products often require a high degree of processing, such as pineapple, durian or vegetables for canning or freezing
- Is vertically coordinated, with quota allocation and tight quality control

The Centralized Model (Anchor company-Outgrowers model) is suitable for those projects involving direct participation of farmers. Farmers will grow a certain crop e.g. durian, rambutan, coffee (under group farming) and have a contract farming arrangement with an anchor company for the processing and marketing of their products.

Under this farming model (Figure 5-7), the development of the project will involve the participation of smallholders as outgrowers and Anchor Company. The anchor company will have contract farming arrangement with farmers and operate the Collection, Processing & Packaging Centre (CPPC) for the processing & marketing of produce.

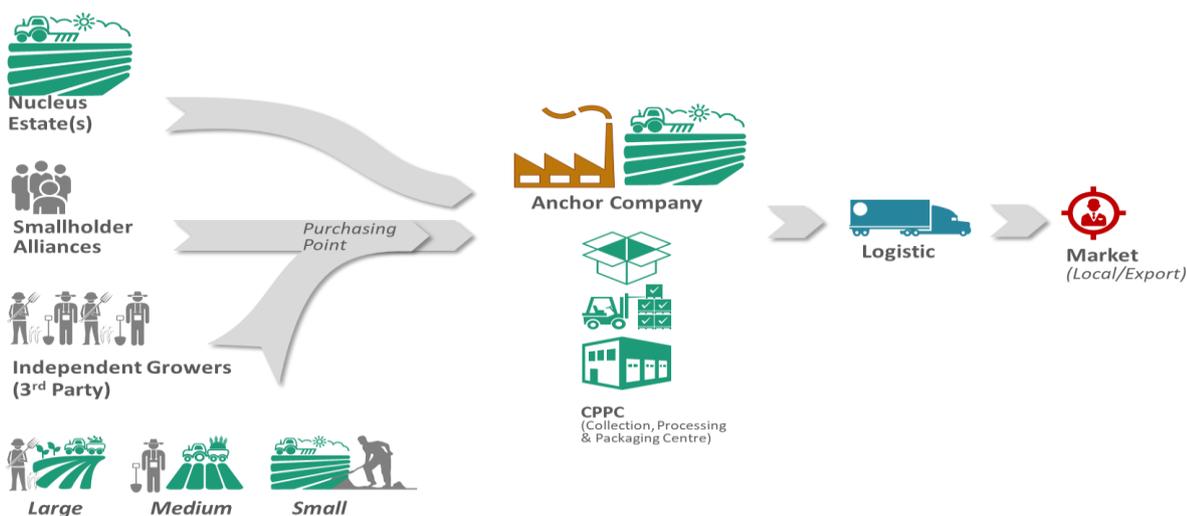


Figure 5-7: Centralized Model (Anchor Company – Out Growers Farming Model)

Source: UNIMAS Holdings

Success story for the above model include:

- Nestle Rice Project in Kerpan & Sanglang, Kedah
- Nestle Chilly Project in Bukit Awang, Kelantan
- Nestle Coffee project in Sik Kedah
- Tropical Fruit Farm Durian Project in Tarat, Serian, Sarawak
- Nelson 'Corn in Cup' contract farming in Perak

Case Study of Outgrower-Anchor Company Business Model: Rice Project in Kerpan & Sanglang, Kedah Involving Nestle.

One such initiative under the Outgrower-Anchor Company Business Model initiated by Nestlé is the Nestlé Paddy Club in Kerpan and Sanglang, Kedah. The company requires high-quality rice with low levels of arsenic (<100 ppb), aflatoxin (<0.1 ppb) and other chemical contaminants, for its production of baby food, Cerelac®. To ensure the rice supplied meets the required international standard and driven by the company's SVC principles, Nestlé established the Nestlé Paddy Club in 2011. Farmer's membership is voluntary with a fee of RM10.00 per planting season. In 2011, there were 20 farmers over 40 Ha of land participating in this programme. In 2021, the programme involves 216 farmers covering more than 611 hectares of paddy fields, producing around 7,000 MT of paddy over two planting seasons.

The programme equips farmers with Good Agricultural Practices in paddy farming to produce greater yielding high-quality crops which enables them consistently meet Nestlé's stringent and rigorous global requirements. The project assists farmers by providing farm management advice and microbial soil enhancers in the form of soil conditioner/supplement (Organica Biotech Sdn. Bhd.). In return, the farmers must sell the paddy to two designated millers at the GMP of RM1,200/MT. Upon milling, the product will be integrated into the downstream food manufacturing processes in Nestlé factories. There are about 300 types of rice-based food produced from paddy cultivated by these farmers, including Cerelac®, which are exported to countries throughout SEA and baby snacks exported to the European Union (EU).



Source: <https://www.nestle.com.my/stories/creating-sustainable-economy>

5.1.5.2.2 Cooperative/ Estate Management Farming Model

In the Cooperative farming model, farmers pool their resources in certain areas of activity e.g. farming. Cooperative is a member-owned, member-controlled business that distributes benefits on the basis of use.

Under this model (Figure 5-8), farmers will form cooperatives and employ the day-to-day management of the agriculture project either by entrepreneurs or private sector through profit sharing mechanism. The cooperative will have marketing contract agreement to market the produce.

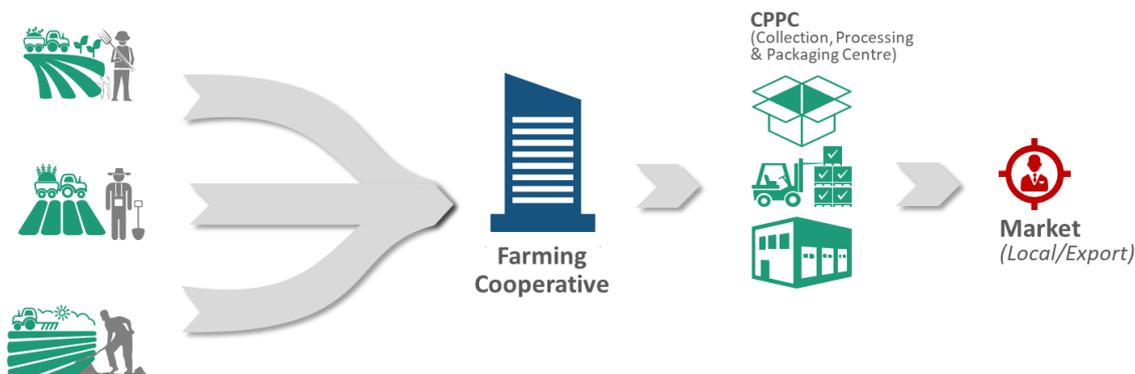


Figure 5-8: Cooperative/ Estate Management Farming Model

Source: UNIMAS Holdings

BOX 1

Cooperatives Can Play Vital Role in Sarawak Becoming Global Food Production Hub

By Editor: April 5, 2021

Cooperative movements in Sarawak have been urged to actively participate in the Sarawak Government’s many initiatives to develop the state into becoming a global food production hub. Entrepreneur Development and Cooperatives Minister Dato Sri Dr Wan Junaidi Tuanku Jaafar said cooperatives have the resources to potentially be one of the driving force in developing the state’s food production sector further by investing in more commercial scale agriculture-based businesses.

He added that time for cooperatives to be more involved in projects close that can bring about huge multiplier impact not only for its members but the local community as well. As of end last year there were 1,077 cooperatives in Sarawak, with to 300,000 members. During the period, the cooperatives in the state registered RM240.52 million in revenue, with total assets valued at RM636.14 million. This is where they can assist in addressing the country’s food security issue.

Source: <https://www.businesstoday.com.my/2021/04/05/>

The Cooperative Model have the resources to potentially be one of the driving forces in developing the Sarawak's food production sector further, by investing in more commercial scale agriculture-based businesses. The cooperative model allows economies of scale in farming and enables the use of modern technology. The model also allows empowerment of the smallholders in commercial farming.

Cooperatives can play a vital role in Sarawak becoming global food production hub (see BOX 1).

Programme Desa Lestari (PDL) in KEJORA

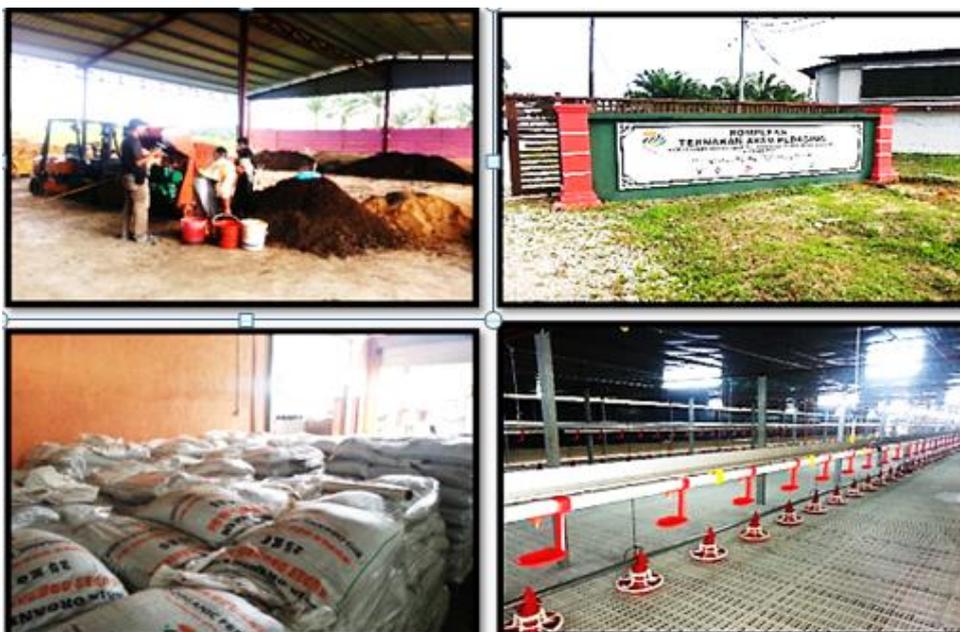
PDL is the Federal Rural Development Ministry (KKLW) initiative under the Government Transformation Program (GTP) to strengthen the economy of rural communities through the implementation of community cooperative-based economic projects.

Starting in 2013, a total of 80 villages throughout the country have been identified and have the potential to be developed through the implementation of economic projects. This effort is a new government initiative to strengthen the economy of the rural population. These cooperative driven initiatives aimed at strengthening the economy of rural communities by empowering cooperatives as economic development agents at the village level.

Since its introduction, a total of 9 villages in the State of Johor have been selected to join the PDL. Of the total, 2 of them are Traditional Villages supervised by the Southeast Johor Development Authority (KEJORA) namely **Kampung Mawai, Kota Tinggi, Johor and Kampung Isnin Maarof, Kluang, Johor.**

Kampung Mawai, Kota Tinggi Success Story

1. Oyster Mushroom Cultivation Project
2. Project 2 units 3 Ton Truck
3. Organic Fertilizer Manufacturing Project
4. Poultry Livestock Project



Source: <https://www.kejora.gov.my/en/desa-lestari>

Kampung Isnin Maarof, Kluang Success Story

1. Food Truck Service Project
2. MD2 Pineapple Crop Agriculture Project



Source: <https://www.kejora.gov.my/en/desa-lestari>

Case Study of Cooperative Farming: Egg Farming Project in Ping Ku City, suburban Beijing

One of the most successful examples of cooperative contract farming is in the People's Republic of China (<https://thaipublica.org/2014/04/model-cp-pinghu/>). The Cooperative farming was established from a partnership of 4 parties i.e. small farmers, the government of China, financial institution, and Charoen Pokphand Group or CP from Thailand (as anchor company). The China government hosted this business model by amalgamating the land of the farmers in the village to form the cooperative, and invited CP as anchor company to manage the egg farming project. CP provides both input and technology for the project. CP also purchased products and distribute to consumers in China.

It has started operations since April 2013 in Ping Ku city, suburban Beijing. This project has invested 3,500 million baht to produce 2.2 million eggs a day ranking the second largest producer after the United States. Project life's span covers 20 years. After this period, when all loan and interest have been paid back, CP would transfer the farm to the farmers a cooperative whose membership comprising more than one thousand farmers.

This project generated the high income to poor farmers, better standard of living, and more stabilized income. Additionally, the distribution of protein production to the market helps people to have enough quality food to consumers with lower prices. The country also had food security from local production.

It combined the advantages of contract farming with modern agricultural technology to create a new career opportunity for traditional farmers. All parties were able to benefit from this project. Some people changed their careers to chicken farmers, and obtained a sustainable income. The CP gained benefit from many supports of the Chinese government especially in obtaining a big consumer market, a large source of labour and land to operate business. Thus, their operations were likely smooth and widely accepted in China. For the China government, the project could create thousands of jobs and

increased income for the population. Another advantage was food security that is significant for a large country like China as well. Furthermore, it also improved quality of life of the people from having better quality food

5.1.5.2.3 Nucleus Estate NCR Land Consolidation Farming Model

The state government encourages the concept of Land Consolidation Model by Government Bodies Such as FELDA, FELCRA, SALCRA, RISDA in the development of Native Customary Rights (NCR) land.

The Nucleus Estate Land Consolidation Model is the model (Figure 5-9) adopted by LCDA (Land Consolidation and Development Authority) to develop NCR land. LCDA will appoint land development agencies such as FELCRA & SALCRA or private sector (as Anchor Company) to manage the farm, based on 60:30:10 (Anchor Company 60%: Smallholders 30%: LCDA 10%) profit sharing arrangement. The Anchor Company will also do the processing & marketing of the produce.

This model is often associated with land resettlement schemes (such as FELDA Land Settlement Schemes), Agropolitan Projects involving severely poor farmers, and new land schemes under FELCRA, SALCRA, and RISDA. It normally involves tree crops such as oil palm and rubber but can include short term crops such as paddy as in the FELCRA Trans Perak Paddy project.

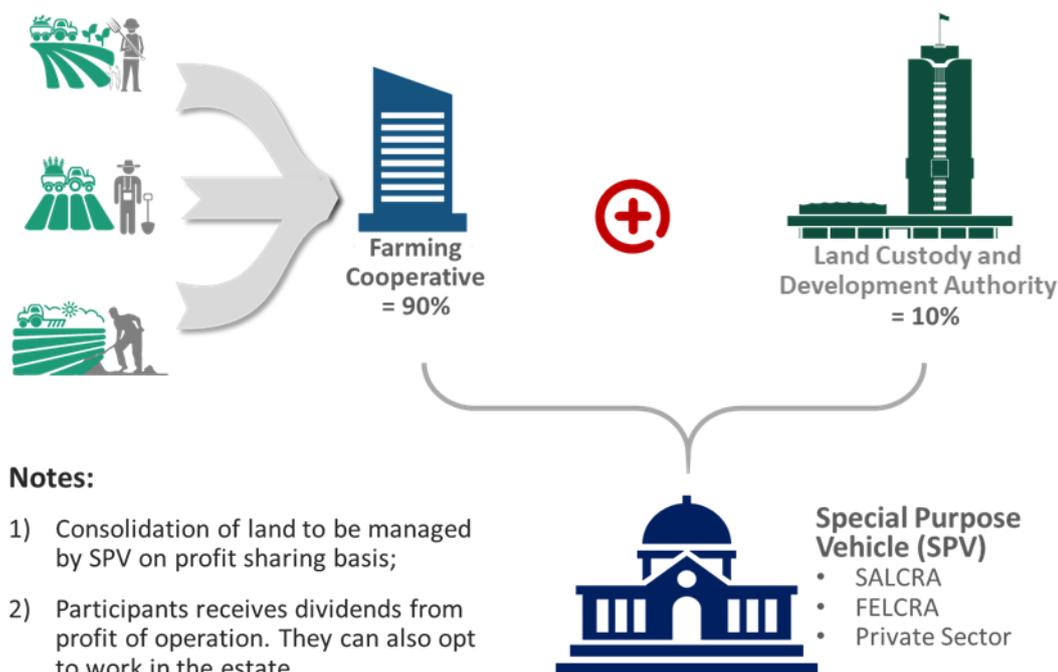


Figure 5-9: Nucleus Estate Land Consolidated Farming Model in Sarawak

Source: UNIMAS Holdings, 2021

An example of the Nucleus Estate Land Consolidated Model Project is the Pembangunan Ladang Rakyat Kampung Naie, Samarahan Division. The project was implemented in an area of 254.63 hectares involving 175 participants whereby FELCRA Berhad is the implementing agency and Lembaga Pembangunan dan Lindungan Tanah (PELITA) as the trustee agency.

One of the purported weaknesses of the Nucleus Estate Land Consolidated Farming Model is lack of empowerment of the smallholders, and the small dividend payment made to shareholders. However, it should be noted that Dividend payment will depend on a number of factors e.g the management

capability of anchor companies, profitability of the farming undertaken, farm size of individual shareholders, gestation period of the crop grown, yield of crops and fluctuating market price of the commodity planted.

It is beyond the scope of this study to undertake a detailed evaluation of the Nucleus Estate Land Consolidated Farming Model implemented in Sarawak since this is a state-wide model used by LCDA.

However, a number of recommendations are made here to improve the income of the smallholders from this model. These include:

- Increase the dividend share of smallholders from profit generated from 30% to 45%
- Increase the dividend share of smallholders from 60:30:10 ratio to 50:45:5
- Involvement of smallholders or their families as farm workers
- Payment of fixed land lease to smallholders
- Establishment of shareholder cooperative to empower the shareholders
- Establishment of community economic zones (CEZ) near the project. The CEZ is an additional avenue whereby the farmers can supplement their income by engaging in such activities as vegetable and herb farming, animal husbandry, aquaculture and others. The plot allocated can vary between quarter to half acre/ smallholder

Recommendation of business models for each project proposal is shown in VOLUME C of the Report.

5.1.5.3 *Critical Success Factors for the Farming Models*

The critical success factors for the farming models will include the following:

- Control over entire supply chain from input to markets
- Anchor Company must have ready market – demand & market
- Anchor Company must have alternative source of supply of raw materials besides contract growers e.g., own farm (nucleus farm) or imports
- Role of Government intervention
 - Funding – subsidy, grant, loans
 - Legislation- Accreditation, Import permit, SPS, Certification, Zoning (such as ZIA, TKPM/A)
 - Incentives – Tax holiday, ITA, Infra
 - Social programme
- Attractive financial profitability over entire supply chain
- Risk management – disease, supply of raw materials, market & economic instability

One major success factor in any farming model is control over (not necessarily own) the entire supply chain from farm inputs, production/ supply of raw materials, processing, distribution and marketing.

5.1.6 Potential Risks and Mitigation

The main hazards for agriculture in Sri Aman would include the threat of natural disasters, diseases, as well as unsustainable farming practices

5.1.6.1 Weather Issues, Natural Disasters, and Diseases

Production of farming activities, especially paddy, fruits and vegetables, are significantly dependent on the weather. Drastic change in the weather pattern or prolonged draught or rain can severely affect the availability of water for irrigation as well as quality and quantity of production. Natural disasters, particularly flooding, forest fire and land slide could destroy farm areas as well as irrigation & drainage infrastructure in paddy areas. Pests and diseases are common issues faced by farmers. Local farmers have to deal with unpredictable blast disease of paddy, moko & fusarium wilt of banana and fusarium disease of pepper, alongside with several other natural risks within the industry.

5.1.6.2 Development of Agriculture on Environmentally Sensitive Areas (ESA) & Climate Change

Coastal habitats, primarily comprised of peat swamps and mangrove forests, have been diminishing at a rapid rate. This ecological zone is a critical component of fishery vitality, species diversity, coastal flood protection, and global carbon storage. Extensive development of these ESA areas can contribute to climate change. The demand for food production increases with every surge in the population. However, the impact of climate change such as rise in temperature and reductions in water availability are threats that will impact production of food to meet future demand. This is made worse by the reduction in arable land.

5.1.6.3 Impact of Unsustainable Farming Practices on The Environment

Unsustainable farming practices can affect the environment as well as the agricultural productivity. These practices include

- Lack of proper waste management in livestock farming especially poultry and pig farming, which causes pollution of surrounding environment especially rivers
- Extensive land clearing during the wet months can cause siltation and pollution of rivers
- Converting shophouses/ buildings for swiftlet farming can result in high risk in environmental health
- Excessive use of fertilizers and chemicals (pesticides, weedicides) can pollute the environment

All these hazards can affect agriculture productivity and loss of income to farmers. To reduce or mitigate these externalities, there is a need to factor-in resilience planning in agriculture. This would include among others:

- Avoidance of agriculture development in environmentally sensitive areas (ESA)
- Defining and gazetting of ESA
- Judicious use of fertilizers & chemicals
- Avoidance of burning in peat areas especially during land clearing
- Sustainable & good agriculture practices (GAP)
- Introduction of bio-controls on seed and other inputs
- Development of an isolation strategy that can be implemented in the event of an outbreak of a new disease, etc.
- Environment Impact Assessment (EIA) for opening of large agriculture areas
- Monitoring of illegal forest clearing

5.1.6.4 *Biosecurity & Food Safety*

Biosecurity and food safety is a statewide issue in Sarawak. At present it is under the purview of the Ministry of Modernisation of Agriculture and Regional Development (MANRED) through the Department of Agriculture Sarawak, Department of Veterinary Services Sarawak and Department of Fisheries Sarawak.

It is the responsibility of these agencies to ensure agriculture products, be it plants, animal or fish origin that are brought into the state are free of threats of diseases, and not detrimental to the biosecurity of the state.

There is a need to step-up and strengthen border checkups on trade of agriculture goods whether they are done legally or illegally (smuggling activities).

There is also a need to provide advisory services to the public, traders, producers etc. on the importance of biosecurity & food safety.

If need be, Sarawak may consider the establishment similar organization like Malaysian Quarantine & Inspection Services (MAQIS), under MANRED, to harmonize biosecurity measures in the state.

SECTION 5.2 AQUACULTURE AND FISHERIES

A number of initiatives are proposed under the SAMP for the development of aquaculture and fisheries resources in the Division. The projects are detailed in Volume C of this report. The key initiatives are outlined hereunder.

5.2.1 Development of Recreational Fisheries at Batang Ai Reservoir

Sri Aman can be developed into an attraction for recreational fisheries, which could greatly enhance visitor flow to the Division. Recreational fisheries can be tied to the Batang Ai reservoir, in particular. Outside of the caged fish, there is a significant feral population of tilapia in the reservoir, which for ecological and biosecurity purposes, need to be controlled. The promotion of Batang Ai reservoir as a recreational fishing destination would enhance its visitor appeal. Having fishing competitions (based on the number of feral Tilapia that are captured) and timing it with events such as the *Pesta Benak*, would enhance considerably the visitor appeal of the Division, in addition, to reducing the biosecurity risks to the aquaculture industry in the reservoir.

5.2.2 Development Expansion of Aquaculture at Batang Ai Reservoir, with a View of Creating Processing Spin-Offs

There is still capacity within the Batang Ai reservoir for an expansion of the existing cage culture activity. It is envisaged up to an additional 13,000 cages (equivalent to 130,000m² of productive area) can be potentially developed over the next 10 years. However, there is a risk associated with expanding the aquaculture activities if the water quality is impacted. High nutrient levels can result in rapid phytoplankton development and potential blue-green algae outbreaks. This can result in fish kills and may therefore be counterproductive to the cage culture development. Accordingly, development of additional capacity would need to take these factors into account. This is best achieved by zoning of the Lake area in accordance with permissible cage densities commensurate with the level of water quality risk in different zones.

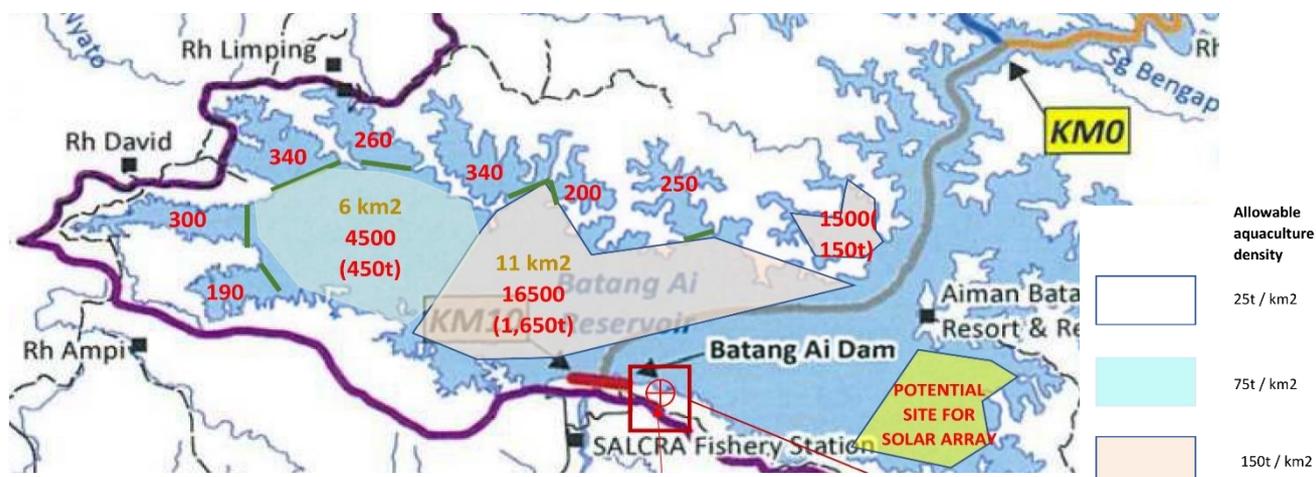


Figure 5-10: Proposed zoning for aquaculture expansion in Batang Ai showing standard cage capacity and production (tonnes)

Source: Envisar, 2018

Additionally, though the aquaculture activity within Batang Ai has been undertaken for some time, there is a lack of value adding activity. This is partly due to the absence of appropriate processing facilities. Though Borneo Eco Fish Sdn. Bhd. are planning their own processing center, other major operators need to be vertically integrated so that they can go beyond primary production.

5.2.3 Integration of ‘Smart Farming’ Systems in Aquaculture using Remote Monitoring and Management Systems

With the world currently moving towards digitalization, there is a need to upgrade the current aquaculture farming systems. Some proposed upgrading would include automatic water parameter sensor and automatic fish feeder, which would significantly improve the production of the cage aquaculture operations. This is already being pursued by the bigger players in Batang Ai. However, they need to do this from their Kuching offices since the 4G coverage in Batang Ai reservoir is still absent. While transmission towers would bring such signals to the reservoir bank, its ability to provide coverage over wide expanses of water that the reservoir represents is still questionable. Farms should thus be equipped with signal capture and amplification equipment that would enable them to fully digitize their operations.

5.2.4 Development of Fisheries Research Hatchery in Temudok

Consistent supply of disease-free fish seed stock is crucial to ensure the sustainability of aquaculture industry at Batang Ai Reservoir. The development of Fisheries Research Hatchery at Temudok is proposed for the development of seed production capability that would enable production of disease-free seed supply. The hatchery will also be equipped with biosecurity and fish health monitoring systems to check/screen all inputs to ensure a disease-free environment. The hatchery is estimated to produce about 10 million fish fingerlings which would be used to supply the cage culture in Batang Ai Reservoir. The proposed fish research hatchery need not be a new facility. Revitalization of the current DoA hatchery in Temudok towards meeting these objectives. Supreme Cold Storage Sdn. Bhd. is currently negotiating to take over the current hatchery and presumably meeting the needs of the industry in Sri Aman and beyond.

5.2.5 Development of Aggregation/Biosecurity Center at Batang Ai

Managing aquatic fauna disease is critical to the future of the aquaculture industry at Batang Ai reservoir. To facilitate this, it will be necessary to establish an Aggregation/Biosecurity Centre at Batang Ai Reservoir area, and monitor/screen all inputs. This will not only improve the quality of the species cultured but also improve the production of aquaculture. Species that pass the biosecurity will be safe for local consumption and will meet the requirements to be exported overseas. The Inland Fisheries Branch is currently building a centre towards this end.

5.2.6 Exploring the Potential of the Adjoining Kalimantan Market for Supply of Additional Products

Sri Aman straddles the border with Kalimantan, in particular the Kapuas River Basin. There can be substantial synergies between the two countries that can and, should, be explored.

5.2.7 Development of a Masterplan for the Economic Development of Tagang Sites in Sri Aman

As pointed out above, there is considerable potential for the tagang sites to enhance the visitor appeal of Sri Aman. However, the development of these sites needs to be based on a masterplan that evaluates their potentials and how they can best be realized.

SECTION 5.3 TOURISM

This chapter provides a summary of proposed strategies and key tourism projects. A full list of tourism projects with associated details is provided in Volume C of this report.

It is recommended that strategic thrusts for tourism focus on five areas:

- ❖ Product Development
- ❖ Community-Based Tourism
- ❖ Conserving Natural Tourism Assets
- ❖ Marketing & Promotion
- ❖ Accessibility

The strategies are summarised in Table 5-7.

Table 5-7: Tourism Focal Areas & Strategies

Focal Area	Strategy	Actions
1: Product Development	Focus new product development efforts on high priority attractions with good tourism potential and tailor these products to specific market demand segments.	11
2: Community Based Tourism	Encourage the development of alternative homestays such as kampung stays, community-managed campsites, and add-on tours, activities, and services. These variations of the traditional homestay model should target appropriate market segments.	6
3: Conserving Natural Tourism Assets	Protect natural assets and utilise these sites for high value-added ecotourism activities.	5
4: Marketing & Promotion	Allocate more marketing resources to promoting attractions and experiences in Sri Aman Division and develop new adventure and sports events.	9
5: Accessibility	Continue to improve access to high priority tourism attractions but be mindful that road access can degrade high-value ecotourism sites and lead to reduced income for local communities.	7

Full details of the various actions and projects are listed in Volume C.

The projects below focus on the high priority tourism attractions identified in the research phase, namely Batang Ai (Lakeside & Upriver Areas), Gunung Lesong-Lingga Ecotourism Cluster, Simanggang Town and Wong Ajong.

The following summarises projects at these key attractions or destination clusters.

5.3.1 Gunung Lesong-Lingga Ecotourism Cluster

Gunung Lesong-Lingga Ecotourism Cluster
Strategic Focus Areas
Product Development, Community-Based Tourism, Conserving Natural Assets, Marketing & Promotion & Accessibility

Gunung Lesong-Lingga Ecotourism Cluster
Actions / Project No.
Actions S1-1, S1-2, S2-1, S3-2, S3-3 & S4-4.
Project Description
Develop the Gunung Lesong-Lingga Ecotourism Cluster with initial focus on building park HQ facilities, community-managed accommodation and improving accessibility and facilities.
Project Rationale
<ul style="list-style-type: none"> • Unlock the tourism potential of Gunung Lesong and surrounding villages and towns • Create economic opportunities for local communities • Tap into growing domestic tourism demand
Activities / Project Components
<ul style="list-style-type: none"> • Road from Pantu to Gunung Lesong (to summit trail entrance, near Munggu Sawa) • Park HQ (staff quarters, office, interpretation centre, public toilets, etc). Obvious site is near current summit trail which is likely to be a focus of future visitor activity • Car park at base of summit trek (near Munggu Sawa) • Community-managed stand-alone accommodation (see Action S2-1) and campsite (see Action S1-2), near start of Munggu Sawa summit trail • Improve park trail network • Boat jetties (Banting & location on Sg Seterap near G Lesong, e.g. near Sumulung or Engkeranji) • Tidal bore viewing platforms • Camp site near Kpg Menuang (see Action S2-2) • Marketing & promotion (see Action S4-4) • Sebuyau Gunung Lesong Wildlife Corridor & Reforestation Project (See Action S3-2) • Wildlife surveys around Gunung Lesong National Park (see Action S3-3) • Cultural Heritage Centre at Gunung Lesong (See Action S2-6)
Estimated Budget
<ul style="list-style-type: none"> • Road, as budgeted under existing plans • Park HQ (RM 6 million) • Car park (RM 500,000) • Community-managed stand-alone accommodation at Gunung Lesong (RM 750,000, see Action S2-1) and campsite (RM 500,000, see Action S1-2) • Park trail network (RM 500,000) • Boat jetties, as budgeted under existing plans • Tidal bore viewing platforms, as budgeted under existing plans • Camp site, Kpg Menuang (RM 300,000) • Marketing & promotion (RM 200,000, see Action S4-4) • Wildlife Corridor & Reforestation (RM 15,000 per hectare, see Action S3-2) • Wildlife Surveys Around Gunung Lesong National Park (RM 100,000, see Action S3-3) • Cultural Heritage Centre at Gunung Lesong, RM 2 million
Investments / Funding Sources
Mostly Public

Gunung Lesong-Lingga Ecotourism Cluster
<p>Roles & Responsibilities</p> <p>Lead</p> <ul style="list-style-type: none"> • SFC • MTCP Sarawak • Ministry of Infrastructure • Sri Aman Resident Office <p>Supporting</p> <ul style="list-style-type: none"> • Gunung Lesong Community-Based Ecotourism Committee • Sarawak Tourism Board • Tour Operators <p>(Different agencies lead different components, see Volume 3 report and individual project action listings and responsibilities.)</p>
<p>Project Timeframe</p> <p>Medium to long term</p>
<p>Target Markets</p> <p>Core market will be local domestic tourists (Sarawakians). 70-80% of visitors to Gunung Lesong National Park will likely be local tourists. This is a similar market mix as Kubah, Gunung Gading and Matang Wildlife Centre. Domestic visitors will also form the largest demand segment for other attractions in the cluster. The cluster should be able to attract small numbers of foreign arrivals (e.g., Europe, Singapore, Australia). However, this will be in the second half of the master plan period when tourism has recovered, and a full range of facilities and accommodation has been developed.</p>

5.3.2 Batang Ai

Batang Ai
Strategic Focus Areas
Product Development, Community-Based Tourism, Conserving Natural Assets, Marketing & Promotion & Accessibility
Actions / Project No.
Actions S1-2, S1-4, S1-9, S1-10, S4-9, S2-5, S3-1, S3-4, S3-5, S5-2, S5-3, S5-5
Project Description
Further develop high yield ecotourism, broaden product offering conserve nature tourism assets, develop a Scientific, Academic, Volunteer and Education travel product (SAVE Tourism) and begin planning for sustainable development of lake tourism.
Project Rationale
<ul style="list-style-type: none"> • Develop lucrative SAVE Tourism niche • Protect high value ecotourism assets • Plan for future development of lake tourism • Batang Ai is one of a limited number of sites in Sarawak that attracts high yield ecotourism demand • Main longhouse tourism destination in Sarawak • Batang Ai is Sarawak's only viable destination for orangutan watching treks
Activities / Project Components
<ul style="list-style-type: none"> • Rainforest Field Studies Centre in Batang Ai National Park, see Action S1-4 • Develop Batang Ai agro-tourism products (fish restaurant, fish cage tours, etc), see Action S1-10 • Promote recreational fishing activities on lake, see Action S1-11 • Develop a Batang Ai water based event or festival, see Action S4-9 • Lakeside camp site, see Action S1-2 • Continue to promote private sector led, community focused ecotourism activities at Batang Ai, see Action S2-5 • Gazette Ulu Sungai Menyang landscape as a protected area, see Action S3-1 • Gazette proposed extensions to Batang Ai National Park, see Action S3-4 • Reconsider need for roads through irreplaceable orangutan habitat. Instead improve lake and river transport, see Action S3-5 • Feasibility Study to assess merits of lake taxis, fuel depot needs and jetty improvements, see Action S5-3 • River debris removal at Ulu Ai & Ulu Delok, see Action S5-2 • Maintenance of tourist jetty and reception area, see Action S5-5 • Feasibility study on float plane service to Batang Ai
Estimated Budget
<ul style="list-style-type: none"> • Rainforest Field Studies Centre in Batang Ai National Park, RM 10 million • Batang Ai agro-tourism products, cost depends on scale and operations. Private sector to assess costs • Recreational fishing, RM 200,000 • Batang Ai festival, RM 250,000 sponsorship • Lakeside camp site, RM 500,000 • Promote private sector, community ecotourism activities, under existing budgets

Batang Ai
<ul style="list-style-type: none"> • Gazette Ulu Sungai Menyang, part of SFC's ongoing operations and responsibilities • Gazette extensions to Batang Ai National Park, part of SFC's ongoing operations and responsibilities • Improve river and lake transport / feasibility study to assess merits of lake taxis, etc., RM 200,000 • River debris removal at Ulu Ai, Engkari & Ulu Delok, RM 100,000 per year • Maintenance of tourist jetty and reception area, RM 50,000 per year • Float plane feasibility study, RM 300,000
Investments / Funding Sources
Mostly Public
Roles & Responsibilities
<p>Lead</p> <ul style="list-style-type: none"> • SFC • MTCP Sarawak • Sri Aman Resident Office <p>Supporting</p> <ul style="list-style-type: none"> • Sarawak Tourism Board • Tour Operators • Sarawak Energy • Sarawak Rivers Board • Ministry of Youth & Sports • Local Council <p>(Different agencies lead different components, see Volume 3 report and individual project action listings and responsibilities.)</p>
Project Timeframe
Medium to long term
Target Markets
Domestic and international tourists.

5.3.3 Simanggang Town

Simanggang Town
Strategic Focus Areas
Product Development, Marketing & Promotion
Actions / Project No.
Actions S1-7, S4-1, S4-2, S4-3, S4-4, S4-6, S4-8
Project Description
Iban Culture Centre (or Sri Aman Cultural Centre), website for Tidal Bore, improved marketing and promotion, cycling event, visitor information desk.
Project Rationale
<ul style="list-style-type: none"> • Cultural centre will provide another anchor attraction for Simanggang • Tidal bore website will fill current information gap and facilitate trips to see the tidal bore • Improved promotion of attractions in Sri Aman Division is needed • Cycling race will give Simanggang (& Sri Aman) another high profile event
Activities / Project Components
<ul style="list-style-type: none"> • Iban Culture Centre (or Sri Aman Cultural Centre) • Dedicated website for tidal bore (Action S4-1) • Increased tourism promotion (See Action S4-2 & S4-6) • Road cycling race when the Borneo Highway is completed. A potential route is Lingga-- Simanggang-Engkilili (See Action S4-8) • Visitor information desk (see Action S4-5)
Estimated Budget
<ul style="list-style-type: none"> • Iban Culture Centre (or Sri Aman Cultural Centre), RM 8 million • Website for tidal bore, RM 35,000 • Marketing & promotion, RM 200,000 for Division-wide initiatives (See Actions S4-2, S4-3, S4-4 & S4-6) • Road cycling race, RM 250,00 government sponsorship • Visitor information desk, zero cost if done at existing office set-up
Investments / Funding Sources
Mostly Public
Roles & Responsibilities
<p>Lead</p> <ul style="list-style-type: none"> • Sarawak Museum (cultural centre) • MTCP Sarawak (events) • Sarawak Tourism (marketing and promotion) <p>Supporting</p> <ul style="list-style-type: none"> • Resident's Office (support)
Project Timeframe
Medium to long term
Target Markets
Domestic and international tourists

5.3.4 Community-Based Tourism Project, Camp Site & Associated Facilities, Wong Ajong, Engkilili

Community-Based Tourism Project, Camp Site & Associated Facilities, Wong Ajong, Engkilili
Strategic Focus Areas
Products Development, Community Based Tourism
Actions / Project No.
Action S2-3, S1-2
Project Description
Develop a community-based tourism project, camp site and associated facilities at Wong Ajong.
Project Rationale
<ul style="list-style-type: none"> • Provides income for local communities • Existing facilities are run-down and in need of repair • Harnesses tourism potential of Wong Ajong • Provides recreational facilities for residents of nearby towns • Encourages domestic tourism • Quick win, fast and easy to implement
Activities / Project Components
<ul style="list-style-type: none"> • Campsite, complete with toilets and showers, dining hut, fire pits and sufficient space to pitch 10 tents • Repair the trail / walkway from entry point to the existing picnic area • New steps to the river • Signage • Clear all rubbish from the site and community / council to implement regular refuse collection (esp. at weekends) • Training for community (e.g. setting a user fee system, maintenance of facilities, guiding, etc.)
Estimated Budget
RM 1,500,000
Investments / Funding Sources
Public
Roles & Responsibilities
<p>Lead</p> <ul style="list-style-type: none"> • MTCP (CBT support and training) • Local Community (manage facilities & provide tourism services) <p>Supporting</p> <ul style="list-style-type: none"> • Local Council (maintenance) • Sarawak Tourism Board (Promotion)
Project Timeframe
Medium to long term
Target Markets
Domestic tourists

SECTION 5.4 SOFT INFRASTRUCTURE PROJECTS

The following productive sector enabling projects are selected on the basis of their potential for high impact on the stated goals of the SAMP. All the projects will be initiated through Public-Private-Partnerships whereby the projects would be managed and delivered as much as possible by the private sector but will be owned by the Government. The lead agencies responsible for the projects would report to SADA.

5.4.1 Business Incubation Centre

Expand the functions of the existing business incubation centre which currently only provides business registration and office space. The scope of coverage of the incubation centre is to be expanded to include all residents and businesses of the Sri Aman division and move away from its current Bumiputera only focus.

The broader role of the incubation centre is to provide value-added services such as entrepreneurship training and development, mentoring and handholding, training and development, quality office spaces suited for e-Commerce type of businesses, and an integrated facility with the proposed industrial park.

The incubation centre will have a thematic focus towards nurturing the development of agriculture, livestock, and tourism businesses with an emphasis on moving local businesses up the value chain.

The incubation centre will house companies that develop, adapt and showcase advanced smart technologies and techniques which have the potential to uplift Sri Aman's economy.

The focus of capability development will include training and the supply of equipment and services for the following areas:

1. Modern farming technique
2. Agriculture and food quality
3. Agriculture processing
4. Agriculture quality testing and certification

The centre will also facilitate the development of successful business models in food processing, agriculture, livestock, aquaculture, and tourism to be used as examples to encourage greater local participation

The development will be done in a phased manner similar to the Technology Park Malaysia Incubation Centre which adopted a landlord model. Under the phase 1, landlord model, the centre will provide office space, and shared facilities such as video conferencing facilities, access to high-speed internet. In the phase 2, the incubation centre to include additional advisory model to the landlord model which is providing additional services such as business advisory services, mentoring and coaching and facilitate access to funding.

5.4.2 Training Centre

Establish an institution of learning (training centre, vocational, college, community college) with the aim of raising the skills level of the local workforce in capabilities that will elevate the value add of the agriculture and food industry which is the current key economic focus area of the Sri Aman Division. The business survey findings identified close to 76% of the respondents stating a need for a training centre/vocational training centre in Sri Aman.

The establishment of the institution achieves two objectives:

1. Prepare the local workforce skills in areas that will facilitate the advancement of the agriculture and food industry into higher value-added activities.
2. Boost the economy and domestic population of the Sri Aman Division

The training centre will cater the needs of the incubation centre, industrial park, agrifood technology park, e-Commerce, and other productive sectors namely agriculture, livestock, aquaculture, and tourism.

This training centre will also be an avenue for sharing of experience and expertise from renowned industry participants.

Note: Courses to be offered are being tested as part of the business sentiment survey conducted as part of this study. The options tested are as follows: Biotechnology, Smart/intelligent agriculture, Agriculture planning, Veterinary, Animal husbandry, Butchery, Food safety and research, Food processing, Food packaging, Standards and compliance, E-Commerce (Agriculture and food), Agriculture and food logistics, Business Set-Up, and Financial Management.

5.4.3 Small Traders E-Commerce Market Access Point

The rapid growth of e-commerce in Malaysia is driven by increasing internet penetration, receptiveness towards online payment platforms and the growing adoption of smartphones. Favourable policies by the Malaysian government through the establishment of the Digital Free Trade Zone are a further impetus to the growth of the industry in Malaysia. Valued at USD3.68 billion (RM15.2 billion) in 2019, the e-Commerce industry is expected to grow by 11.8% by 2023. The onset of the COVID-19 pandemic in 2020 had driven a further shift of purchasing patterns from traditional retail outlets to online stores.

The e-Commerce industry is comprised of a number of key players (1) Logistics services providers, (2) Transaction services providers, (3) Buyers, and (4) Product suppliers.

In the logistics services industry, there are well established players that have business operations across the country, these include PosLaju, DHL, Federal Express J&T Express, and Ninja Van. Similarly, transaction services providers are comprised mainly of major local banks and e-wallet services providers. Payment services providers cover the entire country and are well integrated with e-Commerce platforms and thus are not an area of opportunity for Sri Aman division. From a logistics perspective, opportunities exist for the establishment of a regional distribution and fulfilment hub, the attractiveness to industry players are largely dependent on connectivity and cost of warehousing.

Sri Aman division is a small consumer market base with a population of around 108,225 as of the last census in 2010 and is unlikely to be an attractive location for sales and distribution.

The opportunities for Sri Aman division are in the use of digital commerce as a tool to improve market access for products produced in the region. This is among one of the many strategies to bring products from the region to the rest of Malaysia and across the globe. At present, one of the key challenges of the agriculture sector is access to market where produce is largely not collected for further export to outside of the division.

The use of digital commerce to enhance market access was adopted in China through an initiative by Alibaba, an established e-Commerce company. A key component of the initiative is the establishment of a 'Rural Service Station' that serves as a one stop location for the purchase and sale of products. The key characteristics of the stations are (1) Service station act as purchasers for local communities, (2) Local partners are elected as leaders, and (3) Promotional support to help local trader's setup websites and complete the offline to online experience.

This project involves the establishment of a services hub for e-Commerce and is ideally developed together with the broader initiative to raise the production, quality, and packing of agriculture products.

A facility for rural e-Commerce delivery services that include business centre and a logistics fulfilment area is proposed to be constructed. The facility is ideally located in proximity with Simanggang town and the Pan-Borneo highway for greater ease of accessibility.

5.4.4 Establishment of An Outsource Business Services Sector in Sarawak with First Rural Delivery Centre in Sri Aman

To accelerate economic growth, the suitable and potential Global Business service (GBS) model to be established in Sarawak is the hub-and-spoke model, with Kuching as center of business services serving clients both locally and globally, and several supporting nodes to be based in areas outside of Kuching such as Kota Samarahan, Sri Aman, Bintulu, Miri etc. for processing-related tasks as well as to support unique local demands and requirements as mentioned above.

The GBS hub/organization does not deliver all functions, but rather it is the umbrella for several functions placed in scope and has multiple service delivery models in place in various locations. The hub in Kuching can house transactional activities and back-office processing such as benefits administration, workplace policies, buying and selling of products, accounts, invoices, etc., while local centers like Sri Aman can house standard non-transactional activities that require local understanding and skills such as integrated data warehouse, call center, customer service, development of site-specific policies, etc.

Developing Kuching as the GBS hub in Sarawak is needed as Kuching is the capital of Sarawak with a huge population of 611,566 in 2020 (the 4th populous city in Malaysia) and the main industrial and commercial centers for Sarawak. The people in Kuching are also multi-lingual in English, Bahasa Malaysia, Hokkien, Hakka, and Mandarin Chinese, which makes business communications easier with other locations. Moreover, labor cost is relatively lower in Sarawak as compared to Peninsular Malaysia. According to a survey carried out in 2019 by SarawakJobs.com in Sarawak, monthly salary of a graduate (with up to 2 years of working experience) with a bachelor degree is RM 1,703 versus RM 2,600 in Iskandar, Johor Bahru. The survey also suggests that the populations in Sarawak are well educated with SPM, STPM, and Diploma certificates as well as Bachelor and Master degrees.

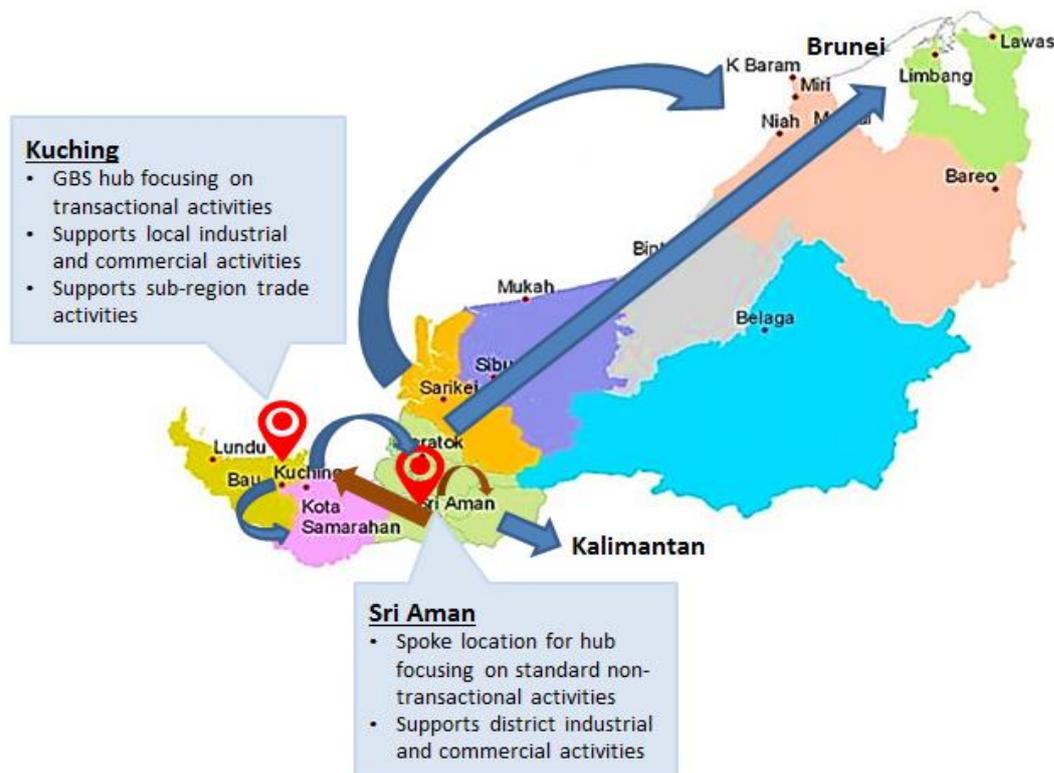


Figure 5-11: Illustration of GBS Hub-and-Spoke Model for Sri Aman

Source: Frost & Sullivan

Table 5-8: Top 5 Populous Cities in Malaysia, 2020

Cities	Population
Kuala Lumpur	7,996,830
Johor Bahru	1,023,900
Ipoh	813,553
Kuching	611,566
Kota Kinabalu	549,586

Source: Frost & Sullivan

The hub-and-spoke model is also suitable as Sarawak forms part of the Brunei Darussalam-Indonesia-Malaysia-Philippines East ASEAN Growth Area (BIMP-EAGA) initiative implemented in 1994. The objective of BIMP-EAGA is to accelerate economic development in the four countries focus areas i.e. agriculture, fisheries, tourism, energy, as well as transport and shipping, by increasing trade and investments inside and outside of the sub-region. Under this initiative, the selected urban centers in Sarawak are Kuching, Bintulu Miri, and Sibiu.

The BIMP-EAGA initiative can encourage the role of Kuching as the GBS hub facilitating resources and serving clients in the sub-region i.e. Brunei, Philippines, and Indonesia, on the desired focus areas. Additionally, the Asian Development Bank (ADB) is providing assistance to the four countries in terms of technical and strategic guidance as well as knowledge and capacity building support, which could be leveraged by Sarawak to implement and establish its digital services.

This project hinges upon state level buy in and strategy to develop Global Business Services where Sri Aman and other divisions would play the role of a supporting hub. At present, Global Business Services is not among the six digital economy sectors under the Sarawak Multimedia Authority; agriculture, manufacturing –industry 4.0, tourism, smart city, digital health, e-Commerce, digital government, and social. The processes of obtaining stakeholder buy in and establishing the hub in Kuching may potentially take five years before the establishment of hub delivery centres.

5.4.4.1 *Physical Infrastructure Requirements*

Kuching

- 1) **Cybercentres/MSC-status building** – To be based on existing or new office buildings where the key requirements are the availability of high speed internet (dedicated private networks of at least T1), redundant power supply, and centrally located close to lifestyle centres
- 2) **Data centres** - Data centres that are compliant to the ANSI/TIA-942 standards

Sri Aman

- 1) **Cybercentres/MSC-status building** – To be based on existing or new office buildings where the key requirements are the availability of high speed internet (dedicated private networks of at least T1), redundant power supply, and centrally located close to lifestyle centres

5.4.5 **Facilitation of Business Match Making and Promotion of Opportunities in Sri Aman**

SADA through the Sri Aman Division Incubator Initiative – proposed as part of the infrastructure initiative - are to establish a working relationship with key business associations of Sarawak to leverage upon their business networks and know-how to provide local businesses with better market access and to bring in potential investors that will develop the agriculture and related economic focus areas of Sri Aman. Business associations include Sarawak Business Federation, Sarawak Chambers of Commerce, The Sarawak Entrepreneur Association, Simanggang Chinese Chambers of Commerce, and other relevant business associations.

Through the local business network, host business forums and promotion of the Sri Aman's business opportunities to prospective investors within Malaysia as well outside Malaysia to create greater awareness and enhance the Sri Aman's brand name. Businesses from the Sri Aman division must be strongly encouraged to participate in trade shows and events organised at National level by offering incentives.

It is also proposed to utilise overseas assets such as STATOS and other promotional platforms available through federal agencies.

SECTION 5.5 INDUSTRIAL PARK

The Sri Aman Division at present lacks proper industrial facilities except for the industrial zone located next to the old airport which is currently fully occupied and is tenanted by predominantly maintenance services industries and automotive companies; based on workshops carried out as part of this study 5.5ha (13.6 acres) has been planned by MINTRED in proximity to Kampung Muhibbah for mixed industry.

A new industrial park will facilitate the expansion of the economic activities in the Sri Aman Division towards higher value-added activities. The business survey identified that 46% of the respondents mentioned that an SME industrial park is needed especially for storage and consolidation while 39.6% of them claimed it is needed for value-added processing activities.

The proposed Industrial Park is aimed at facilitating market access and is built around (1) Establishment of a physical location to accommodate logistics and other related activities; and (2) Development of soft infrastructure for instance facilitating the establishment of business networks and services required to raise local products to international standards.

The proposed Industrial Park will set up Sri Aman for a bigger role as a regional food processing center through the establishment of crucial extension services that create export market ready products, differentiate Sri Aman products, link Sri Aman suppliers to potential customers, and address logistics costs through consolidation/better capacity utilization.

The proposed park will primarily focus on food processing and packaging, providing and servicing agricultural machinery, serving the requirements of the commercial agriculture sector, and recycling of waste arising from food processing. In the long run the park will focus on other manufacturing activities.

Potential industries that can be established in the Industrial Park include:

- 1) Oil Palm refinery – Under the SAMP projects approximately 16,700 hectares of new or replaced planting of oil palm will be established. The production from these areas will require a new oil palm mill to be established. Since the land areas identified for the oil palm are smaller parcels scattered across the Engkilili and Lubok Antu subdistricts, it makes sense to provide a centralized location, and Temudok is well suited for this.
- 2) SAMP is proposing about 10,000 hectares of coconut plantation development. Downstream processing for a range of coconut products can be undertaken at the Temudok Industrial Park.
- 3) There is potential for the establishment of a fertilizer production factory to provide for the agricultural developments in the region.
- 4) Nursery facilities can be established for coconut, banana, durian, coffee, rambutan, and various other crops being established in the Division
- 5) Facilities for selling and servicing of agricultural machinery
- 6) Facilities for selling and servicing of farm transport vehicles

The proposed Industrial Park will be developed in a phased modular approach that suits the production capacity and maturity of agriculture production in the region. Key functions such as the collection, processing, packing, food certification, business networking, branding and promotion are to be established in the first three years of the master plan.

The proposed Industrial Park to house a number of soft infrastructure facilities that include

- (1) Business Park consisting of small ready built industrial lots aimed at housing Small Medium Enterprise agriculture processing activities
- (2) Business services center building to house various supporting services that include product certification, training and development, business incubation

SECTION 5.6 TRANSPORTATION INFRASTRUCTURE

A key theme under the SAMP is connecting communities. Having good road access (road or river as appropriate) and public transport options are fundamental to achieving that end. We outline here only the key strategies and projects. The full list of projects, together with details, is provided in Volume C of this Report.

5.6.1 Transportation Objectives

The projects have been developed based on the following criteria:

- Providing access to facilitate projects proposed under SAMP. The new and upgraded roads proposed in this Plan are primarily providing access to agricultural projects or tourism assets
- Providing transportation options to connect communities with services and with other communities
- Opening up parts of the Division that have previously had poor access
- The local movements of all purposes (work, school, industrial, social, etc) mainly served by road-base transportation. Settlements along the river depends on small boats

The following are summaries of the projects that have been determined to be the most impactful on the economic growth of Sri Aman and the well-being of its population. However, there is a much larger range of projects that were proposed but are not highlighted here. The details on all the transportation related projects are set out in Volume C of this report

5.6.2 Roads

5.6.2.1 Review of SADA Proposed Road projects

The SADA proposals are listed in Table 5-9. Our assessment of their appropriateness and priority are included as per the following colour shading.

High Priority	Medium Priority	Low Priority	Not Appropriate	Not identified
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Not identified indicates that the location is uncertain and not shown in Table 5-10

Table 5-9: New Roads and Road Upgrading Projects Proposed By SADA

Reference	Description	Length (KM)	Comment / Priority
Proposed New Road			
N1	Proposed Simanggang Link Road	14	Suggest different alignment
N2	Proposed Basi Road (Brayun – Sg. Basi to Kuching/Sibu Trunk Road)	25	Low priority. Not included in SAMP
N3	Proposed New Ulu Batang Ai Road	30	Not appropriate – will negatively impact pristine tourism and ecological areas
N4	Proposed Engkeranji – Sg. Pisang Road	17	Low priority – Not included in SAMP

Reference	Description	Length (KM)	Comment / Priority
N5	Proposed Banting – Gunung Lesong – Engkeranji Road	6	High Priority. Together with N6 and U2, U4 will form an important link from Pantu to Lingga, creating a development corridor and tourism circuit, including Gunung Lesong.
N6	Proposed Lingga – Banting Road	10	High Priority
N7	Proposed Jalan Tebarong	3.6	This appears to be a local road to service an existing community. This should proceed under a different program. Not included in SAMP
N8	Proposed Sebembau Gayau Road	5	Provides useful link for settlements. Will also facilitate proposed projects.
N9	Proposed Ulu Lemanak Road	52	Not appropriate. Current alignment transgresses TPA areas and will result in damage to environmental assets
N10	Proposed Selanjang Angkong – Enchiap Road	6.5	No identified development benefits. Not included in SAMP
N11	Proposed Batu Besai /Po Ai Shortcut Road	4.4	Helps with connectivity
N12	Proposed construction of Jalan Merebong – Bukit Tunku	4	Helps with connectivity
N13	Proposed Lingga Banting Road	11	Useful shortcut but crosses difficult deep peat area. No real agricultural development potential. And no settlements. Not included in SAMP
N14	Proposed Empelanjau Munggu Mawang Road	6	Not identified
N15	Proposed construction of Jalan Merbong Bukit Tungku	4	Not identified
N16	Proposed Bukong Bypass	3	Not identified
Subtotal		201.5	
Proposed Road Upgrading			
U1	Proposed upgrading of Jalan Menuang to Langgir	7.5	Low priority. Deep peat area, little development potential. Not included in SAMP
U2	Proposed upgrading of Jalan Menangkin to Engkeranji Road	11	High Priority. Part of the Pantu – Lingga Link.
U3	Proposed upgrading of Jalan Batang Strap, Sapak, Isu ke Simpang Ubah	24	Useful link to settlements and paddy project
U4	Proposed upgrading of Pantu – Keranggas –Engkeranji Road	26	High Priority. Part of the Pantu – Lingga Link.
U5	Proposed upgrading of Ulu Paku Road, Batu Lintang	14	Medium. Developed in association with private plantation projects. Upgraded later
U6	Proposed upgrading of Guntong – Menalang Road	6	Little perceived benefit for development. May be justified if connects a lot of settlements.
U7	Proposed upgrading of Merindun Merio – Engkilili Road	13	Helps with connectivity. Open up new areas for agriculture.
U8	Proposed upgrading of Ulu Skrang Road	50	High. Important to improve connections in this area and open up for development.
U9	Proposed upgrading of Brayun – Long Round Road	5	Not required under SAMP. Council may want to do this one.
U10	Proposed upgrading of Melugu Scheme Road	5.3	Appears to be servicing existing scheme. Not included in SAMP
U11	Proposed upgrading of Jalan Sri Aman Access to dual carriageway	9	Reconsider in association with N1 to provide alternate access road to Simanggang (See spatial plan)

Reference	Description	Length (KM)	Comment / Priority
U12	Proposed upgrading of Melugu Dau – Batu Besai Panggau – Pakit Road	13	Not identified
U13	Proposed upgrading of Town Road	10	Not identified

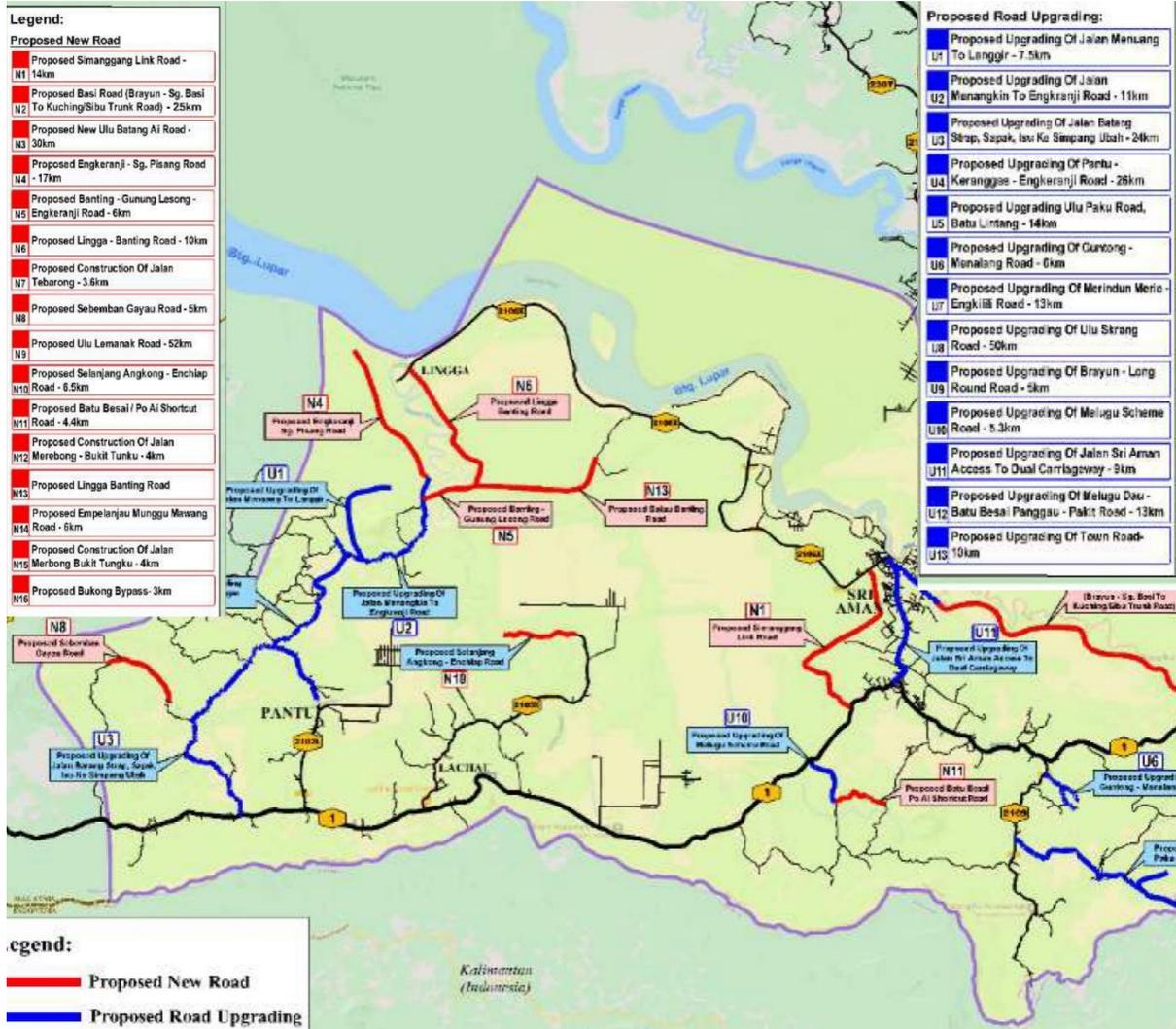


Figure 5-12: SADA Proposed Roads – Map 1

Source: Daya Rancang

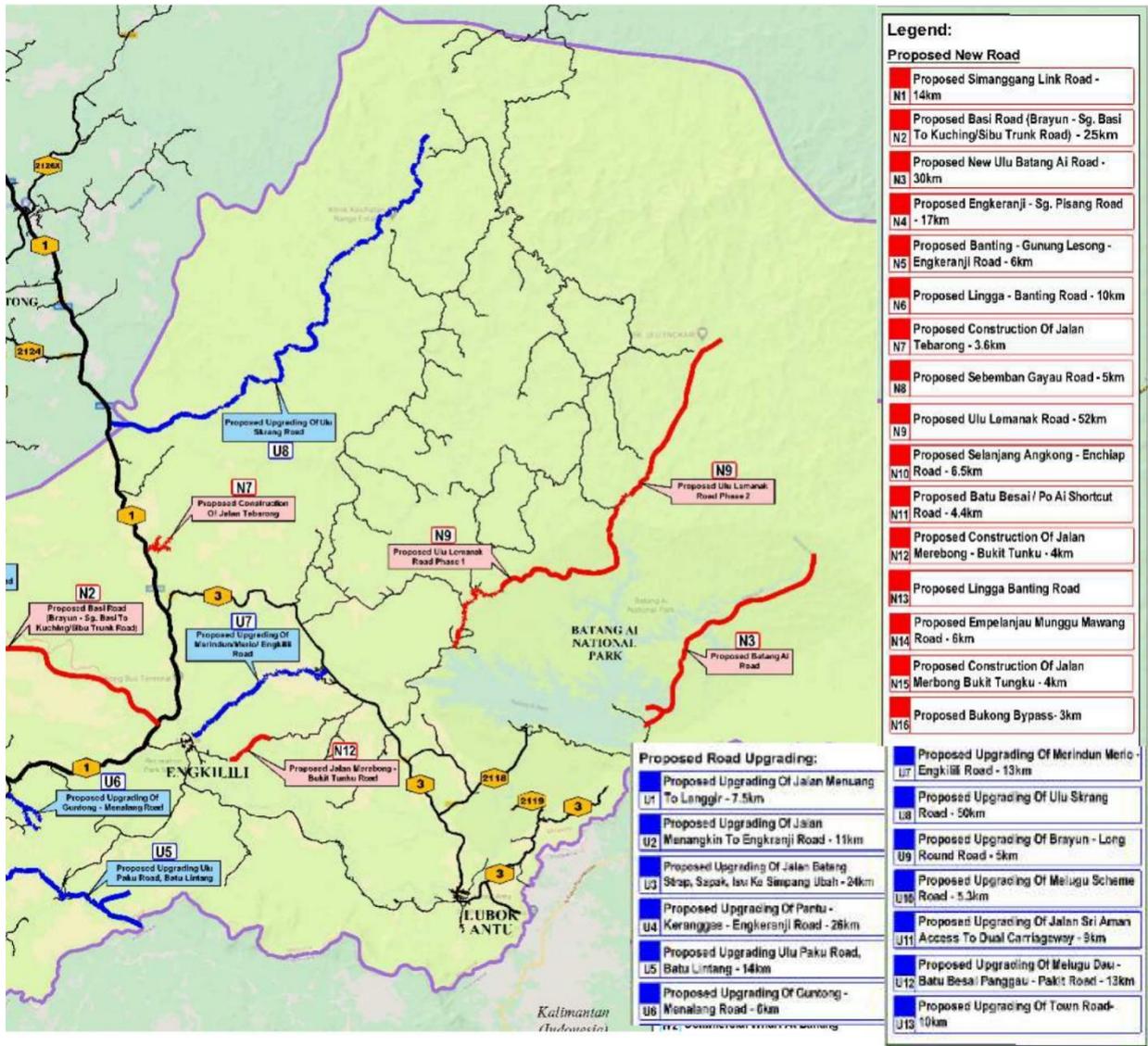


Figure 5-13: SADA Proposed Roads – Map 2

Source: Daya Rancang

5.6.2.2 New and Upgraded Road Network

The new and upgraded roads are designed to improve connectivity between settlements and to provide suitable access to/from development projects areas.

The road upgrades will allow heavier and more frequent freight loads to be accommodated.

The list of roads proposed for construction or upgrading is shown in Table 5-10. Refer to Map B-5 for the locations of these roads.

Table 5-10: SAMP Proposals for new roads and road upgrades

ROAD	DESCRIPTION	LENGTH (km)	CAPITAL COST
NEW ROADS			
RO-1	Simanggang Link Road	7	RM45,500,000
RO-2	Banting - Gunung Lesong - Engkeranji Road	6	RM54,000,000
RO-3	Lingga - Banting Road	10	RM75,500,000
RO-4	Batu Besai/ Po Ai Shortcut Road	4.4	RM29,000,000
RO-5	Jalan Merebong - Bukit Tungku Road	4	RM26,000,000
RO-6	Sebemban Gayau Road	5	RM32,500,000
RO-7	Access Road to New Aquaculture Site At Batang Ai	3	RM18,000,000
ROAD UPGRADES			
RO-8	Upgrading of Menangkin to Engkeranji Road	11	RM71,500,000
RO-9	Upgrading of Pantu - Keranggas - Engkeranji Road	26	RM169,000,000
RO-10	Upgrading of Ulu Skrang Road	50	RM331,000,000
RO-11	Upgrading of Jalan Akses Sri Aman to dual carriageway	9	RM82,500,000
RO-12	Upgrading of Merindun Merio - Engkilili Road	13	RM88,700,000
RO-13	Upgrading of Batang Strap, Sapak, Isu to Simpang Ubah Road	24	RM168,000,000
RO-14	Upgrading of Engkilili – Lubok Antu Road	30	RM160,000,000
TOTAL		202.4	RM1,351,200,000

5.6.2.3 Linking Pantu and Lingga to Create Tourism Circuit

New road projects linking Pantu and Lingga will create a ‘tourism loop’ that will encourage multiple day visits to the area, covering Pantu town, Gunung Lesong, Banting historical precinct, Lingga Town, Batang Lupar riverside road with outlooks to Pulau Seduku, visits to rural villages, and eventually to Simanggang Town.

The road projects that will be required to achieve this connectivity is shown in Figure 5-14.

Under SAMP there will be two new roads built to facilitate this (cross-reference to Figure 5-14 and Map B-5).

- Lingga - Banting Road (10km) [3]
- Banting - Gunung Lesong - Engkeranji Road (6km) [2]

There will also be upgrades to roads from Pantu to Banting

- Upgrading of Menangkin to Engkeranji Road (11km) [8]
- Upgrading of Pantu - Keranggas Road (26km) [9]

There are a number of communities in this area that have been poorly connected to their service towns of Pantu and Lingga. The upgraded roads will vastly improve their access options, particularly once a public transport system is available.

The roads will provide access to the Gunung Lesong National Park and make viable the proposed ecotourism projects proposed for there. It also provides access to Banting, previously relying on riverine access or difficult logging roads. Banting has some important historical and heritage features that will become available for the public to engage with.

By completing this link, it will be possible to introduce a public transport system that can efficiently service the main settlements on the Simanggang-Lingga-Pantu-Simanggang loop.

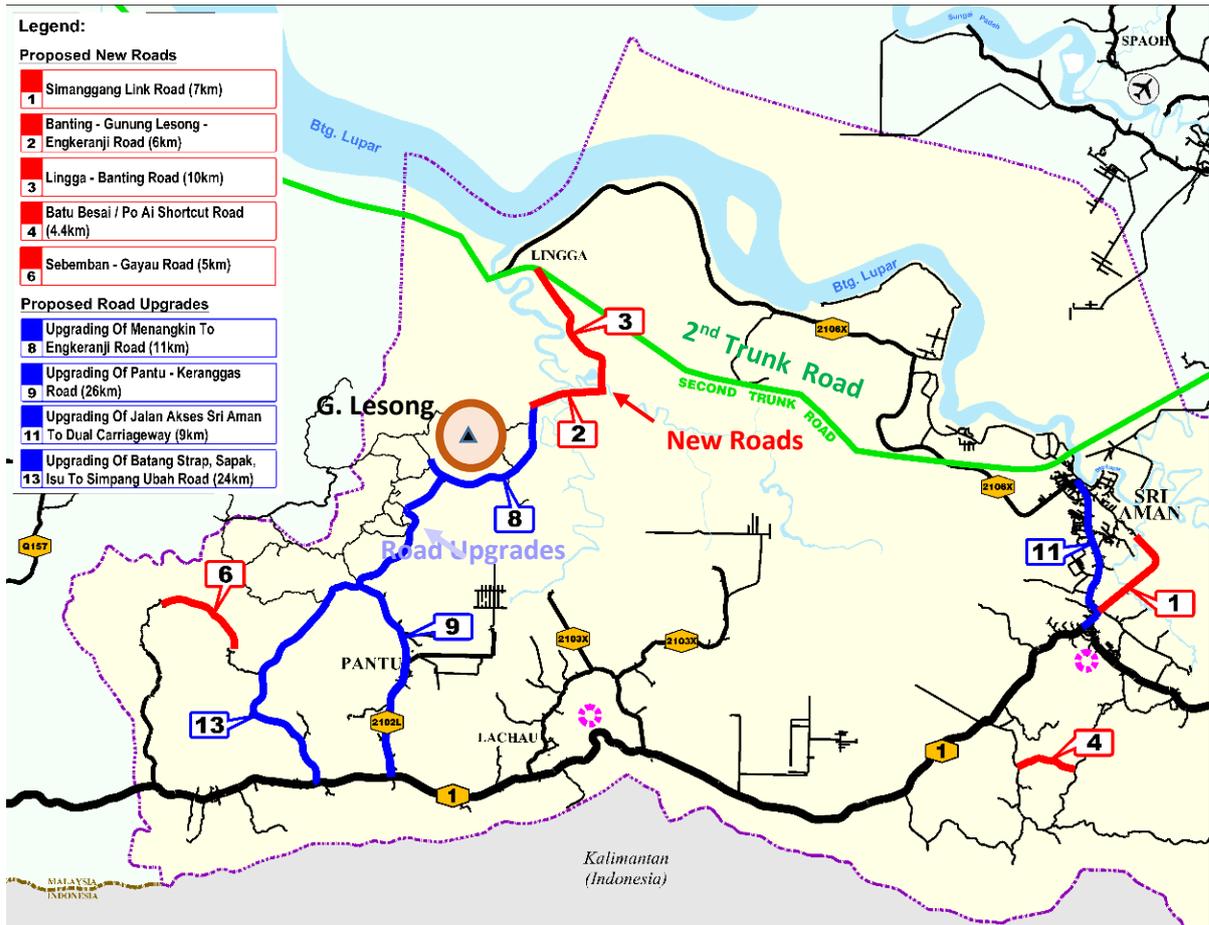


Figure 5-14: Proposed Road projects connecting Pantu and Lingga

(see Map B-5 in Map set for descriptions of road proposals)

Source: Daya Rancang

5.6.2.4 Public Transportation Expansion

The completion of new roads and upgrading of existing roads under the SAMP provides opportunities to implement a more efficient inter-town bus service that will be a key component for connecting communities with services and with other communities.

The SAMP proposes the establishment of three key public transport inter-town routes:

- The Simanggang – Lingga – Pantu – Lachau - Simanggang Route
- The Engkilili – Lubok Antu – Batang Ai – Engkilili Route
- The Simanggang – Temudok – Engkilili – Temudok – Simanggang Route

The project will use a number of buses operating each route in both directions on a fixed timetable. Formal bus stations will be provided at key towns, with bus stops installed at intermediate pick-up points.

A bus terminal and highway rest area will be provided at Lachau to complement the existing popular wayside stop there.

The bus system will allow persons in all the settlements serviced to access government and community services in the relevant town centres at affordable cost. It will provide the level of reliability that is needed by individuals in the settlements.

It will also reduce the reliance on individual motor vehicles, with benefits for the environment, reduced traffic congestion, etc.

The principal benefits are:

- Individuals will more easily be able to access medical, educational, sports, and community services
- People across communities will more easily be able to visit each other, enhancing communication and cohesiveness
- More people are able to participate in the life and activities across Sri Aman

The initial stages while the service is being established and the patronage is low will require some flexibility. During this initial period, we propose that arrangements be made with schools to provide school bus services that are timely, efficient and low cost. Outside of school hours these buses can be used to provide commuter services between towns in line with a fixed timetable.

The awareness program will involve progressive life style changes. These include: -

- a. Modernisation of public transport system that provide convenience, safety, comfort and reliable services.
- b. Digital information at all bus stations (schedule, ticketing, updates, etc.).
- c. User-friendly and interactive software application for information dissemination and interactions via mobile phone.
- d. Integrating the sub-urban and rural public transportation in the same application (apps).
- e. Stricter enforcement in safety measures, SOP and facilities.

The public transport routes are shown below with details provided in Volume C of this Report.

Simanggang – Lingga – Pantu – Lachau - Simanggang route



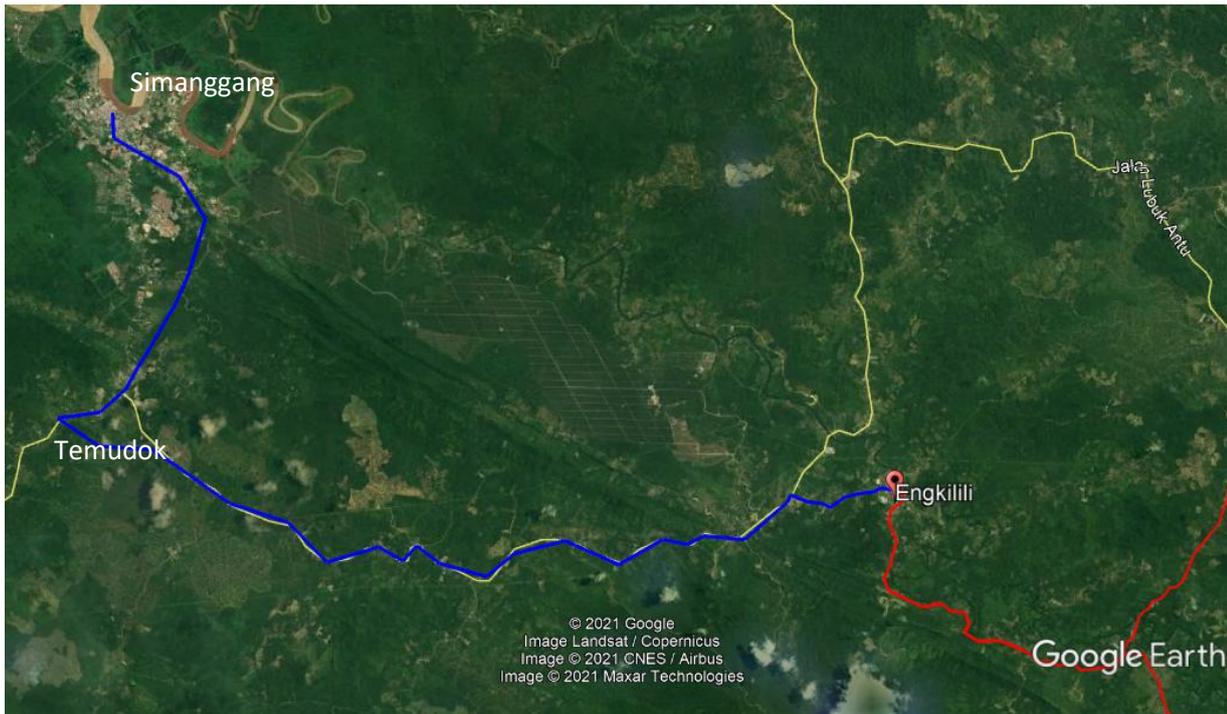
Source: Daya Rancang

Engkilili – Lubok Antu – Batang Ai – Engkilili Route



Source: Daya Rancang

Simanggang – Temudok – Engkilili – Temudok – Simanggang Route



Source: Daya Rancang

5.6.2.5 Air service to Batang Ai

The proposal to provide amphibious aircraft service to Batang Ai will likely enhance the accessibility for tourism activities. Additionally, it can provide efficient rescue and medical services to the remote upstream riverside settlements. At the initial stage, it is recommended that the amphibious aircraft service be operated as an additional service by existing chartered operator and/or resort operator.

A feasibility study will be required to determine viability, details, costs, and regulatory requirements.



Figure 5-15: Potential Lake Landing Site for Amphibious Aircraft at Batang Ai

Source: Daya Rancang

5.6.2.6 Water taxi service for Batang Ai

For areas with limited road connections, rivers form the main means of transportation. While there are a number of areas that currently fall into this category, the SAMP is proposing road connections to many of these communities (e.g. Banting, Ulu Skrang).

However, there are a number of settlements (23) upstream of the Batang Ai Dam, on the Sg Engkari and Batang Ai that are located in Totally Protected Areas, as shown in Figure 5-16. The SAMP recommends that these areas are not disturbed by road construction to conserve their important environmental assets.

The population involved is shown in Table 5-11. There are approximately 2,780 people in 442 doors across the 23 settlements.

Table 5-11: Longhouse Data within Batang Ai Catchment

No	Longhouse Name	Location	No. of doors	Population
1	Rh Nyindang ak Belayong	Ng Delok Ulu, Btg Ai	16	48
2	Rh George ak Maong	Tapang Pungga Ulu, Btg Ai	7	36
3	Rh Ninting ak Jantan	Ng Jambu, Ulu Sg Delok, Btg Ai	7	77
4	Rh Kawin @ Janggong ak Changging	Pala Taong Delok, Btg Ai	7	40
5	Rh Andah ak Lembang	Ng Sumpa, Delok, Btg Ai	26	240
6	Rh Griffin ak Adin	Jungin Ulu	10	60
7	Rh Kino ak Urek	Menyang Sedi	20	95
8	Rh Manggat ak Meringai	Menyang Taih	17	144
9	Rh Intang ak Kulak	Mengiling A, Sg Engkari	14	101
10	Rh Sabang ak Sang	Mengiling B, Sg Engkari	10	98
11	Rh Guyu ak Jarau	Ng Ukom, Sg Engkari	33	160
12	Rh David Ujan ak Gumbang	Ng Sepaya, Sg Engkari	57	316
13	Rh Wesley Bakak ak Mawang	Ng Stamang, Sg Engkari	41	213
14	Rh Liam ak Nyambang	Rantau Kemayau Manis, Sg Engkari	58	287
15	Rh Jaong ak Raba	Lbk Pantu, Sg Engkari	15	98
16	Rh Bada ak Chendai	Ng Talong Ulu, Sg Engkari	25	273
17	Rh Brown ak Jalak	Ng Setapang, Sg Engkari	17	114
18	Rh Sambau ak Chabi	Nanga Mengkak, Sg Engkari	39	239
19	Rh John ak Adok	Ng Tutong Ulu, Sg Engkari	9	58
20	Rh Patrick ak Bigot	Tanum Buai, Sg Engkari	5	18
21	Rh Pagang ak Janting	Lepong Mawang Ulu	10	62
22	Rh Tugong ak Nyelang	Lepong Bawang Ili	12	75
23	Rh David ak Grang	Ng Nyato	17	88
Total			442	2779

Source: Daya Rancang

- Navigation issues, especially associated with logjams in the River
- Navigation issues when the Lake level is low, limiting upstream travel
- Navigation during wet and stormy weather, including rough conditions on Lake
- Constraints on navigation (to not encroach on aquaculture, SEB exclusion areas)
- Embarkation facilities at settlements, schools, clinics, Especially suitability of jetties for safe access
- Standard of boats to be used as water taxis
 - Atap
 - Seating
 - Capacity
 - Minimum engine power
- Skills / licensing of Boatman

5.6.3 Summary of Transportation Projects

The budget costs for the transportation related projects proposed under SAMP are shown in Table 5-12.

Table 5-12: Summary of Transportation Projects and Costs

No.	Description	Est Budget	Timing
TR-1:	Proposed New Jetties on Batang Seterap, at Banting, Pantu & Engkeranji.	RM15,000,000	M-L
TR-2	Public Transport Network (Bus)	RM62,500,000	S-M
TR-3	Feasibility Study for Water Taxi service at Batang Ai	RM200,000*	S
TR-4:	Proposed New Jetties at Batang Ai	RM21,300,000	S-M
TR-5:	Proposed pedestrian network, cycle track and installation of smart centre using AI technology in Sri Aman.	RM5,000,000	M
RO-1 to RO-7	New Roads	RM280,500,000	S-L
RO-8 to RO-14	Road Upgrades	RM1,070,700,000	S-L
S5-7	Feasibility Study into amphibious plane service to Batang Ai	RM300,000*	S
TOTAL		RM1,455,000,000	

* Not included in Total as cost is counted under tourism projects

SECTION 5.7 INFRASTRUCTURE (DRAINAGE AND IRRIGATION)

5.7.1 Drainage and Flooding

There are a large number of drainage issues in the Sri Aman Division, covering serious flooding issues, minor flooding, local drainage problems, and road inundation affecting access.

The causes of these issues can vary and include:

- Drainage systems designed for the population when they were constructed are now under capacity due to growing development in the catchment.
- Build up of debris, vegetation, and rubbish in the drain system that reduces its effective capacity
- Buildings being constructed in flood prone areas, without appropriate design to manage inundation events (e.g., construction on stilts).
- Road culvert capacity is insufficient due to increasing runoff and/or culvert blockages
- Sedimentation in the downstream reaches of local river systems has reduced river capacity, leading to increased overbank flooding events.
- Coincidence of high flow events in the main rivers, with king tide events limits the ability of rivers to discharge and increases the potential for flooding.

The following key projects are intended to address these drainage issues.

5.7.1.1 Committed Projects

DID have a number of committed flood mitigation and drainage improvement projects, which are shown in Table 5-13 and Table 5-14.

Table 5-13. Committed Flood Mitigation Works

PROJECT	BUDGET
Flood Mitigation Kejamut Area	2,000,000
Flood Mitigation Works at SK Engkeranji, Lingga	3,500,000
Rancangan Tebatan Banjir (RTB) Di Bandar Simanggang, Bahagian Sri Aman, Sarawak	15,000,000
TOTAL	20,500,000

Table 5-14. Drainage Improvement Works

PROJECT	BUDGET
Drainage Improvement Works at Taman Tiara, Kampung Teratai, Kampung Ningkan and Jalan Brayun, Sri Aman Division	10,000,000
Drainage Improvement Works at Kampung Resak, Jalan Batang Lumar, Jalan Tawi Sli and Jalan Berjaya, Sri Aman Division	10,000,000
Cadangan Bina Baru Sistem Saliran Utama di Pekan Pantu, Bahagian Sri Aman, Sarawak	6,000,000
Drainage Improvement at Kampung Muhibbah dan RPR, Sri Aman, Sarawak	25,000,000
Drainage Improvement Works at RPR Engkilili	5,000,000
Drainage Improvement Works at Taman Gamang	3,500,000
Drainage Improvement at Pasir Panas, Sri Aman Division, Sarawak	4,000,000
Drainage Improvement at Taman Siang / Jalan Bayu, Sri Aman, Sarawak	3,000,000
Drainage Improvement Works at Jalan Kejatau	10,000,000
Cadangan Bina Baru Sistem Saliran Utama di Sinyor, Bahagian Sri Aman, Sarawak	4,500,000
Drainage Improvement at Jalan Kejatau - Limu	500,000
TOTAL	81,500,000

5.7.1.2 SW-1 Drainage Works for Areas subject to flooding problems

Drainage issues vary from major to minor. It is clear from the socio-economic study, that, for the most part, flooding contributes to personal and community inconvenience and nuisance, together with relatively minor financial impacts, rather than having a large financial impact. It may well be that the community has adapted to periodic flood events and is able to minimise their financial exposure. Nevertheless, there would be a very significant benefit in addressing these issues.

While the committed projects will address a number of these areas, there remain a number of sites that will still be potentially affected. We propose that these remaining areas be investigated, and mitigation strategies devised with a view to implementing appropriate works.

This will require a review of known drainage issue sites, including a site visit to each. From this a priority list of drainage remediation projects is to be developed. They are then to be implemented in accordance with their position on the priority list. The number of projects to be completed will be limited to those that can be covered by the proposed budget.

5.7.1.3 SW-2 Road Culvert Upgrades

Flooding of roads can have serious implications for access to services and medical evacuations, in addition to the isolation of communities. This project proposes to undertake a desktop assessment of road culverts in the division, and develop a priority list for culvert upgrades. Higher priority sites will have culverts upgraded or replaced, with the number of culverts being in accordance with the capacity of the budget provided.

5.7.2 Riverbank erosion

Riverbank erosion can have a devastating impact on floodplain farms, adjacent infrastructure, and residential and commercial buildings.

Riverbank erosion has a number of causes:

- Removal of vegetation along the riparian zone of the river. Without the actively developing root systems of these vegetation communities, riverbank soils are much more prone to erosive forces
- Rapid changes in water level in rivers, during and following flood events, or tidal fluctuations, can lead to collapse of saturated soils on the bank, resulting in large scale landslips.
- Increased wave action from riverine vessels or even from weather events, can lead to bank erosion
- Changes to bank and bed conditions through dredging or sand harvesting can lead to bank slips where the toe of the bank is undermined

To some degree riverbank erosion is a natural process, whereby sediment is supplied to the river system and carried downstream to the coast, where it replenishes beaches, feeds mangrove systems, etc. However, the rate of erosion is exacerbated by the increasing development along riverbanks, and the activities that take place on rivers (motorized vessels, dredging, etc.). Also, the location of infrastructure and assets near riverbanks means that the impact of riverbank erosion is now much greater.

Addressing and/or preventing riverbank erosion can be a very expensive exercise. It also requires a comprehensive understanding of the fluvial processes that underlie the erosion. It is not uncommon for erosion problems to be addressed with expensive protection works at one location to then be found to occur anew at another location a short distance downstream.

5.7.2.1 Committed Projects

DID have a number of committed flood mitigation projects, which are shown in Table 5-15.

Table 5-15. Riverbank Protection Works Projects

PROJECT	BUDGET
Riverbank Protection Works at Batang Lupar, Sri Aman Division, Sarawak	60,000,000
Riverbank Protection at Bakong Area	90,000,000
Riverbank Protection Works at Batang Lingga, Bahagian Sri Aman, Sarawak	60,000,000
Riverbank Protection works at Pasir Panas	30,000,000
Riverbank Protection Works at Banting, Sri Aman, Sarawak	4,000,000
Riverbank Protection Works from Kpg Hulu Lingga to Tanjung Jaya	45,000,000
Riverbank Protection Works from Kampung Hilir Lingga to Sg. Pendam Batu	15,000,000
TOTAL	304,000,000

The following additional project is proposed for Sri Aman:

5.7.2.2 *RB-1 Riverbank Protection Works for High Priority Areas*

The riverbank erosion works are focused on the downstream Batang Lupar, from Simanggang down to Lingga. We suggest that there are a number of other sites within Sri Aman Division that are affected by riverbank erosion, where protection works will be appropriate.

Riverbank erosion sites that are outside the current committed projects are to be inspected by a team including a geomorphologist and river engineer to determine the mechanisms behind the erosion and establish a list of high priority sites. Appropriate protection designs will be developed and projects will be implemented in accordance with the priority ranking and up to the limit of the budget allowed.

5.7.3 Irrigation

There are a number of agricultural projects proposed under SAMP that will benefit from an irrigation system. It is proposed to expand the areas of rice paddy which requires flood irrigation for high levels of production. Further, it is proposed to double crop this padi each year. This means that water for flooding the padi must be available 'on-call' and not subject to the vagaries of the weather.

Further, there are a range of specialized crops that will also benefit from controlled irrigation. This includes crops to be grown in the proposed agrotech parks.

Two irrigation projects are proposed, although each may be implemented at multiple sites.

5.7.3.1 *IR-1 Flood Irrigation for Padi Projects*

This will involve the construction of irrigation channels, together with control systems and pumps, to deliver water to padi farms for flood irrigation. Implementation of the Granary project is already well advanced, while the Pantu Paddy project is a new proposal.

Proposed Paddy Scheme in Pantu Region

A preliminary assessment of the requirements for the Paddy project in Pantu region is provided hereunder.

Irrigation Requirement:

Two crops per year x 100 day growth cycle.

Area = 6,000 Ha

Irrigation water Requirement = 1 metre per crop

= 60,000,000 m³ per crop (for 6,000 Ha)

= 60,000 ML x 2 crops = 120,000 ML/year

Rainfall

Average 0.2 m to 0.4 m depending on season

Thus, irrigation demand = $(120,000 \times (1 - 0.2) \text{ ML/yr}) / 200 \text{ days} = 480 \text{ ML/day}$

Possible Irrigation configuration

- 5 pump points from local rivers/waterways, each approximately 100 ML/d
- Two delivery channels from each pump point, each 50 ML/d (0.6 cumecs). 0.6 m dia pipe would suffice, or equivalent open channel.
- 10 storage reservoirs, each approximately 50 ML (160 m x 160 m x 2 m deep)
- Pump from storages to farm supply channels.
- Farm supply channels @ 30 m / Ha = 180 km

Pump Points

A critical aspect of irrigation design is establishing that a reliable water source is available. By nominating 5 independent water source points, the risk associated with having insufficient supply is reduced. Each source would need to have capacity to supply 100 ML/d (1.15 m³/s).

Some possible pump points to be investigated are provided in Figure 5-17. These are located on waterways that have significant upstream catchments, so the supply is expected to be adequate in non-drought conditions.



Source: Daya Rancang



Figure 5-17. Possible pump points for Pantu Paddy Irrigation Scheme

Source: Daya Rancang

5.7.3.2 IR-2 Storage Pond and Feeder Mains for Non-Padi Projects

This project provides suitable storage ponds and feeder mains to specialised agriculture projects for drip or sprinkler irrigation.

5.7.4 Summary of Drainage, Irrigation and Erosion Projects

Table 5-16 is a summary of the projects proposed under SAMP. These are in addition to the current projects that DID have as committed projects at present.

Table 5-16: Summary of Drainage Irrigation and Erosion Projects

Project Title	Project Components	Linked Projects	Estimated Costs
SW-1 Drainage Works for Areas subject to flooding problems	Identify priority sites	SW-2, SW-3	RM25,000,000
	Design mitigation works		
	Implement designs		
SW-2 Road Culvert Upgrades	Identify priority sites	SW-1, SW-3	RM50,000,000
	Design mitigation works		
	Implement designs		
RB-1 Riverbank Protection Works for High Priority Areas	Identify priority sites	-	RM50,000,000
	Design mitigation works		
	Implement designs		
IR-1 Flood Irrigation for Padi Projects	Design and construction of irrigation channels	AG-1 Batang Lupar Paddy Granary	Already allocated
		AG-2 Pantu Specialty Rice Project	RM150,000,000
IR-2 Storage pond and feeder mains for non-Padi Projects	Storage ponds	AG-3 (Pineapple) in Pantu area	RM1,500,000
	Feeder mains	AG-8 (Sweet Corn) in Simanggang	RM1,500,000
	Drip or sprinkler irrigation	AG-10 Agrotechnology Park in Lachau	RM1,500,000
	Pumps	AG-10 Agrotechnology Park in Temudok	RM1,500,000
		Total	RM281 million

SECTION 5.8 UTILITIES (COMMUNICATIONS)

The proposed telecommunications projects have the following objectives:

- To increase the exchange centre capacity based on future developments and population increase
- To ensure blanket coverage of Sri Aman with 4G wireless network coverage
- To require that all future greenfield sites have fibre optic cable installed.

It is critically important to construct the proposed telecommunication tower(s) and provide remote areas wireless/cellular infrastructure. This will enable the promotion of IT knowledge, in line with the national vision to provide 100% telecommunication coverage nationwide including the Sri Aman Division, which is consistent under the Malaysia Communication and Multimedia Commission.

A number of SAMP projects are dependent on this – in particular the adoption of SMART farming approaches in agriculture and aquaculture, as well as the digital business models being adopted.

The over-riding strategy in Sri Aman is to connect people and communities with services and markets, no matter where they live. Sri Aman can only develop fully once it has adopted the digital economy. The key to this is providing blanket wireless access for mobile phones and internet.

5.8.1 Wireless Coverage

Use of wireless telecommunication systems are the key to development in the rural areas of Sri Aman. This will facilitate a rapid shift to a digital economy.

We recommend the roll out of 4G technology as being the most appropriate for the Division at this time. (5G coverage is only about 1/20th of 4G and thus is really only suited to high density population centres).

The planned rollout of new telecommunication towers is a critical component and it is important that this has a very high priority for implementation in this region. We fully support the Government initiative to install an additional 85 towers across the division.

We also support the Government initiative to set up a government-owned company as a telecommunications service provider, especially if the various licensed wireless telecommunication companies indicate unwillingness to utilise this infrastructure.

5.8.2 Committed Plans

There is a total of 131 new towers to be installed under committed plans by the Government. These come under the following programs:

- | | | |
|---------------------|---|-----------|
| 1. Jendela | - | 45 Towers |
| 2. Smart300 Phase 1 | - | 77 Towers |
| 3. Smart300 Phase 2 | - | 19 Towers |

Figure 5-18 shows the coverage provided by the proposed 131 telecommunication towers together with the existing towers within the Sri Aman division. The proposed telecommunication towers will enable better internet and IoTs coverage for the people in the Sri Aman division.

The coverage from the existing and proposed towers assumes that each tower can provide coverage for a radius of 12 km. While topography may interfere with this coverage it can be considered a fairly conservative estimate for 4G coverage.

The result of the mapping indicates that fairly blanket coverage of the Sri Aman Division can be achieved.

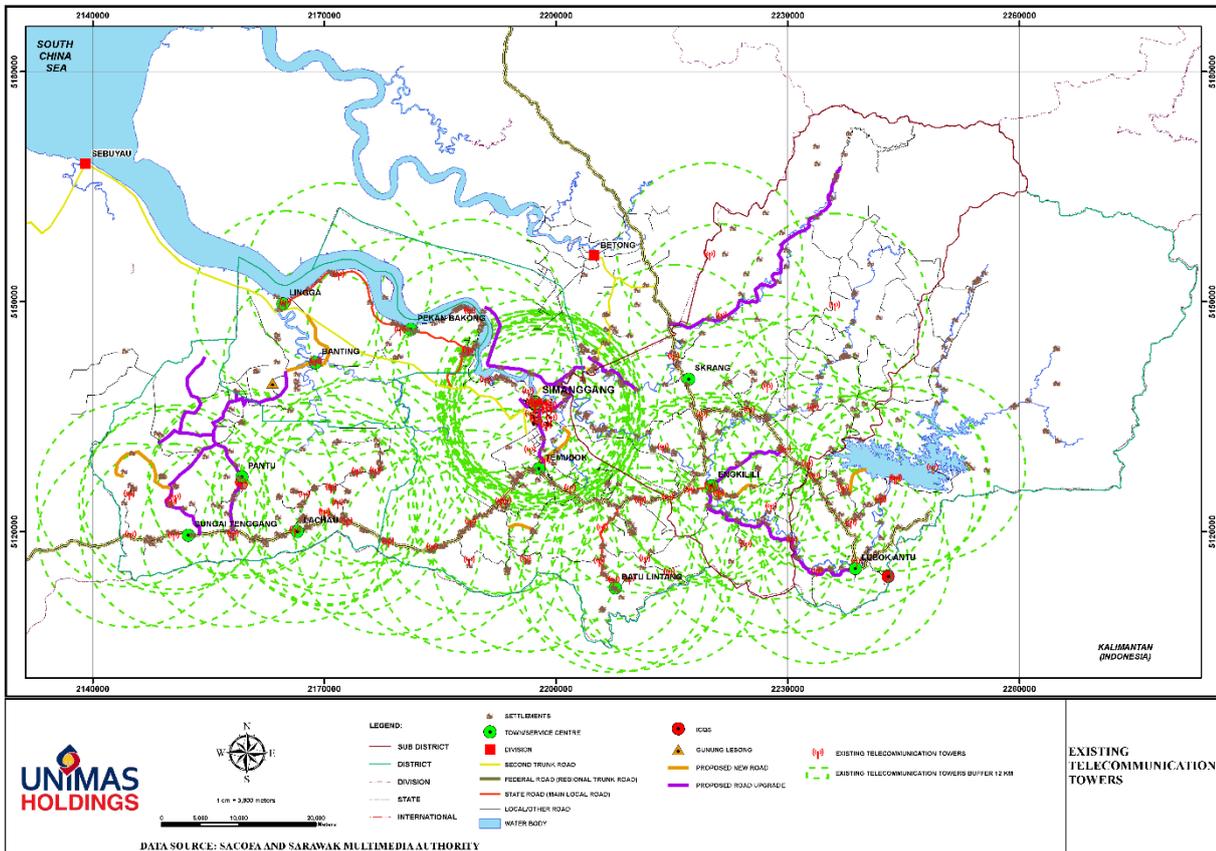


Figure 5-18: Telecommunication tower coverage following committed project implementation

Source: Sacofa and Sarawak Multimedia Authority

5.8.3 Additional Towers

We have recommended the installation of an additional tower at Batang Ai Lake to service the proposed aquaculture landing and biosecurity complex there.

The Field Research Centre at Batang Ai National Park will also require a communication tower. This one will need to be powered by a local generator.

5.8.4 Upgrade Exchanges in Simanggang and Temudok

While we are not aware of capacity issues in these locations, we do expect that demand will increase dramatically as a result of the projects implemented under the Masterplan. In particular Temudok will go from a minor demand centre to a major one.

The capacities of the exchanges that service these areas should be reviewed and upgraded in anticipation of forecast demand.

5.8.5 Summary of Telecommunication projects

Table 5-17: Summary of Committed Telecommunications Projects

Project Title	Project Components	Linked Projects	Estimated Costs
TC-1 Installation of 86 new towers across Sri Aman Division under SMART 300 Rollout	New mobile phone / internet towers	-	RM78,000,000
TC-2 Installation of 45 Towers under JENDELA Rollout	New mobile phone / internet towers		RM50,000,000
TC-3 Installation of 20 VSAT units across Sri Aman Division	VSAT towers	TC-1	RM15,000,000
TC-4 Upgrade Telecom exchanges in Simanggang and Temudok		-	RM30,000,000
		Total	RM173 million

Source: Sacofa and Sarawak Multimedia Authority

Table 5-18: Summary of Telecommunications Projects under SAMP

Project Title	Project Components	Linked Projects	Estimated Costs
TC-5 Establish State Government owned digital services provider	Set Up New Government Business	TC-1, TC-2, TC-5, TC-6, TC-7	
TC-6 Installation of 1 new tower for proposed Research Centre at Batang Ai NP	New mobile phone / internet tower	S1-4	RM1,200,000
TC-7 Installation of 1 new tower for proposed Aquaculture Complex at Batang Ai Lake	New mobile phone / internet tower	AQ-1	RM1,000,000
		Total	RM2.2 million

Source: Sacofa and Sarawak Multimedia Authority

SECTION 5.9 UTILITIES (ELECTRICITY)

Sarawak Energy Berhad (SEB) operates the Batang Ai Hydro Electric power station in Lubok Antu District. This provides a significant proportion of the power that is fed into the state-wide grid. SEB has a number of planned projects that will help to stabilise the electricity network and cater for increasing demand, particularly in the urban areas.

A summary of SEB planned projects is provided in Table 5-19.

Table 5-19: Summary of Proposed SEB Projects in Sri Aman

Project Title	Project Components	Linked Projects	Estimated Costs
EL-1 Serudit to Sri Aman 132kV Transmission Line	Transmission towers, HV line	EL-3	RM90,000,000
EL-2 33kV overhead line from Lachau EHV Substation to Temudok 33/11kV transformer station	Transmission towers / poles	-	RM6,000,000
EL-3 Simanggang 132/33kV Substation	Substation	EL-1	RM100,000,000
EL-4 Simanggang B 33/11kV Substation	Substation	EL-3	RM25,000,000
EL-5 Ng Kesit Substation	Substation	-	RM15,000,000
EL-6 Second EHV 275/33kV transformer at Lachau	Transformer	EL-2	RM20,000,000
EL-7 Upgrading of Simanggang Sub transformer	Transformer works	-	RM3,800,000
EL-8 Double circuit from Simanggang EHV to Simanggang Sub station	Power lines	-	RM25,000,000
EL-9 33kV Covered Conductor line to Banting and new 33kV Substation at Banting	Power lines, Substation	-	RM40,000,000
		Total	RM324.8 Million

Source: SEB

5.9.1 Power Demand from SAMP Projects

We have estimated the power demand from major SAMP projects that will need to be supplied from the existing network. These are summarised in Table 5-20. Based on this data SEB can assess if any additional system upgrades will be required to meet these demands.

Table 5-20: Power Requirements for SAMP Projects

Project Title	Power (mw)	Linked Projects	District	Location
Aquaculture Landing Area - Batang Ai	3.5	AQ-1	Lubok Antu	Batang Ai
Crocodile Farm in Simanggang	1.8	AQ-3	Sri Aman	Simanggang
Aquaculture for marine fish in Lingga	1.2	AQ-4	Lingga	Lingga
Fish hatchery, Temudok	1.9	AQ-5	Sri Aman	Temudok
Recycling Industry Park	17.1	WM-10	Sri Aman	Kpg Selepong Berangan
CPPC Lachau	10	AG-14	Pantu	Lachau
CPPC Temudok	10	AG-14	Sri Aman	Temudok
Temudok Industrial Park (200 Ha)	100		Sri Aman	Temudok
Agrotech Park Lachau	3	AG-10	Pantu	Lachau
Agrotech Park Temudok	3	AG-10	Sri Aman	Temudok
TOTAL	151.5			

Source: SEB and UNIMAS Analysis

SECTION 5.10 UTILITIES (WATER SUPPLY)

5.10.1 JBALB Projects

JBALB is planning and working towards provision of clean, potable water to all settlements in Sri Aman. It has an extensive mains water supply system that covers most of the Division. This is supplemented by the Sarawak Alternative Water Supply (SAWAS) scheme that provides local water supply to remote villages that are outside the practical reach of the mains network.

5.10.1.1.1 Current Projects

JBALB has identified a number of projects that are aimed at improving the security of supply by upgrading treatment plant capacity, interlinking pipe networks, and improving water source capacity. It also continues to expand the reach of the SAWAS projects. A summary of the projects currently proposed by JBALB in Sri Aman is shown in Figure 5-19, Figure 5-20, and in Table 5-21.

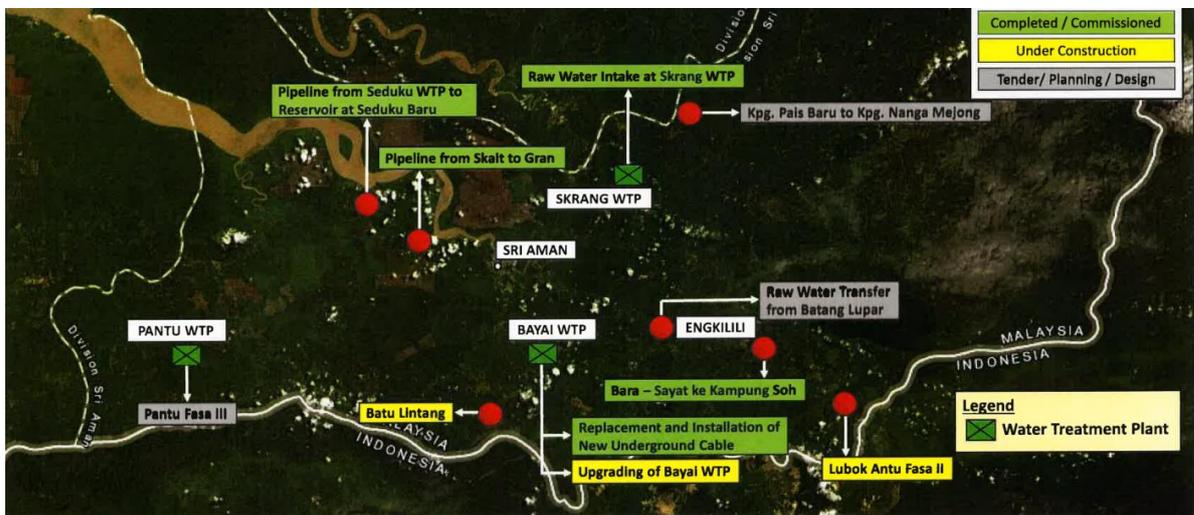


Figure 5-19. JBALB Approved Water Supply Projects in Sri Aman

Source: JBALB Sri Aman

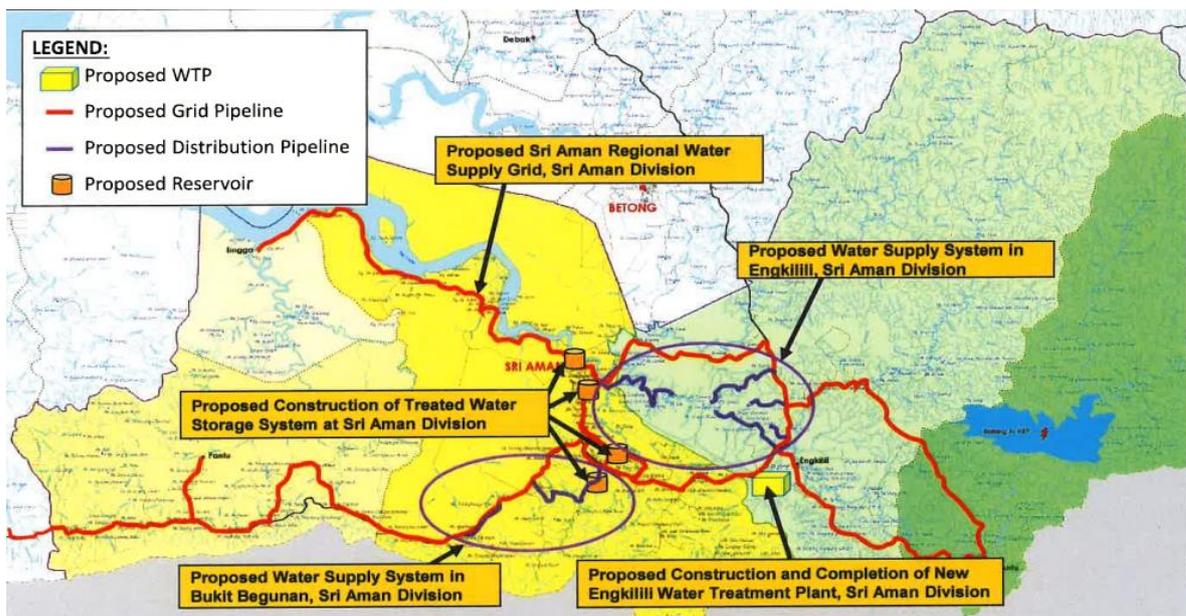


Figure 5-20. Proposed Water Supply Projects under 12MP in Sri Aman

Source: JBALB Sri Aman

5.10.1.1.2 Bayai Water Treatment Plant

JBALB is currently undertaking work to increase the capacity of Bayai Treatment Plant from 33MLD to 53.3MLD. This work is nearing completion. The Undup water resource will be supplemented by a new pipeline being installed from a new intake on the Batang Lupar (between Lubok Antu & Engkilili) to transfer water to the Bayai Water Treatment Plant.

5.10.1.1.3 Other JBALB Projects

Table 5-21: JBALB Proposed Projects in Sri Aman.

Project Title	Project Components	Linked Projects	Estimated Costs
Bayai WTP upgrade and water transfer pipeline (currently under implementation)	WTP upgrade to 53.3 ML/d		RM161,500,000
	New intake on Btg Lupar		
	Transfer Pipeline		
WS-1 New 75 MLD Engkilili Water Treatment Plant	Pumps	WS-5	RM220,000,000
	Treatment systems		
	Ponds		
	Office & Admin		
	Pipes, etc.		
WS-2 Treated Water Storage System SMK Simanggang, and Simpang Kiassan	Storage tank and storage pond	-	RM30,000,000
WS-3 Sri Aman Regional Water Supply Grid	Pipe mains interconnected	-	RM500,000,000
WS-4 Water Supply System in Bukit Begunan	Extend water mains to settlements	-	RM50,000,000
WS-5 Water Supply System in Engkilili	Extend water mains to settlements	WS-1	RM70,000,000
WS-6 Rural Water Supply Project for Pantu Area (Phase III)	Upgrade WTP to 5.3 ML/d	EL-2	RM120,000,000
	Install 6 x High level water tanks		
	^ booster pumps		
	140 km of water reticulation pipes		
WS-7 SAWAS) for rural/remote parts of Lubok Antu, Skrang, Lingga and Pantu	RC dam on waterway	-	RM152,000,000
	Storage tanks		
	Treatment if required		
	Reticulation piping		
		Total	RM1,282 million

Source: JBALB Sri Aman

5.10.1.1.4 Water Grid Extension Proposed Under SAMP

In addition to the JBALB planned projects SAMP is proposing that JBALB consider extending the water grid connection from Pantu to Lingga once the new roads between these two towns are completed. This pipeline connection will add a lot of resilience to the water grid. It has not been a practical option up till now as there is currently no road connection through this area. However, the SAMP will construct a number of new roads and upgrade others so that transportation from Pantu to Lingga will be easily achieved. In these circumstances it will be feasible to install a pipeline along the road alignment. Total pipeline length would be approximately 50 km.

Based on indicative costings used in the *Sarawak Water Supply Master Plan and Water Grid DFR (Dec 2019)*, unit cost for this connecting pipeline would be RM1.3 million / km for a 600 mm pipeline. For 50 km this is a capital cost of RM65 million (Table 5-22).

Table 5-22: SAMP Proposed Projects in Sri Aman.

Project Title	Project Components	Linked Projects	Estimated Costs
WS-2 Water Grid Pipeline extension from Pantu to Lingga	600 mm pipeline (50 km)	-	RM65,000,000

Source: Daya Rancang

5.10.2 Water Demand from SAMP Projects

JBALB planning does not include the projects being proposed under SAMP. It is important that JBALB has an understanding of significant additional water demands that will be associated with any of the SAMP projects. Table 5-23 summarises the water demands from such projects. Note that projects with small – medium water requirements are not included as these will not impose an undue strain on the mains system. Also, there are a number of the projects that have significant water demand but which do not rely on JBALB supply; e.g., irrigation projects.

JBALB may consider enhancing supply in some areas after assessing these requirements to be in excess of system capacity.

Table 5-23: Water Supply Demand Estimates from Major SAMP Projects

PROJECT	M ³ /d
Water supply for Recycling Industry Park	1000
Water supply for CPPC Lachau	1000
Water supply for CPPC Temudok	1000
Water Supply for Temudok Industrial Park (200 Ha)	8000
Water supply for Agrotech Park Lachau	100
Water Supply for Agrotech Park Temudok	100
	11200

Source: Daya Rancang

SECTION 5.11 WASTE MANAGEMENT (SOLID AND LIQUID WASTE)

5.11.1 Solid Waste Management

Strategies to manage the collection and disposal of solid waste in Sri Aman cover several themes:

- Increase collection coverage
- Improve / upgrade existing landfill sites
- Establish new landfill site to meet high sanitary standards and current best practice
- Reduce waste in the community
- Improve waste management in remote settlements
- Establish a viable recycling industry

5.11.1.1 Meeting the challenges of Solid Waste Management

It is incumbent on waste managers to adopt the waste hierarchy of **Reduce, Reuse, Recycle**, before consigning waste to disposal.

Reduce

Reduce is an important strategy and is very much in the domain of Local Government. To implement this consumer must be provided with information and incentives to reduce the generation of waste. The problem is frequently generated at the manufacturing and packaging level, however and this is where the greatest achievements are likely to be made.

Reuse

Reuse requires social and community infrastructure that encourages the secondhand goods economy. There are some community and social barriers that may need to be broken down to achieve this.

Recycle

Recycle is a key initiative in waste reduction. It can turn waste materials into useful and valuable products, both saving landfill space, and reducing the need to extract more natural minerals.

Strategies aimed at reduce and reuse are highly encouraged, but are beyond the scope of this Study. However, this study does incorporate an important strategy to promote waste recycling; a strategy that will stretch beyond Sri Aman Division and be of benefit to the whole of the southern part of Sarawak.

Disposal

Even with disposal of wastes there are opportunities to minimise impacts while increasing benefits.

Incineration

Using suitable materials as fuel in high temperature incinerators can be effective, as well as having the potential to generate power to feed into the grid. Consideration must be given, however, to the generation of air pollutants from this process (especially NO_x and SO_x and particulates).

Gas generation

Organic wastes, in particular, are very prone to produce methane in their decomposition process. The methane can be a major problem in the management of landfills. However, if a collection system is

incorporated, the methane can be drained off and used for power generation that can be fed into the power grid.

5.11.1.2 Solid Waste Management Strategy in Sri Aman

The Study on Integrated Solid Waste Management in Sarawak (May 2019) investigated a number of options for managing waste in Sarawak. These strategies included:

- (i) Sanitary Landfill with Recycling /Gas Recovery
- (ii) Organic Waste Biogas Plant (AD)
- (iii) Recycling
- (iv) Composting
- (v) Waste to Energy Plant (Suitable for major cities)
- (vi) Biodry – RDF Fuel for Cement Kiln (CMS) (Proposed for Kuching only)

Strategies (i) to (iv) have potential for Sri Aman. However, the biogas plant will require the separation and separate collection of organic (food) waste. While it is proposed in this section that such initiatives be implemented at locations such as markets and major towns, it is expected that it will be many years before it is feasible to collect sufficient organic waste to provide a constant, reliable feed to a biogas Plant.

Thus, the strategy in Sri Aman is focused around (i), (iii), and (iv) above.

5.11.1.3 Proposed Projects

The long-term strategy for solid waste is to establish a sanitary landfill at Lubok Antu and at Simanggang to service the whole Division. Once established the existing dumps sites at Pantu, Lingga, Engkilili, and Entulang will be closed down and rehabilitated. These sites will incorporate a waste transfer station to deliver waste to Lubok Antu sanitary landfill.

The sanitary landfill at Lubok Antu, and the future one at Simanggang should be designed to incorporate a leachate collection system, as well as a methane collection system.

A waste recycling center is proposed for Sri Aman that will also service the surrounding Divisions. This is covered in some detail later in this section.

Green, vegetative waste can be separated at the CAS sites or the IWF facilities, so that vegetative waste can be composted and reused for parks and gardens.

The new sanitary landfills will be known as Integrated Waste Facilities (IWF). They will incorporate leachate collection and treatment, gas collection, waste segregation, including separation of recyclables.

The IWF at Lubok Antu is to be established initially. The new IWF at Sri Aman will be established beyond the timeframe of the SAMP, most likely in the next decade.

Incinerators are also being considered for some of the existing sites, but no decisions on these have been made to date.

Table 5-24 provides a summary of the solid waste management projects for Sri Aman.

Table 5-24: Summary - Solid Waste Management Projects

Project Title	Project Components	Linked Projects	Estimated Costs	Agencies	Time Frame
WM-1 Upgrading of existing dumpsites/landfills at Entulang, Lingga, Pantu, Engkilili	Temporary upgrade	WM-2	RM4,000,000	Councils	S
	Closure in 2026 and Rehabilitation		RM12,500,000		
WM-2 Expand and upgrade the Lubok Antu site to a Level 4 Sanitary Landfill	Leachate collection & treatment	-	RM12,500,000	MDLA	M
	Gas collection				
	Waste segregation				
	Recycled Waste Transfer Station				
WM-3 Waste Transfer Stations to be established at Entulang, Pantu, Lingga, Engkilili,	Close ex landfills and create new Waste Transfer Stations	WM-2	RM12,500,000	Councils	M
WM-4 Extend solid waste collection services to more rural areas	Annual cost	-	RM1,500,000	Councils	S-L
WM-5 Waste segregation and Scheduled collection for HH bulky, green and recyclables	Investigative study	WM-10	RM750,000		S
WM-6 Set-up of Civic Amenity Sites (CAS)		WM-10	Incl in WM-3	Councils	M
WM-7 Composting plant/Green centres for food waste at commercial premises		-	RM5,000,000	Councils	S-M
WM-8 Public awareness on waste minimization, recycling, and composting		WM-10	-	Councils	S-L
WM-9 Waste management in Remote communities	Design and Construction for 23 longhouses	-	RM690,000	MDLA	S-L
	Maintenance (Annual)		RM345,000		
Total (Capital)			RM48 Million		
Total (Maintenance)			RM1.85 million		

Source: Sri Aman District Council and Lubok Antu District Council

5.11.2 Liquid Waste Management

There is no centralised sewerage collection and treatment system in Simanggang or in other settlements in Sri Aman. Generally domestic liquid waste is passed through a septic tank system (individual or communal) before discharging to the stormwater drains, and thence to the local rivers. At this stage there are no plans to introduce a sewage collection system and treatment plant for Sri Aman. However, the SAMP has a number of recommendations with respect to the management of liquid wastes in the Division.

- Localised sewage treatment plants Commercial and institutional establishments
- Industrial effluent treatment systems for industrial premises
- Establish downstream treatment for remote communities

5.11.2.1 LW-1 Localised Sewage Treatment Plants

Commercial and institutional establishments such as hotels, resorts, large eateries, schools, learning centres, army camps, police station should be equipped with sewage treatment infrastructure such as

packaged plants. Sewerage design is to comply with the Sarawak Urban Sewerage Systems Guidelines and the Malaysian Sewerage Industry Guidelines. This approach could also be adopted for larger scale greenfields residential developments.

5.11.2.2 LW-2 Industrial Effluent Treatment Systems

Industrial premises are to design an industrial effluent treatment system as per the Environmental Quality (Industrial Effluent) Regulations, 2009. New sources of industrial effluent must be notified to the Department of Environment. The discharge of industrial effluent must comply to the Environmental Quality (Industrial Effluent) Regulations, 2009.

Furthermore, a downstream effluent treatment system for an industrial park such as a centralised industrial effluent treatment can be proposed if necessary. For premises that process oil-palm fruit or oil palm fresh fruit bunches into crude palm oil whether as intermediate or final product, they wastewater must meet the Environmental Quality (Prescribed Premise) (Crude Palm Oil) Regulations, 1977.

These proposals will be incorporated into the industry projects in this Master Plan (e.g. the CPPC and FPPC)

5.11.2.3 LW-3 Establish Downstream Treatment for Remote Communities

Many remote communities are provided with communal septic tank facilities. However, the maintenance of these is not practical and most are operating inefficiently as a result of lack of desludging.

Water polluted by sewage, if inadequately treated, represents a potential health issue for anyone who ingests the water or, in extreme cases, even comes in contact with it. At current levels there are risks associated with swimming, bathing, washing, drinking the river water downstream of settlements.

It is also likely that local communities are not trained in the management and maintenance of the systems, and the hazards associated with systems that work inefficiently.

We propose that these facilities be provided with simple sand filters or septic tank effluent holding ponds planted with water plants. These can provide further treatment of sewage effluent before discharging to the waterway.

5.11.3 Recycling

The recycling industry is in its infancy in Sarawak, but has incredible potential to grow and be very profitable, both economically and environmentally. It is envisaged that Sri Aman is well placed to play a key role in the development of this industry, by establishing a Recycling Industry Park to service Kuching, Sibul, and intermediate urban centres.

The proposal is to establish a State-of-the -Art recycling Industry Park at a suitable site in Sri Aman. It will have facilities dedicated to recycling of various waste materials:

- Metal (steel, aluminium, copper, etc)
- Electronics (extracting important elements from computers, TV's, phones, etc)
- Plastics
- Glass

- Concrete

Materials are to be delivered to site following segregation. That is segregation is not part of the facility, but needs to be undertaken by Local Authorities or suppliers within their own jurisdiction. A secondary sorting may be applicable at the site for some applications (e.g. types of plastic, electronic components).

Suppliers will be paid for the raw materials provided but the cost will be reduced if segregation / sorting is sub-standard.

Government capital expenditure will relate to land purchase, land clearing and development, including fill material, security fencing, infrastructure for drainage, water supply, power, and telecommunications, with an **investment cost estimated at RM12.5 million**.

Lots on the site are to be leased to private industry operators who will set up their own facilities. The lease payments will offset the capital investment by Government and should enable all costs to be recouped over time.

Nevertheless, it is expected that significant incentives will be required initially to establish the park as a going concern. Once a recycling facility is available, we anticipate that there will be strong support from Local Authorities across the southern part of Sarawak, who are keen to reduce landfill waste, and enhance their green credentials through an active recycling initiative.

We recommend that a feasibility study be undertaken into setting up a waste recycling centre in Sri Aman Division to service segregated waste from Kuching and Sibul, as well as neighbouring Divisions and Sri Aman itself.

The Study should also establish the appetite of private enterprise businesses to be a part of this venture. It will also investigate suitable sites, including the site proposed in this report.

SECTION 5.12 INFRASTRUCTURE (COMMUNITY AND SOCIAL AMENITIES)

Identifying the requirements for community and social infrastructure is within the scope of social planning. In Sri Aman this refers to the community facilities, services and networks including schools, hospitals, sports facilities and community and cultural complexes.

Accessible social infrastructure needs to be well located in relation to transport, residential areas and employment. Social infrastructure should be provided in sequence with new residential development, particularly in greenfield areas located in outlying and fringe localities with high service and transport needs.

5.12.1 Desired Outcome

The aim is for the Sri Aman community to be vibrant, safe and healthy, provided with sufficient social infrastructure, and resilient to climate change and pandemics, placing strong emphasis on ethnic diversity.

Objectives:

- To include the social needs of the community in planning and development processes to maintain and enhance the quality of life.
- To achieve well designed, safe and healthy local environments that encourage active community participation and healthy lifestyles and provide safety and security.
- To ensure that the current and future needs of the community are met through coordinated and sequential provision of appropriate social infrastructure including schools, medical facilities and hospitals, community centres and sports and recreational facilities.
- To manage urban and rural growth and development to create, maintain and enhance a sense of community, place and local identity throughout the Sri Aman region
- To support cultural development and the arts through the planning and provision of cultural infrastructure and initiation of a catalyst cultural project.

5.12.2 Future Social Infrastructure Requirements

Based on a predicted increase in residential population of around 34,000 in the next decade, there will be a need for additional schools, sports facilities and hospital beds in the Sri Aman Division.

Currently, there are five (5) secondary schools in Sri Aman, with three located in, or near, Simanggang. The majority of the household heads are looking for the setting-up of secondary schools closer to their locality. To them, this is also a way to stop the out-migration of their youth. Hostel accommodation should be provided as part of the new secondary school complex for all students living in remote areas of the Sri Aman Division.

Future primary and secondary schools should be evenly distributed in Sri Aman and Lubok Antu districts. Provision of primary schools in the less accessible hinterland should be strongly considered. There is also a need to provide more pre-schools throughout the region.

In terms of schools in remote rural areas the Ministry of Education, Innovation and Talent Development (MEITD) is considering operating two sessions in existing schools (the morning and afternoon session) as an alternative to constructing new school facilities.

Sri Aman should have a state-owned Institution of Higher Learning (IHL) offering courses such as those now available in CENTEX in Betong.

Table 5-25 shows the expected change in demographic distribution in Sri Aman. Based on data from the Department of Statistics Malaysia, the school-going population will be approximately ranging from 40 per cent to 60 per cent of the net population increase.

The requirement for new schools, new hospital beds and new sports facilities as a result of a population increase of 34,000 in the next decade is shown in Table 5-27.

Table 5-25: Anticipated change in Demographics 2020 to 2030

Population	2020	2030
Population aged 0-14 years	23.6	21.9
Population aged 15-64 years	68.6	66.8
Population aged 65 years and over	7.8	11.3

Source: DOSM

Table 5-26: Number of Schools in Sri Aman by District

Sri Aman Division 2020	Primary Schools	Enrolments	Secondary Schools	Enrolments
Sri Aman District	36	5190	5	4206
Lubok Antu District	28	2513	2	1924
TOTAL	64	7703	7	6130

Source: Education Department, 2021

Table 5-27: Proposed new schools, hospitals, and sport facilities in 2020 and 2030

Social Infrastructure	2020	2030
Schools	71	Schools for additional 4,300 students
Hospitals	1 old, 1 new	1 additional (92 beds)
Sports Facilities	1 mini stadium	1 new major sport stadium, 1 new mini stadium

Source: EPU Sarawak, JKR Sarawak, PPD Sri Aman

5.12.2.1 Schools

Current enrolments are 6,130 at secondary level and 7,703 at primary level. Based on the current proportion of school children to total population (approx. 12.5%) the anticipated additional requirement is approximately for 4,300 students by 2030.

The average enrolment for the 64 current primary schools in Sri Aman is 120 and the average enrolment for the 7 secondary schools is 870. Using this as a benchmark we make the following estimates of future school requirements over the 10-year SAMP implementation period.

5.12.2.1.1 Secondary Schools

It was assessed that 3 new secondary schools will be required within the region, each with 600 students. These can be located at Engkilili, Lingga, and Temudok.

One of the prime considerations for location for secondary schools is being able to attract good quality teachers to the schools. If the school is very remote it will not have the attraction needed for a reliable, quality teaching staff. Thus Engkilili, Lingga and Temudok are all in reasonable distance of Simanggang.

New and upgraded roads will make these schools more accessible for surrounding towns and settlements. With the improved road systems proposed under SAMP a school bus system can be established to ferry students to and from school.

5.12.2.1.2 Primary Schools

New primary schools will need to cater for approximately 2,500 students. It is estimated that 20 new primary schools will be required for this purpose.

These schools will need to be distributed fairly evenly across the Division.

5.12.2.1.3 Hospitals and Clinics

A new hospital is currently under construction in Simanggang.

It is recommended that a new hospital be established prior to 2030 and it should be located in Engkilili as currently there is no hospital there. It should be designed for approximately 100 beds.

Again, the location of the hospital has to consider its ability to attract quality trained staff to stay there for long periods. Thus, proximity to the Division capital of Simanggang is important.

The provision of future public medical clinics should mainly target the Lubok Antu District. Medical clinics should also be provided in medium and low-level centres including Lingga, Pantu, Lachau and Bakong.

5.12.2.1.4 Sports Stadium

The increase in population will justify a new major sports stadium. It was recommended that one major sports stadium should be constructed in Simanggang and one minor one in Lubok Antu. The new sports facilities can promote sporting events. Maintaining and establishing regionally significant infrastructure for recreation and sport will foster creative art, recreation and leisure industries that will stimulate the local economy and increase job opportunities in the area.

5.12.3 Addressing the impact of Climate Change and Pandemics

Several existing urban settlements in Sri Aman are susceptible to the potential impacts of natural hazards including floods and extreme weather conditions. In these areas, an adaptation approach will strengthen the community's overall resilience to potential impacts. This involves improved prevention, detection, response and recovery systems to protect the community, environment, businesses and infrastructure from the threat of disasters. New development in existing urban areas will need to incorporate design mechanisms to mitigate the effects of natural hazards and disasters.

In terms of any future pandemics, it is essential to ensure the necessary resources, policies and infrastructure, are in place that protects the health and safety of all school personnel, including the students and teachers. Schools should educate staff and students on pandemic prevention measures, develop a schedule for daily cleaning and disinfection of the school environment, facilities and frequently touches surfaces, and ensure availability of hand hygiene facilities and national/local

guidance on pandemic prevention. Ensure adequate ventilation and increase total airflow supply to occupied spaces, is provided for. Clean, natural ventilation (i.e., opening windows) should be used inside buildings where possible, without re-circulating the air.

It is important for all community facilities including new schools, hospitals, community and cultural centres to address the impacts of natural hazards and climate change. The Green Building Index (GBI) introduced in 2009 addresses the tropical and sustainable design and buildings and new townships. Community building design must comply with sustainable design requirements as set in the Malaysian Green Building Index (GBI index).

A set of tropical design and planning guidelines should be identified for schools and future community buildings. The set of guidelines should address the following

- regional evaluation
- climatic elements: site selection and introduction of semi open spaces
- sol-air orientation
- solar control on the environment and building
- forms, wind effects and airflow patterns
- thermal effects of materials and heliothermic planning
- introduction of water sensitive urban design measures as part of planning and designing new school complexes, sports stadiums and facilities, community centres and cultural centres

5.12.3.1 Cultural Centres and Spaces

Sri Aman has a diverse range of cultures, each featuring their own unique customs, beliefs, values, knowledge, heritage, traditions and way of life of this area. Cultural spaces, centres, and facilities play an important role in providing a place for community events, functions, meetings, and festivals, used by a range of different cultural groups. Cultural centres also attract tourists and visitors to the area and, as such, will that will stimulate wealth and job creation for the Sri Aman region. Cultural heritage places and landscapes are important to the community because of their cultural heritage significance. The Sri Aman Master Plan recognises the significance of different cultures and the importance of conserving Indigenous natural and cultural heritage.

As the Iban are the biggest ethnic community in the area Iban culture and traditions should be dominant in the region while preserving and safeguarding the values and needs of other ethnic groups. The Sarawak government should launch and coordinate the development of an Iban cultural centre which could become a catalyst project attracting tourists to the area.

5.12.3.2 Recommended Policies

The policies related to the social infrastructure should include:

- Identify and plan for social infrastructure provision in sequence with residential development.
- Provide social infrastructure that is well located and accessible concerning residential development, public transport services, employment and educational opportunities.
- Identify and secure sites for social infrastructure, particularly in broad hectare developments located in outlying areas with high service and transport needs, and in development in activity centres and established urban areas identified to accommodate further growth.
- Provide multipurpose, flexible and adaptable social infrastructure that can respond to changing and emerging community needs over time.

- Co-locate and integrate community facilities and services to improve service delivery, and form accessible hubs and focal points for community activity, where appropriate.
- Identify opportunities to use surplus government land or infrastructure for community purposes.
- Engage in partnerships with the private, public and non-government sectors to collaboratively plan and deliver affordable and accessible social infrastructure
- Community health and safety in urban and rural environments is improved by providing appropriate social infrastructure, places for community activity, and involving local communities in planning processes.
- The number of new schools should be proportional to the population increase in the next decade. Their exact location, typology (primary or secondary) should be determined by the Ministry of Education, Innovation and Talent Development (MEITD)
- New sports facilities should be proportional to the population increase in the next decade. A new major stadium is designated for Simanggang and a minor sports facility for the Lubok Antu area.
- A new hospital for approximately 100 beds is proposed for Engkilili
- Introduce tropical design guidelines for educational and community buildings. The guidelines promote passive design as the way to address the impact of the tropical climate
- Initiate a catalyst project as a new cultural symbol of Sri Aman: The Iban Cultural Centre

5.12.3.3 Summary of Community and Social Infrastructure projects

Table 5-28 summarises the community and social infrastructure projects being proposed under the SAMP.

Table 5-28: Community and Social Infrastructure Projects under SAMP

Project Title	Project Components	Estimated Costs	Time Frame
SCHOOLS	New Secondary Schools (3)	RM210,000,000	M-L
	New Primary Schools (20)	RM240,000,000	S-L
HEALTH	New Hospital (Engkilili)	RM200,000,000	M
	New Clinics (20)	RM40,000,000	M-L
SPORTS STADIUM	New major stadium in Simanggang	RM40,000,000	L
	New minor stadium in Lubok Antu	RM15,000,000	M
CULTURAL CENTRE	Iban Cultural Centre, Simanggang	Incl in S1-7	S-M
	Cultural Heritage Centre at Gunung Lesong	Incl in S2-6	L
TOTAL		RM745,000,000	

Source: Daya Rancang

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PART 6 **HUMAN CAPITAL DEVELOPMENT PLAN**

An increase in human capital achievement among the Sri Aman population will stimulate economic growth and reduce the incidence of poverty. To this end, there is a need to ensure a match between the population's skills and what skills are needed by the industries. Thus, the HCD strategies are formulated by taking into account the current scenario facing the division, in order to determine the issues and challenges to enable an optimum way forward to be recommended.

SECTION 6.1 SITUATIONAL ANALYSIS

6.1.1 An Overview of Sri Aman Labour Force

With a population size of 109,800 in 2019, Sri Aman contributes around 3.82% of the total labour force of Sarawak, which is relatively low in comparison to the other districts in the state. This shows that Sri Aman's district have a population size that could be developed further in terms of its human assets.

Table 6-1: Sri Aman's Labour Force, 2019.

Year 2019	Sri Aman	Sarawak	Sri Aman Ratio
Population	109,800	2,810,000	3.9%
Labor Force	51,500	1,346,800	3.82%
Employed Persons	50,000	1,304,700	3.83%
Outside Labor Force	22,800	623,100	3.66%

Source: My Local Stats Sarawak, Department of Statistics Malaysia, 2019.

The labour force participation rate in Sri Aman is slightly higher than the state average by 0.9%. However, most of these employment endeavours, especially within the rural areas, are as-needed-basis type of jobs. That means there is no job security, as there is no guarantee that there will be continuous employment in the future. Labour work within the villages is low-pay, unsecured and very casualised, and payments are made according to time-worked or output produced.

Table 6-2: Sri Aman's Labour Force Participation Rate (LFPR), 2019

Year 2019	Sri Aman	Sarawak
LFPR	69.3%	68.4%
Unemployed	15,000	42,100
Unemployment Rate (%)	3%	3.1%

Source: My Local Stats Sarawak, Department of Statistics Malaysia, 2019.

In terms of educational attainment, the average educational qualification attained is within secondary school's level. This educational attainment seems to drop further as the population reside further from the town centres.

Table 6-3: Educational Level of Sri Aman's Household Heads.

Survey Sites	Highest Educational Qualification Attained by Household Head									
	No formal Education	Primary School Standard 1,2,3	Primary School Standard 4,5,6	Lower Secondary School	Upper Secondary School	Diploma	Degree	Master	PhD	Vocational
Simanggang	25	16	57	46	67	8	5	0	0	0
Pantu	17	13	37	15	10	0	0	0	0	0
Lingga	63	19	64	17	11	3	0	0	0	1
Lubok Antu	73	20	42	36	42	5	0	0	0	1
Engkilili	35	14	48	25	30	4	4	0	0	1

Source: Sri Aman Master Plan Study-Socio-Economic Survey, 2020

Based on the SES survey, it was found that the majority of the rural population are farmers that work their own land while doing secondary jobs in their spare time. While in the urban localities, the main economic activities of the self-employed demographics are owners of restaurants, sundry shops, insurance agent and garages etc. For the wage earners, the top industries that employed the most people in Sri Aman are within the agriculture, construction, and services activities such as sundry shops, restaurants, and garages. Within the town centres, the majority of the population either work as government or private office workers.

Table 6-4: Main Occupations of Sri Aman's Household Heads

Survey Sites	Main Occupation								
	Farmer	Animal/Fish Breeder	Fisherman	Construction Worker	Transportation Worker	Businessman	Government Office Worker	Private Office Worker	
Simanggang	56	0	0	10	5	29	25	9	
Pantu	38	0	0	5	0	25	0	1	
Lingga	52	5	8	15	0	10	4	0	
Lubok Antu	107	6	2	12	1	25	10	7	
Engkilili	65	0	0	6	1	30	9	5	

Source: Sri Aman Master Plan Study-Socio-Economic Survey, 2020

SECTION 6.2 ISSUES AND CHALLENGES

Based on the consultants' site visits, SES, and business surveys, SADA lab involvement and also secondary data from the relevant division's, Sarawak's and federal's government agencies, there are various issues and challenges that need to be addressed pertaining to Human Capital Development (HCD). Shortcomings related to the human capital need to be identified and evaluated so that proactive measures can be developed to ensure optimum strategies to develop the manpower of Sri Aman. Among the issues and challenges identified are as follows:

6.2.1 Inequitable access to Educational Infrastructure and Facilities

The access to education varies significantly across the different sub-districts depending on their distance to the town areas. In comparison to the town areas of Simanggang and Lubok Antu, most rural areas are limited in the number of schools, especially secondary levels.

For instance, students from Pantu and Bukit Begunan areas have to go all the way to Balai Ringin or Melugu Secondary Schools to proceed with their secondary level educations. This contributes towards cases of dropouts as it is costly for the parents to send their children so far from their homes for schooling, especially for the B40 group. Additionally, the number of both primary and secondary schools across the districts remain unchanged over the course of the 10 years period as shown in Table 6-5.

Table 6-5: Number of Schools in Sri Aman division from 2021 to 2020

Sri Aman Division	2011		2018		2019		2020	
	Primary School	Secondary School*						
SA District	36	4	36	5	36	5	36	5
LA District	28	2	28	2	28	2	28	2

Note (*) that the secondary school is accounted for academic-based, technical and vocational.

Source: Pejabat Pendidikan Sri Aman

The local education authorities also have to face issues of dilapidated school conditions due to poor maintenance over the years. As these schools are under the purview of the Federal government, there is slow uptake to the requests from the state government to improve and expand the school infrastructure and facilities in Sri Aman.

6.2.1.1 Lack of Institution of Higher Learning (IHLS)

Currently Sri Aman only has two Giat MARA institutions that offer limited basic vocational training programs with relatively small capacity intakes.

Due to the proximity of Betong and the low population of Sri Aman, the setting up of federal-based educational institutions might be problematic. This is because, in order to get Federal's approval for new IHLS there is a need to ensure the population number is high enough to cater for this new addition, while also having to compete for allocations with the other states in Malaysia that might have higher a population advantage and industrialization needs.

Table 6-6: IHLs according to Districts.

District	IHLs	No.	No. of Instructors	No. of Students
Sri Aman	Giat MARA	1	2	31
Lubok Antu	Giat MARA	1	4	19
Total		2	6	50

Source: SADA Development Plan 2021-2030

6.2.1.2 Underutilization of local labour in jobs perceived as 3Ds

For labour intensive industries such as agriculture, specifically plantations, Sri Aman is having problems with over-reliance on low-skilled foreign workers. Although the figures below might be lower than some divisions in Sarawak, based on the limited size of the productive sector in Sri Aman, proportionally it is a significant amount.

Table 6-7: Number of Foreign Workers in Sarawak Based on Sectors and Division, as of March 2021

Sectors / Industries	Bintulu	Miri	Mukah	Sibu	Bakun	Kuching	Serian	Marudi	Betong	Samarahan	Kapit	Sri Aman	Sarikei	Lawas	Limbang	Saratok	GRAND TOTAL
Agriculture, Forestry and Fisheries	17,039	16,813	10,922	5,636	9,525	2,358	4,063	3,072	2,143	1,575	428	712	451	621	582	38	75,978
Manufacturing	14,413	6,419	1,396	5,022	1,494	2,138	105	668	18	85	444	24	246	132	19	-	32,623
Construction	2,792	751	117	635	356	1,895	203	19	169	391	112	157	150	79	179	24	8,029
Wholesale, Retail, Restaurants & Hotels	502	287	7	242	8	523	5	17	3	28	4	7	12	13	21	-	1,679
Community, Social and Personal Services	428	340	14	322	-	361	2	3	7	3	5	7	54	16	58	2	1,622
Finance, Insurance, Real Estates, & Business Services	168	13	-	95	-	15	-	-	-	26	-	-	-	-	-	-	317
Mining & Quarry	40	43	40	15	8	35	-	46	-	14	-	16	-	1	-	-	258
Transportation, Storage & Communication	142	16	-	28	-	13	-	-	-	-	-	-	3	1	-	-	203
Electricity, Gas & Water Supply	-	-	-	17	-	2	-	12	-	-	-	-	-	-	-	-	31
Grand Total	35,524	24,682	12,496	12,012	11,391	7,340	4,378	3,837	2,340	2,122	993	923	916	863	859	64	120,740

Source: MSEN System (as of 31 March 2021), Department of Labour Sarawak.

As can be seen from Table 6-8, there are more than 1000 foreign workers employed annually in Sri Aman since 2015. These foreign workers are mostly unskilled labour from Indonesia, and the majority are employed in agriculture, followed by construction sectors. These figures below do not take into account the unregistered foreign workers which might be potentially higher than those listed. This trend of recruiting unskilled foreign workers only shows a drop in 2020 due to the Covid-19 pandemic where most business activities experienced declining revenues and activities.

Table 6-8: Number of Foreign Workers in Sri Aman Based on Sectors, 2015-2020.

Sectors / Industries	2015	2016	2017	2018	2019	2020
Agriculture, Forestry and Fisheries	1273	1217	1035	1161	958	503
Construction	277	465	318	330	297	141
Manufacturing	8	7	3	57	72	20
Community, Social and Personal Services.	6	7	2	3	7	7
Mining & Quarry	177	37	24	27	21	14
Wholesale, Retail, Restaurants & Hotels	9	12	6	14	14	2
Grand Total	1750	1745	1388	1592	1369	687

Source: Frost & Sullivan, 2020

This reliance on foreign workers is attributed to the local youths' tendency to avoid jobs that are viewed as having a 3D image (Dirty, Dangerous and Difficult). This phenomenon has also led to relatively high unemployment among youths given that there are limited job opportunities in other sectors such as the services and manufacturing industries.

6.2.1.3 Youth out-migration

Based on the SES survey conducted, there is high incidence of out-migration among the Sri Aman's youths. This is mainly due to the youths' perceived lack of suitable job opportunities and the promise of better career options in the urban areas within Sarawak and also West Malaysia. This has created a void within the communities, especially in the rural areas with senior citizens left to work the land.

6.2.1.4 Level of educational attainment among rural communities

Students from lower income families have a higher tendency to drop out of the education system. Enrolment rates of secondary schools in both the Sri Aman and Lubok Antu districts have been experiencing a decreasing trend. For instance, in the Sri Aman, there is a downward trend from 5114 students in 2010 to 4280 students in 2020. This shows a reduction by 16.31% in the enrolment rate especially within the upper secondary school level. Based on the SES survey, issues such as limited access to educational institutions and job opportunities in the rural areas have a demotivating effect on both the youths and household heads to further these youths' studies to higher secondary schools or tertiary level education. This is ultimately a loss of resources for Sri Aman as they represent potential human capital that could be utilized for the division's growth.

Table 6-9: Enrolment rate of primary and secondary school in Sri Aman division, 2011-2020.

Enrolment rate	2011		2018		2019		2020	
	Primary School	Secondary School						
Sri Aman District	6508	5114	5260	4333	5255	4329	5141	4280
Lubok Antu District	3445	2103	2645	1903	2540	1980	2456	1933

Source: My Local Stats Sarawak, Department of Statistics Malaysia

6.2.1.5 Lack of ICT infrastructure and facilities

Based on the SES survey there seems to be a digital divide between the urban and rural population where the majority of rural households surveyed stated difficulties in accessing internet facilities and information. As shown in Table 6-10, Lubok Antu district lags behind Sri Aman in terms of digital infrastructure such as broadband coverage, internet centres and also schools with Computer Lab facilities. A low level of IT literacy is prevalent within the rural schools as these children not only do not have access to computers at home, but also limited access at schools. This digital divide is a major challenge towards HCD as access to technology is crucial for educational purposes, and also for a marketable workforce that can fulfil the current industry needs for digital-savvy employees.

The Malaysian Communications and Multimedia Commission (MCMC) have been tasked by the Federal government to provide Internet facilities to underserved areas as well as to inculcate computer-based skills and know-how especially among rural youths and children. These nation-wide initiatives are in the form of Pusat Internet or Internet Centres. However, as can be seen in the Table 6-11, there are no increase in the number of community-based internet centres since 2017 in both the Sri Aman's districts. This lack of investment is worrying given the importance of IT literacy and know-how in this era of digital economy.

Table 6-10: Sri Aman's Digital Infrastructure.

Infrastructure	Sri Aman District	Lubok Antu District	Telecommunication Towers in Sri Aman Division	
2G Broadband Coverage	89%	53.8%	4 Legged	11
3G Broadband Coverage	78.2%	42.3%	3 Legged	45
Internet Centre	4	2	Guyed Mass	2
Community Wifi	37	30	Monopole	3
School Computer Lab	21	11	Rapole	7
			Small Cell	8

Source: SACOFA Sdn Bhd (2018); Malaysian Communication & Multimedia Commission (2018)

Table 6-11: Number of Internet Centres from 2017 to 2019.

Internet Facilities	Year / District					
	2017		2018		2019	
	Sri Aman	Lubok Antu	Sri Aman	Lubok Antu	Sri Aman	Lubok Antu
Malaysia Internet Centres	5	2	5	2	5	2
Rural Internet Centres	-	-	-	-	-	-

Source: My Local Stats Sarawak, Department of Statistics Malaysia

6.2.1.6 Lack of employment opportunities

Due to limited job opportunities, the majority of the rural population are self-employed small-scale farmers, earning relatively low incomes. These populations usually have to take up a second job, even resorting to casual labour that indicates the inadequacy of their income in maintaining a basic living standard. With the exception of Simanggang, the median income of the other subdistricts is below the poverty line. Even within the town centres of Simanggang and Lubok Antu, the type of jobs available are confined to either being government or private sector office workers, and lower-level jobs such as shop assistance, restaurants workers, salesmen etc. While for the rural population, non-standard or casualised jobs are prevalent. These types of employment are often associated with job insecurity, earnings volatility, limited access to social protection schemes or training and career advancement. Based on the SES survey, the majority of the household heads stated that the lack of suitable and stable

employment is a hindrance to their quality of life as they have to rely on casual side-job that often have a low-rate of return

Table 6-12: Head of Household's Perception on the Adequacy of their income.

Survey Sites	Are the current income adequate to cover monthly household expenses?	
	Yes (%)	No (%)
Simanggang	57.4	42.6
Pantu	41.8	58.2
Lingga	52.9	47.1
Lubok Antu	29.8	70.2
Engkilili	37.8	62.2

Source: Sri Aman Master Plan Study-Socio-Economic Survey, 2020

6.2.1.7 Ageing Population

Due to the slow birth rate and the outmigration of younger residents, there is an increasing proportion of the senior population. This is especially notable within the rural communities of Sri Aman division. Based on the SES survey shown in Table 6-13, the majority of the household heads are within their late 50s, which is indicative the of Sri Aman division edging towards an ageing population. An ageing population is a situation where the proportion of people aged 60 years and older increases. The study on world population ageing report shows that population ageing is a global phenomenon and has been acknowledged as one of the four global demographic “megatrends” (United Nation, 2019). For the Sri Aman division, this poses a challenge in terms of the type of jobs that could be undertaken by these senior citizens and also the level of technology adoption to match industry needs for future jobs.

Table 6-13: Household Head's Average Age

Survey Sites	Average Age
Simanggang	58
Pantu	57
Lingga	59
Lubok Antu	55
Engkilili	58

Source: Sri Aman Master Plan Study-Socio-Economic Survey, 2020

6.2.1.8 Institutional Framework

There is also a lack of a systematic institutional framework that can enforce the collaboration between industry, entrepreneurs, industry associations, and academicians. This includes an avenue for policy discourse, technical advisory consultations to mobilise resources and synergies for the overall development of HC in Sri Aman. Without this framework other important opportunities that could assist the development of SMES such as outreach programs or social assistance programs are also under-provided.

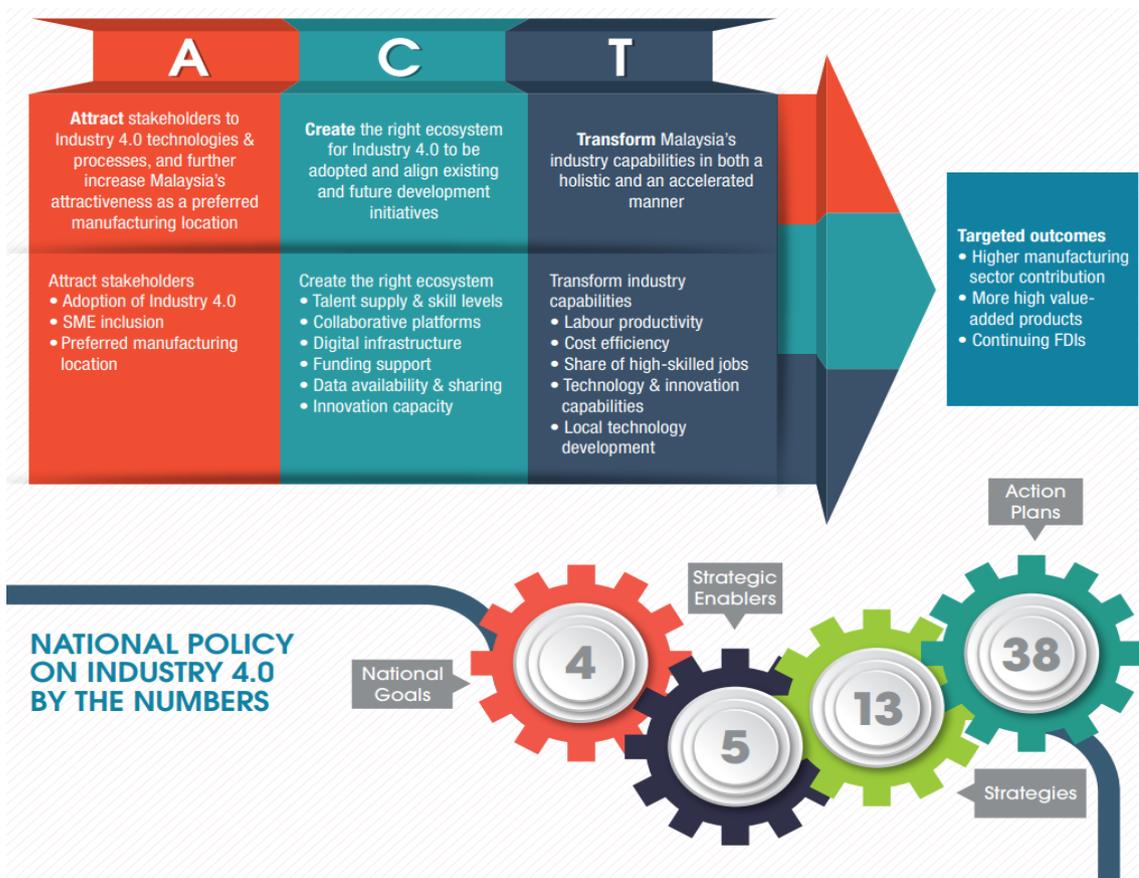
SECTION 6.3 IMPACT OF MEGATRENDS ON FUTURE JOBS IN SRI AMAN

Looking ahead, there is a need to understand how megatrends will affect Sri Aman’s future workforce and how best to harness these trends to generate opportunities. Megatrends are defined as transformative global forces of the future that drive businesses, societies, economies, cultures, and individual lives (Frost and Sullivan, 2019). Technological disruptions, demographic changes, changes in the global economy and geopolitical landscape are the megatrends that are being experienced globally.

6.3.1 Industry 4.0

The advent of Industrial Revolution 4.0, which is pillared on information technology and automation, brings about a wide range of technologies that not only cover manufacturing, but also all economic sectors. IR4 is mainly propelled by four distinctive technological developments: AI and automation, high-speed mobile Internet, the use of big data analytics, and cloud technology. Of these four technologies, AI and automation are anticipated to be the most influential factor affecting the global employment landscape. Due to this, the government under MITI have introduced the National Policy on Industry 4.0 (Industry4WRD). According to MITI, though Industry4WRD Policy is developed for the manufacturing industry and its related services, the approaches in this Policy are relevant and could be applied in other sectors as well. The objectives of this policy are threefold, which are [i] Attract; [ii] Create; and [iii] Transform as shown below:

Figure 6-1: Objectives of Malaysia's National Policy on Industry 4.0.



Source: Malaysia’s National Policy on Industry 4.0 (Industry4WRD)

At the state level, the Sarawak Digital Economy Strategy was launched in 2018 with the aim to utilize digital platform to spur Sarawak's economy and industries. From the perspective of Sri Aman's employment landscape, the advent of Industry 4.0 means a high number of low-skilled jobs will be eliminated especially in the agriculture, aquaculture and fisheries sectors. These low-skilled employees will need to be re-skilled or up-skilled to prepare them for new job requirements as the sectors expand towards greater-value added activities. In fact, the creation of these highly-skilled jobs will greatly benefit the communities as it means higher income and better career prospects for the locals.

6.3.2 Green Principle and SDGs

In addition to IR4, a megatrend in the form of green principle and environmentally sustainable development has seen the inclusion of the green economy and Sustainable Development Goals (SDGs) on all major economic activities. "Green jobs" do not have a rigid definition as it encompasses employment that contributes to the reduction of environmental impact to levels that are ultimately sustainable. This involves jobs that assist to reduce the consumption of raw materials and energy, decarbonizes the economy, protect and restore ecosystem and biodiversity and minimize the production of waste and pollution. According to International Labor Organization (ILO) definition, Green jobs provide decent work and also contribute directly to reduce environmental impact.

Figure 6-2: Definition of Green Jobs



Source: ILO,2016

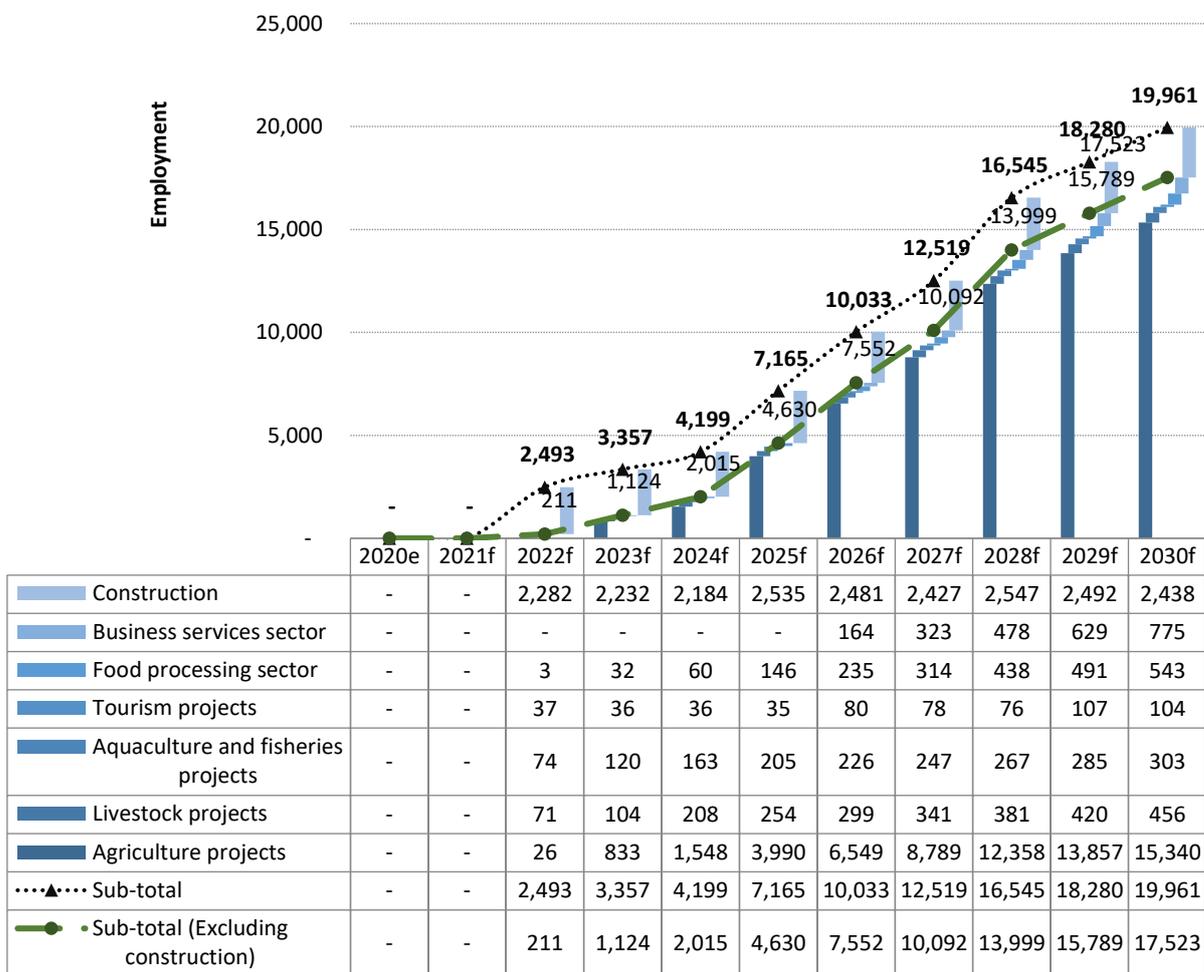
6.3.3 Digital Labour

There will be an increasing demand for telecommuting or "invisible" work such as "virtual labour" or "digital labour". Notwithstanding the type of investments that are strategized within the Sri Aman Master Plan, the upstream and downstream linkages of these activities within the related sectors of agriculture, service, manufacturing, tourism etc. will need individuals that are engaged in the gig economy, for instance virtual assistants that perform variety of tasks within the E-Commerce systems. This human labour needed to work behind the technology will form a significant portion of Sri Aman's future jobs. Thus, freelance jobs that have no dedicated locations will be the norm in the future. The types of people involved in a gig economy include freelancers, part-time workers, software developers, lawyers, accountants/ financial advisors, specialists, independent contractors, project workers, etc.

6.3.4 Future Jobs by Sector

Based on the increase number of investors and the expansion of the economic activities in Sri Aman division, it was forecasted that there will be an additional 17,523 long-term occupations (excluding construction) being generated by 2030.

Figure 6-3: Jobs Generated in Sri Aman Based on Economic Activities by 2030



Source: Frost & Sullivan Analysis

The highest number of employments will come from the agriculture activities, followed by food processing, and business sectors. Bearing in mind that this employment will involve interrelated in job categories and locations within the productive sector’ value chain, below is the detailed information on the future jobs that Sri Aman would be experiencing within the next 10 years and beyond.

6.3.4.1 Agriculture

For Sri Aman, a business model that optimise land use with the aim of high agriculture productivity is recommended. In addition to minimising the use of unskilled labour, encouraging automation and increasing skilled labour in Sri Aman, this strategy is also in line with the sustainability concepts and also the megatrend applicable for the agriculture sector. Megatrends in the form of climate change, political uprisings and economic instability have led to strategies to address concerns over food security and sustainable management of the ecosystem in agriculture activities. Two megatrends that are widely acknowledged are the element of IR4 digital technology and green technology. For Sri Aman, IR4 and

green concepts in the agriculture sector means adoption of greater mechanization and automation, eco-friendly processes, in addition to higher value-added activities. This will lead to higher requirement for a knowledge-intensive workforce, and less reliance on unskilled labour. Based on International Labour Organization (ILO) categorization, future high-tech green jobs are segmented into two sectors as shown as follow:

Table 6-14: Future Jobs in Agriculture

<i>Agriculture Sector's Segments:</i>	<i>Forestry Sector's Segments:</i>
<ul style="list-style-type: none"> • Soil conservation • Water efficiency • Organic growing methods • Reducing farm-to-market distance 	<ul style="list-style-type: none"> • Reforestation and afforestation • Agroforestry • Sustainable forestry management • Halting deforestation

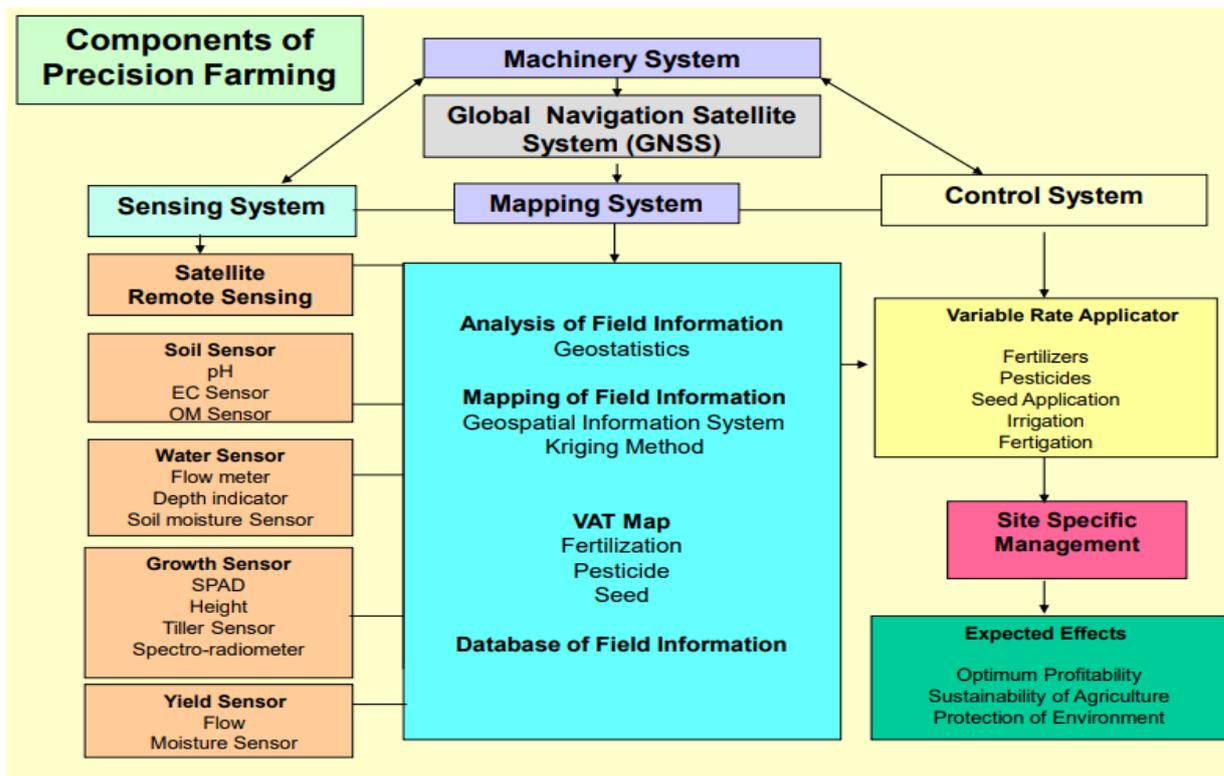
Source: ILO, 2018

Sri Aman, just like the rest of Malaysia, is not self-sufficient in terms of staple foods such as rice, vegetables and fruits. The future of jobs in relation to the agriculture sector will be addressing the food sustainability issues by using technology and modern techniques to ensure greater harvesting yields, diversifying crops, while relying more on automation than human labour in achieving these objectives. In 2018, the World Government Summit launched a report titled “Agriculture 4.0: The Future of Farming Technology”, aiming to highlight the growing challenges in food production and supply. This aspect will be influencing the future jobs in agriculture where the focus will be on reducing reliance on imports for staple foods, improving the value chain so that food loss and wastage from farm to table can also be reduced. The traditional method has shown that wastage occurs in the supply chain during harvesting, shipping and storage. There are significant opportunities for job creation in the area of reducing post-harvest losses of food. It has been reported that a high quantity of agricultural produce is lost or destroyed by pests, moisture, fungal contamination, spoilage and other conditions. These losses are particularly severe if there is a lack of skilled workers with knowledge in developing safe and secure storage facilities (e.g., effective packaging and handling of produce in transit from the farm to distribution outlets). Thus, jobs within the value-added upstream agriculture value chain are foreseen to be in greater demand within the next 5 to 10 years. Making agriculture profitable and attractive to young people is key to reducing the foods import, reducing unemployment and boosting the division revenue. Bearing in mind the advent of farming technology to Sri Aman, future jobs especially within the plantation sector, rice and fruit farming will encompass farming incubators and onsite R&D that employs digital technology to gather and analyse critical data pertaining to the farming variables, in addition to research on how to generate high value-added agriculture products. Thus, potential future jobs in Sri Aman are listed according to the segments as listed below:

6.3.4.1.1 Jobs in Precision Farming

Precision Farming (PF) or Smart Farming (SF) includes the integration of information and communication technologies into farm equipment and sensors for use in crop cultivation and food production systems (Virk et al, 2020). Precision farming uses information technology to adapt soil, water and crop management to match varying field conditions such as soil texture, nutrients and moisture status, pest and disease distribution, and so on. For Sri Aman’s agriculture development, PF is crucial for agriculture’s processes of both the commodity and food crops such as oil palm, sago, paddy, pineapple, coconuts, durians, rambutan etc. In terms of future jobs, the figure below shows the five main technologies involved in precision farming. All of these components once adopted will lead to creation of crucial future jobs in the field of precision farming in Sri Aman.

Figure 6-4: Components of Precision Farming.



Source: Akademi Sains Malaysia, Sustaining Malaysia’s Future, A Mega-Science Framework For Sustained National Development (2011-2050)

Among the categories of skilled workforce required are agriculture and soil scientists, aquaculture and organic farming specialists. Also, skills and expertise in the use of GPS, remote sensing technologies and development of software that enables precision agriculture and agronomics with less use of fertilizer, and wastage of fuel. Experts are also required in the handling of artificial intelligence (AI) and smart robotics that limit use of chemicals and assist in developing a cleaner agriculture ecosystem.

Table 6-15: Future Jobs in Agriculture

Jobs	Job Description	Sample of Job Titles under this Occupation
Precision Agriculture Technicians	This job applies geospatial technologies to agricultural development or management activities such as pest scouting, site-specific pesticide application, yield mapping, or variable-rate irrigation, using geospatial technologies such as GIS and GPS. Job holders create or analyse maps or remote sensing images in order to compare physical topography to data on soils, fertilisers etc.	Crop Specialist, Independent Crop Consultant, Nutrient Management Specialist, Precision Agriculture Specialist (Precision Ag Specialist), Precision Farming Coordinator, Soil Fertility Specialist
Agricultural Inspectors	Job holder Inspects agricultural materials, manufacturing equipment and facilities, as well as fish and logging activities, for compliance with health, quality, and safety regulations and laws.	Consumer Safety Inspector (CSI); Brand/Food Inspector; Crop Inspector; Food Safety and Inspection Service; Seed and Fertilizer Specialist; Shipping Point Inspector
Agricultural Equipment Operators	Handle equipment to aid agricultural activities such as tilling soil; planting, cultivating, and harvesting crops. Post-harvest activities such as husking, shelling, threshing, and ginning can be performed using stationary equipment.	Farm Equipment Operator, Loader Operator, Tractor Machine Operator, Rake Operator, Sprayer, Windrower Operator

Jobs	Job Description	Sample of Job Titles under this Occupation
Machinists	Job holders set up and operate a range of machine tools to produce precision metal parts and instruments. Work on mechanical instruments, modifying, or repairing them. Fabricate and change parts to produce or restore machine tools or maintain industrial machines.	Computer Numeric Controlled Machinist, Machinist, Maintenance Machinist, Manual Lathe Machinist, Production Machinist, Tool Room Machinist
Supervisors of Farming and Workers	Job holders supervise and organise agricultural, aquaculture and related workers activities	Field Operations Farm Manager, Harvesting Supervisor, Foreman, Pest Management Supervisor
Inspectors, Testers, Sorters, Samplers, and Weighers	Job holders examine raw materials, manufactured, machined, fabricated or assembled parts or goods for wear, and deviations from requirement by inspecting, testing, sorting, sampling or weighing them.	QA Auditor, QA Inspector, QA Technician, Quality Control Technician, Quality Auditor, QC Inspector, Quality Inspector, Quality Technician, Test Technician
Soil and Crop Scientist	Conduct research on yield, and management of crops, agricultural plants and trees, as well as their growth in soils and pest control; or investigate the chemical, physical, biological, and mineralogical composition of soils in relation to plant or crop growth. May identify and map soils, as well as investigate the effects of different soil management practises.	Agronomist, Agronomy Specialist, Crop Nutrition Scientist, Extension Specialist, Microbiology Soil Scientist, On-Site Soil Evaluator, Research Soil Scientist, Soil Fertility Extension Specialist, Soil Scientist
Conservation technicians and scientists	Manage, and preserve natural resources so that they can be used without causing harm to the ecosystem. Conducting soil surveys and developing strategies to prevent soil erosion or protect agricultural lands. Advice farmers on the best ways to preserve soil and water, as well as the number and types of livestock and forage plants that are best suited to specific land; and in farm improvements.	Conservationist, Environmental Analyst, Erosion Control Specialist, Land Manager, Land Reclamation Specialist, Land Resource Specialist, Resource Conservation Specialist, Resource Conservationist, Soil Conservationist
Buyers and Purchasing Agents, Farm Products	Job holder purchase farm products either for further processing or resale. May negotiate contracts.	Procurement Official, Procurement Specialist, Purchasing Administrator, Purchasing Agent

Source: UNIMAS Holdings

6.3.4.1.2 Jobs in Drone Technology

The use of drones will be applicable to all industries, but for the agriculture sector, the specific areas that will have high number of future jobs in Sri Aman will be talents in:

- Soil and field analysis: Jobs related to soil analysis and gathering data for managing irrigation and nitrogen levels.
- Planting: Jobs in developing drone-planting systems that shoot pods with seeds and nutrients into the soil.
- Crop spraying: Jobs in handling aerial spraying.
- Irrigation and health assessment: Handling of sensor drones that can identify which parts of a field that need improvement.

Generally, future jobs in this field will comprise talents in developing, handling and maintaining drones for agricultural purposes such as sensor drones, harvesting drones and picker drones.

6.3.4.1.3 Rice and Fruit Crop Farming

The future jobs in agriculture will cater to the drive towards self-sufficiency level (SSL) in food. Other than rice farming, future jobs will also involve modern farming in the cultivation of pineapple, durians, bananas, sweet corns and coconuts on a commercial basis for both domestic and international markets. It is foreseen that these types of future jobs will use high knowledge workers, with jobs encompassing scopes below:

- Food and Fresh Produce Administration Jobs
- Food and Fresh Produce Adviser and Farm Consultancy Jobs
- Food and Fresh Produce Apprenticeship and Trainee Jobs
- Food and Fresh Produce Director Jobs, including Sales Director Jobs
- Food and Fresh Produce Driver Jobs / HGV Farm Driver Jobs
- Food and Fresh Produce Engineering and Mechanical Jobs
- Food and Fresh Produce Graduate Jobs
- Food and Fresh Produce Human Resource Jobs
- Food and Fresh Produce Technician Jobs
- Food and Fresh Produce Management Jobs, including; CEO, CFO, MD and Operations Manager Jobs
- Food and Fresh Produce Quality Control Jobs
- Food and Fresh Produce Supply Chain Jobs
- Food and Fresh Produce Retail Jobs
- Food and Fresh Produce Sales Jobs
- Food and Fresh Produce Purchasing Jobs
- Food and Fresh Produce Buyer Jobs
- Food and Fresh Produce Commercial Manager Jobs
- Pack House Jobs
- Specialist Produce Grader Jobs
- Produce Manager Jobs
- Research and Development Jobs including; R&D Jobs

The demand for a sustainable and eco-friendly methods of fruit farming will also lead to an increase in demand for greenhouse jobs. Crop, nursery, and greenhouse farmworkers and labourers are responsible for a variety of activities related to the cultivation and harvesting of grains, fruits, vegetables, nuts, and other crops. Among the future jobs that are relevant for this value chain are:

Table 6-16: Future Jobs in Crops Farming

No.	Future Jobs	Job Descriptions
1	Plant Flowers and Vegetables	One of the primary responsibilities of a greenhouse worker is to plant flowers and vegetables in commercial, industrial, and retail greenhouses. In this aspect of the role, greenhouse workers follow planting guidelines regarding soil depth and composition, germination time, and moisture levels to ensure that the majority of seeds and cuttings grow fully into plants.
2	Maintain Inventories	Greenhouse workers support plant health and growth through active watering and trimming, ensuring that plants have adequate water but are not at risk for root rot or other diseases caused by excessive moisture. Additionally, many greenhouse workers also trim plants to encourage healthy growth and remove diseased or unwanted shoots and leaves.
3	Answer Customer Questions	Greenhouse workers may also directly interact with customers to answer questions about plant care or the plants themselves. This is generally more common in retail greenhouses, where the worker supports sales efforts by providing customers with advice and guidance. Within a retail greenhouse, the greenhouse worker may also need to complete customer transactions.
4	Apply Pesticides	In some cases, greenhouse workers may also apply pesticides to plants within the greenhouse. Depending on the state, the greenhouse worker may need to be licensed to work with certain types of pesticide. In this aspect of the role, the greenhouse worker takes precautions to avoid contamination and health hazards and ensure that pesticides are safe and correctly dosed.

No.	Future Jobs	Job Descriptions
5	Water and Trim Plants	Greenhouse workers support plant health and growth through active watering and trimming, ensuring that plants have adequate water but are not at risk for root rot or other diseases caused by excessive moisture. Additionally, many greenhouse workers also trim plants to encourage healthy growth and remove diseased or unwanted shoots and leaves.
6	Agronomist	This job is to develop strategies, plan and implement agronomy research related to crop cultivation, production system, precision agriculture, fertilizer recommendation, yield improvement and etc. The person must be able to provide technical advisory services, recommendation and visit to crop project for technical support in cultivation, production, new initiative, continuous improvement, project management and etc.

Source: <https://www.jobhero.com/job-description/examples/agriculture-farming/greenhouse-worker>

The workforce that will be used for the above tasks will require extensive training as automated harvesting of certain fresh fruits, such as pineapple and bananas etc., is particularly challenging. For instance, due to the delicate nature of the crops, they require handling of ‘smart’ technological solutions like mechatronic systems with precision sensing, actuation capabilities that can handle soft and flexible objects. According to the experts in the field such as Charlton et al (2019), a lot of these high-tech solutions are still in the development and experimentation stages, but some are available for purchase, and already in common use.

6.3.4.1.4 Future Jobs in Paddy Cultivation

Based on the Sri Aman Masterplan’s recommendations, there are more than 15,000 ha that will be developed for rice farming or granary areas. This paddy cultivation operations can be automated or mechanised in-line with the smart farming concept. The type of skilled labour for this kind of operation encompasses: [i] Land levelling guided by remote sensing technology; [ii] mechanized land preparation; [iii] sowing of seeds using drone; [iv] Application of variable fertiliser using GPS and drones; [vi]mechanized harvesting.

In addition to future jobs that involve mechanization within the farm itself, numerous jobs creation potential within the downstream of paddy farming will also be available based on the following value chain:



Figure 6-5: Paddy Farming's Downstream Value Chain

Source: Khazanah Research Institute, The status of the paddy and rice industry in Malaysia, 2019 (http://www.krinstitute.org/assets/contentMS/img/template/editor/20190409_RiceReport_Full%20Report_Final.pdf)

6.3.4.1.5 Jobs in Organic Farming

Compared to industrialised farms or plantation, organic farms tend to be more labour-intensive and thus will lead to higher employment gain to the Sri Aman population. The increasing demand for a healthy and natural source of food supply will mean expansion of organic farming. Future jobs will be located in both on-farm processing (e.g., specialize sorting and handling) and non-farm production of organic agricultural inputs (e.g., natural fertilizers) and post-harvest farm-to-market supply chains. Specifically, talents will be needed in the various value chain of organic farming as shown below:

Table 6-17: Job Requirements according to the Organic Farming's Value Chain

Value Chain	Types of Jobs within Value Chain	Employment Requirement's Tasks
Farming process of Organic Food	Technology	<ul style="list-style-type: none"> • Farming technology and process for compliance with organic certifying bodies, while ensuring optimum yield. • Post-harvest technology to ensure minimum output loss and wastage in the supply chain during harvesting, shipping and storage. • R&D for innovative product development of organic outputs • Utilization of ICT in processing, and also branding in social media
	Supply and Market Access	<ul style="list-style-type: none"> • Procurement systems and sourcing for raw materials such as seed and plant material.
	Quality Management	<ul style="list-style-type: none"> • Continuous improvement of product quality • Monitoring and compliance of organic food quality standards at both Malaysian and international standards • Training of internal stakeholders on quality assurance of organic outputs.
Distribution process of organic food	Distribution Channel	<ul style="list-style-type: none"> • Establish cooperation and linkages with distributors for both national and international markets
	Transportation	<ul style="list-style-type: none"> • Speed and method of delivery for organic outputs to reach consumers in a state of freshness
Marketing Process of Organic Food	Market Access	<ul style="list-style-type: none"> • Promotion, placement and pricing strategies of various categories of organic outputs for both Malaysian and international markets

Source: UNIMAS Holdings

Factors that will determine labour demand of organic farming will be based on how diverse the cropping rotations will be, the combination of crops and livestock to recycle organic wastes into soil nutrients, maintenance work to reduce soil erosion, degree of reliance on biological processes for pest and weed management and other agroecological farming methods that are being adopted for Sri Aman.

6.3.4.1.6 Plantation

According to the Malaysian Agricultural Producers Association (MAPA), plantation companies are starting to adopt digital solutions such as artificial intelligence (AI), Internet of Things (IoT), and big data to lessen dependency on manual workforce for processes that can be automated. MAPA have also recommended that to foster the sustainable oil palm industry, there is a need to have more research on mechanization, high yielding oil palm seedlings as well as adjusting the wage and promoting this industry so that Malaysian youths will be more willing to take up future jobs. For instance, in the Oil Palm Industry Value chain, the type of future jobs that could be generated for the Sri Aman population encompass the upstream, midstream, and downstream levels as follow:

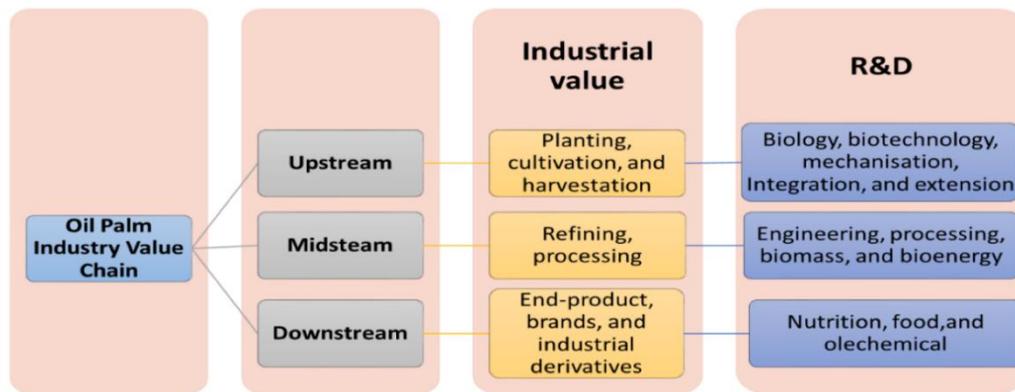


Figure 6-6: Future Jobs in Plantation.

Source: Maluin, F.N.; Hussein, M.Z.; and Idris, A.S. An Overview of the Oil Palm Industry: Challenges and Some Emerging Opportunities for Nanotechnology Development. *Agronomy* 2020, 10, 356. <https://doi.org/10.3390/agronomy10030356>.

6.3.4.1.7 Forestry Sector

Just like megatrends in other part of the world, future jobs in Sri Aman’s forestry sector will be linked with the SDG agenda. This is because reduction in the division’s forest areas have negative impacts on timber production, biodiversity, watershed protection, the carbon balance and rural employment. Among the focal green jobs will be on protecting the ecosystem and biodiversity, and minimising pollution. Thus, green job opportunities that exist will be promoting:

- Agroforestry: plantation of fruit or timber trees within crop fields
- Forestation and tree plantation: developing forest resources through timber production, watershed conservation, habitat improvement, soil and water conservation, building shelters for wildlife, and other major purposes of afforestation
- Conservation of forest, biodiversity and sustainable forestry management

Specifically, talents will be needed in the various value chain of the forestry sector as follow:

Table 6-18: Future Jobs in Precision Forestry's Technology Landscape Sector

Future Jobs		Job Descriptions
Genetics and Nurseries	Advanced genetic improvement	Gene mapping and marker-based breed selection to ensure plants have genetic profiles suited to the site and end use.
	Automatic nurseries	Fully enclosed and controlled environments for raising seedlings under optimum conditions for plant health and growth.
Forest Management (Silviculture)	Site-specific management	Prescriptions adapted to site needs, e.g., fertilization & drainage, often based on data from soil sensors.
	Pest and disease monitoring	Digital monitoring of potential outbreaks, e.g., with UAVs, & coordinated responses to minimize damage to the forest.
	Mechanized silviculture	Increased use of machinery to improve safety, labour productivity & operations, e.g., via fertilization & weed control.
	Fire monitoring	Digital monitoring of fires, with UAVs or satellite, e.g., to provide early warnings & coordinate fire-fighting.
	Water-management systems	Central control of water infrastructure (e.g., flood gates) based on weather, soil moisture, river water levels, and analytics.

	Future Jobs	Job Descriptions
Harvesting	Digital inventory	Measurement of forest standing inventory – volume, species, and sometimes grade mix – by aerial remote sensing and in-forest devices.
	Mechanized harvesting	Fully mechanized systems to improve safety, productivity, and process control.
Wood Delivery	Remote/automatic loading	Loading cranes that can be operated remotely (e.g., from a truck cab or central office location) & eventually autonomously.
	Wood logistics optimization	Use of advanced software to control the central dispatch of trucks & other transport infrastructure.
Across the full value-chain	Forestry-planning models	Software to support forest-management decisions, from strategic to tactical & operational.
	Field support tools	Mobile devices deployed in the forest, giving supervisors access to forest information systems and planning tools.
	E-dashboards	Used to visualise performance data, based on one central, standardised, and electronic data repository.
	Data analytics	Analysis of data to solve complex problems, e.g., identifying constraints on tree growth at a micro level & determining effective interventions.

Source: McKinsey and Company, Precision Forestry: A Revolution in the Woods, June 25, 2018. <https://www.mckinsey.com/industries/paper-forest-products-and-packaging/our-insights/precision-forestry-a-revolution-in-the-woods>.

6.3.4.2 Aquaculture and Fisheries

Fisheries and aquaculture have the potential to generate high revenues for Sri Aman’s economy and a source of employment opportunities for a great number of the communities especially within the Batang Ai area. However, new technologies and skills are crucial to improve the sector’s sustainability and productivity. Based on the Value Chain of Aquaculture, there are diverse future jobs that need to be filled within the next 5 to 10 years:

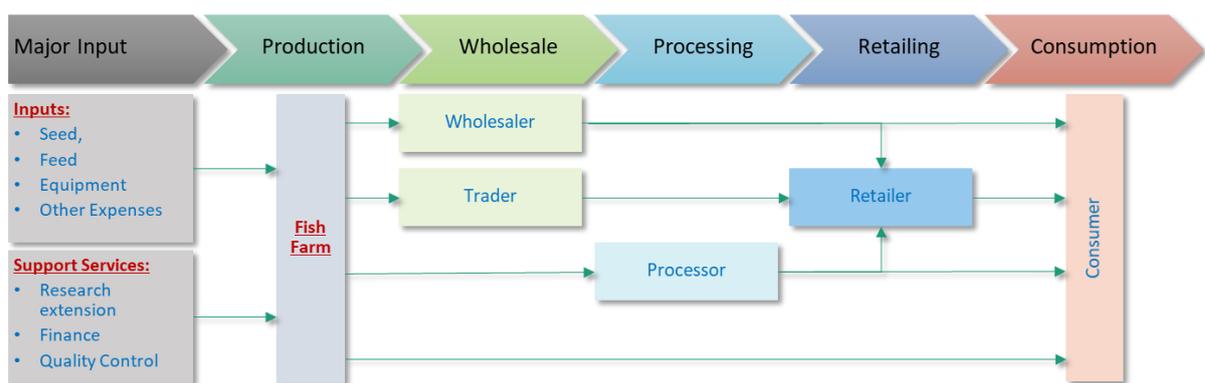


Figure 6-7: Aquaculture Value Chain and Potential Jobs Creation

Source: UNIMAS Holdings Analysis

Table 6-19: Future Jobs in Aquaculture and Fisheries

No.	Future Jobs	Job Descriptions
1	Fish processing	Is the receiving and preparation of fish, including but not limited to cleaning, cooking, canning, smoking, salting, drying or freezing.
2	Commercial fisheries and aquaculture	Operations undertaken for profit and with the objective to sell the harvest on the market through direct contracts, wholesale, auction, or other forms of trade. Jobs in commercial fishing comprises both industrial and small-scale fisheries.
4	Fisheries management	Jobs involving incorporated process of information collection, analysis, planning, and decision-making, resources allocation, and planning and enforcement of fishery regulations to ensure the continued productivity of the living resources.
6	Fish Farmers	<p>Fish farm workers help to breed and rear fish in ponds, tanks, cages or nets in the water. Most fish are farmed for food, but some are bred for angling or for ornamental ponds. They are also called fish husbandry workers or fish farm technicians. This will involve creation of skilled and semi-skilled jobs with job descriptions that covers variety of tasks as below:</p> <ul style="list-style-type: none"> ✓ examining and maintaining water quality ✓ feeding fish manually, or through automatic feeding systems ✓ grading fish by size, transferring them to bigger tanks or cages ✓ preventing and treating infection by checking fish for disease ✓ draining, cleaning and also repairing tanks, filters and nets ✓ getting fish ready for sale, gutting them and packing them in ice for transport ✓ Buildings and equipment maintenance.
7	Aquaculturist	<p>Aquaculturists will assist with all aspects of fish husbandry, including feeding, grading, and movement of fish, as well as water quality monitoring and inventory management. They will also:</p> <ul style="list-style-type: none"> ✓ Train and oversee aquaculture and fish hatchery support workers ✓ Gather and record growth, production and environmental data ✓ Administer and supervise stock examinations for diseases/parasites ✓ Sort different types of breeding stock, manage incubation and short-term rearing of fish in net pens or small ponds ✓ Handle and oversee maintenance of facility and equipment ✓ Assist with planning facilities and manage automated building and equipment control systems ✓ Assist those interested in aquaculture to develop commercially viable aquaculture systems ✓ Design, oversee and conduct biological studies on aquatic resources. Also give technical support for projects with researchers and universities. ✓ Find and treat diseases within fish populations. ✓ Provide guidance for delivering training and information to diverse audiences encompassing farmers, private agencies, educators, etc. ✓ Identify ways to improve processes and systems within the aquaculture and fisheries sectors.
8	Fish processors	This job involved converting raw products into processed, marketable products. They sort fish, tend and operate head and gut machines, inspect the products, load and unload freezers, weigh, and package and label the product, and load/unload the product and other supplies. Processors may work in any of a number of areas of the operation including the factory, the freezer containers, etc.

Source: Food and Agriculture Organization of the United Nations (2016) Scoping study on decent work and employment in fisheries and aquaculture: Issues and actions for discussion and programming. [Online] Available at: <http://www.fao.org/3/i5980e/i5980e.pdf>; <https://www.agcareers.com/career-profiles/aquaculturist.cfm>

6.3.4.3 Livestock

Due to Sri Aman’s vast land areas, there is high potential for the livestock industry to be developed, not just for local but also international markets. The use of modern high-technology processes will also mean the potential of high-skilled job creations for the local communities. Compared to chicken and pig rearing, ruminant livestock such as sheep, goats and cows tend to be more directly dependent on the environment in which they are being reared for feed resources. Thus, workers in ruminant livestock will need to be knowledgeable on the prevailing environmental conditions compared to workers in chicken and pig rearing. The context is also dependent on levels of capital investment, extent of specialisation and whether these livestock are reared on feedlots/grassland or whether they are part of a mixed crop-livestock farming systems. Based on the value chain of the livestock business model, future jobs can come from any of the following processes and operations:

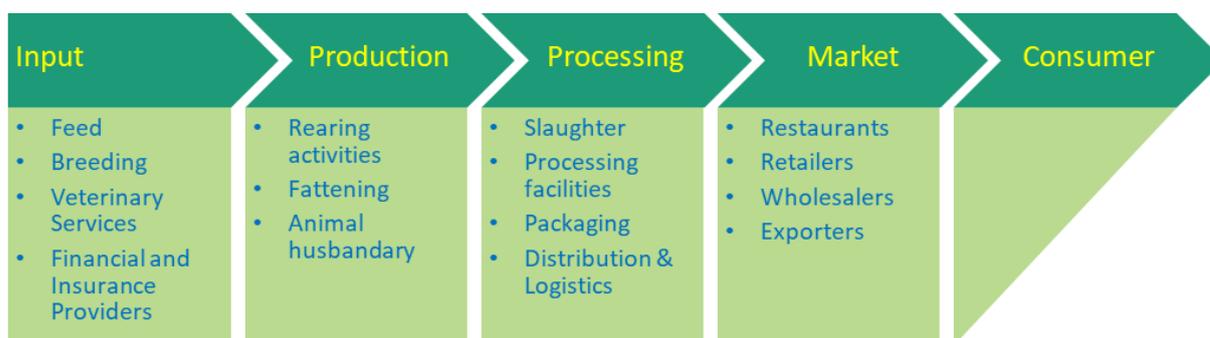


Figure 6-8: Livestock Value Chain and Potential Jobs Creation

Source: UNIMAS Holdings Analysis

Generally, future jobs that will be available for Sri Aman will encompass the above value chain, notwithstanding whether its cattle, sheep, goat chicken, swiftlet, or pig rearing:

Table 6-20: Future Jobs in Livestock

Future Jobs in Livestock Value Chain	Job Titles	Job Descriptions
<p>Primary Production:</p> <p>Jobs that focus on livestock production support services that will improve livestock survival, health and also conserve the environment and grazing land ecosystems</p>	Animal Breeders	Select and breed animals such as cattle, goats, sheep, swine, or poultry according to their genealogy, characteristics, and offspring. Should have knowledge of artificial insemination techniques and equipment use. May require keeping records on heats, birth intervals, or pedigree.
	Veterinarians	Inspect, diagnose, treat, or research diseases and injuries of livestock.
	Livestock Supervisors or Foremen	Plan, supervise, or coordinate the operation of livestock operations and establishments. May recruit, train, and oversee workers to do the operational. May involved in financial and marketing activities.
	Skilled livestock farmworkers	Jobs that involve attending to the livestock using modern equipment and tools. Require knowledge of raw materials, production processes, quality control, costs, and other techniques for maximizing the effective management and distribution of livestock products.
	Farm Equipment Mechanics and Service Technicians	Service, repair, or refurbish farm machinery and vehicles, such as tractors, dairy equipment, irrigation systems etc.

Future Jobs in Livestock Value Chain	Job Titles	Job Descriptions
<p>Route to Market:</p> <p>Jobs that will lead to value-added components that can increase efficiency and quality to meet market requirements, this involved the processing and distribution of livestock and its related products such as dairy and processed products etc.</p>	Livestock product processors	Jobs related to specialized slaughtering tasks adhering to the halal & international standard, skills in cutting standard or premium cuts of meat for marketing, making sausage, or wrapping meats.
	Inspectors	Inspect livestock and products, processing equipment, process and facilities, to ensure compliance with rules and regulations, governing health, quality, and safety.
	Transportation, Storage, and Distribution Officers/ Managers	Plan, guide, or coordinate transportation, storage, and distribution activities in compliance with company policies and relevant government laws and regulations. Includes logistics tasks.
	Supply Chain Specialists	Coordinate purchasing, warehousing, distribution, or budgeting activities for optimum efficiency and minimize cost. Oversee inventory movement, storage and processing.
<p>End Market:</p> <p>Keeping abreast and adoption of latest technology and market-driven trends to satisfy customer needs and preferences, such as health-food, promoting food safety standards etc.</p>	Buyers and Purchasing Agents	Plan, direct, or coordinate activities of an organization or department that provides lodging and other accommodations.
	Online-Business specialists	Directly supervise and coordinate work activities of cleaning in homestays, campsite, motels, hotels, and other establishments.
	Market Research Analysts and Marketing Specialists	Plan, direct, or coordinate activities of an organization or department that provides lodging and other accommodations.
	Livestock photographers and videographers	Take visuals and photographs of livestock and products to be displayed online and in print for promotional purposes

Source: UNIMAS Holdings

6.3.4.4 Tourism

Eco-Tourism encompasses all aspects of nature-based tourism in which tourists' primary motivation is to experience and appreciate nature as well as the traditional cultures that exist in a natural environment. The focus is not only to deliver economic benefits but also the conservation of the natural environment for those locations. For Sri Aman, this is going to be done through developing hybrid agriculture and tourism offerings. This will closely relate to the value chain such as depicted:

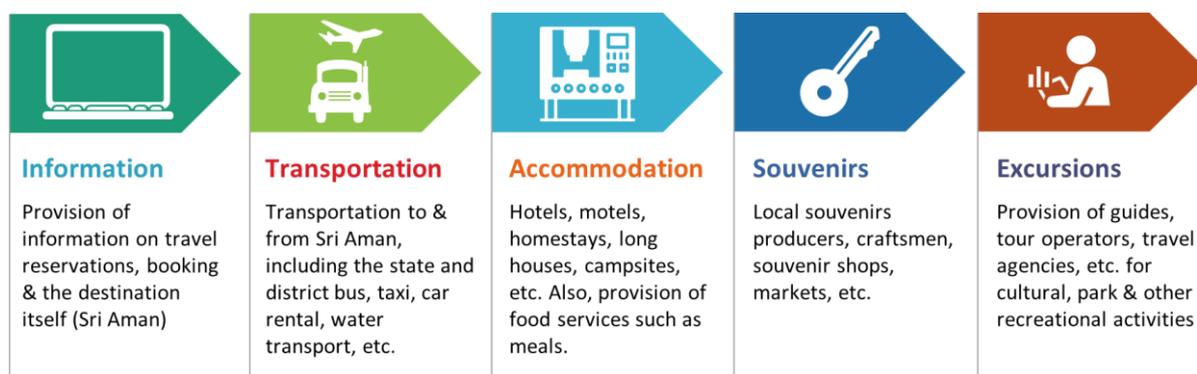


Figure 6-9: Tourism Value Chain and Potential jobs Creation

Source: UNIMAS Holdings

Many stakeholders will be involved in the development of the tourism industry in Sri Aman. Both the expansion of the upstream and downstream operations will result in a high number of new jobs being created. With the advent of high-technology applications and the adoption of augmented realities especially in the marketing of the tourism products, this will mean the spill-over effects in terms of future jobs will be experienced in other sectors too, such as within the ICT and business services sector. With this in mind, below are the actors and potential jobs from the eco-tourism:

Table 6-21: Future Jobs in Sri Aman's Tourism Sector

<i>Future Jobs in Tourism Value Chain</i>	<i>Job Scopes</i>	<i>Job Descriptions</i>
<p><i>Product design and development: This activity entails the conceptualizing of new or improved tourism product offering, jobs in enhancing tourism offering, and testing their acceptability in the market. These jobs also involve brand planning, pricing structure and expanding the ranges of the various elements of the tourism packages.</i></p>	Tour Operators	Job involving designing, organizing and promoting tourist excursions and expeditions for individuals and groups. Conduct research on tourist sites, environmental conditions and relevant matters that can affect the tourism offering
	Travel agents	identify a specific element of the total ecotourism product and develop a product offering.
	Ecotourism specialists	This type of jobs will involve working directly with the tourists, and/or assisting conservation area personnel. Their skills will be required to help eco-tourism groups, industry players and local communities in creating eco-tourism packages that is sustainable and eco-friendly.
<p><i>Promotion and Distribution: This activity involves communicating the tourism products/offering to the target markets and managing the promotional channels that bring the customers in contact with the tourism offerings.</i></p>	Online marketing jobs	Developing and maintaining websites and other media, promote the tourism product that is on offer.
	Finance Officers	Job encompassing financing matters, budgeting, maintaining payment systems & bookings
	Commercial photographers and graphic artists	Take visuals and photographs of tourism services and products to be displayed online and in print for promotional purposes
	Advertising agencies jobs, copywriters, commercial photographers, graphic artists.	These jobs are responsible in marketing and advertising activities that appeal to the target audience. Skills in using latest technology and digital applications are also crucial. Various career options in this field, such as graphic designers that put together visuals for physical, print & online advertisements, copywriters to write print and online ads, etc

<i>Future Jobs in Tourism Value Chain</i>	<i>Job Scopes</i>	<i>Job Descriptions</i>
<p><i>Inbound Transportation:</i> These jobs’ scopes focus on moving the visitors to the tourism destination. Given the location of Sri Aman, domestic transport element is important, where the main modes of transport include land and river.</p>	Reservation and transportation handling personnel	At management level, these jobs centred on liaison and coordinating tasks to ensure smooth and efficient operation. At operational level, jobs examples include making and reservations for transportation or accommodation, or selling transportation tickets. May contact individuals and groups to inform them of package tours; or provide tourists with travel or transportation information.
	Rental services jobs	Jobs involving rental of vehicles for tourism excursions such as bicycles, boats, cars etc.
	Lodging personnel	Plan, direct, or coordinate activities of an organization or department that provides lodging and other accommodations.
<p><i>Accommodation and Catering:</i> This involved handling the provision of paid accommodation, which may or may not, include food services for a fee. The type of accommodation includes hotels, homestay, inns, Bed & Breakfast (B&B), guesthouses, resorts, apartments, campsites, etc. Jobs within the catering activities involves providing food services for a fee, which includes meals and snacks.</p>	Housekeeping and Maintenance Jobs	Directly supervise and coordinate work activities of cleaning in homestays, campsite, motels, hotels, and other establishments.
	Guest Relations Service jobs such as Homestay, resorts, or B&B representatives	Plan, direct, or coordinate activities of an organization or department that provides lodging and other accommodations.
	Front Desk jobs, Front Office agents	Front office personnel involved dealing directly with customers since they are the first point of guests/visitors contact. Their main responsibility is to assist guests to settle in and accommodate guests’/visitors’ needs within the duration of their stay.
	Cooks	This position encompasses a wide food sector to choose from, ranging from preparing and cooking for accommodation’s guests, contract catering in parks/tourists’ sites, or within the retailing value chain.
<p><i>Excursion:</i> This jobs scopes involve planning and conducting activities, which includes ground transportation to the tourist attractions as well as any associated leisure, sporting, sightseeing, or educational activities.</p>	Recreational workers, Excursion/Activities Attendants/ Operators	Jobs involve managing the daily operations of the leisure and recreational facilities. Assist patrons at tourist sites and may schedule use of recreation facilities, maintain and arrange equipment to be used by guests of sporting events, leisure or recreational activities etc.
	Tour guides	Manage the ecotourism activities, which in include outdoor adventure guides, etc.
	Community-Based Ecotourism Jobs	Jobs that involved community outreach. Providing tourists with an understanding of the environmental characteristics of Sri Aman’s interesting locations. Ensure adherence to capacity and environmental standard so negative impacts can be control.
	Cultural services jobs	This includes jobs within the cultural services, entertainment activities, historical sites, nature reserve activities performing arts, etc. This includes doing customer preference assessment, meeting quality standards for services, and evaluation of customer satisfaction.
	Rental services jobs	Renting and leasing of recreational and sports goods
	Tourism Retail jobs	Jobs within the handicrafts retail outlets, duty free shops, souvenirs shops and other specialized retail trade of tourism characteristic products.

<i>Future Jobs in Tourism Value Chain</i>	<i>Job Scopes</i>	<i>Job Descriptions</i>
	Miscellaneous Tourist Services	Include services that cater to tourist needs such as travel insurance; finance services, goods delivery and other products/services that specialize in tourist markets

Source: UNIMAS Holdings

6.3.4.4.1 *Potential Jobs within the excursion, accommodation, and catering services*

Excursion, accommodation, and food catering are an important element in ecotourism. These tourism components will require a large number of young workers, with a high proportion of part-time, seasonal and casual workers than other tourism components. Since the tourists are expected to come from all walks of life, this component of the tourism will offer potential jobs based on the tourism package and value chain actors below:

Table 6-22: Components of Ecotourism Excursion Activities and Relevant Value Chain Actors

Excursion Element	Comments	Value Chain Actors
1 Ground Transport to Attraction	Dependent on attraction's location and visitor's point of origin. At the minimum, the attraction may be walking distance from visitor's accommodation. Visitors on independent tours may walk / hike, or use bike or car rentals, public transport or hotel shuttles. Visitors on escorted tours may use any of the above or chartered transport arranged by tour guide / tour operator / accommodation provider	Bike or Car Rental Company Taxi / Bus / Boat / Ferry / Plane Company Private Taxi / Bus / Boat / Ferry / Plane Operator Tour Guide Tour Operator
2 Entry Fee / User Fee	Entry / User fee may range from nominal value contributing to operating expenses, to market value contributing to profits	Owner / Manager of Excursion Attractions
3 Tour Guide Fee	Tour Guide Fee may range from hourly rate to standard tour rate. Customised tours at associated rates may also be available.	Tour Guide Tour Operator
4 Rental or Purchase of Excursion-Related Equipment	Rental fee may range from hourly rate to standard tour rate.	Owner / Manager of Excursion Attraction Tour Guide Tour Operator Input Provider (Private Equipment Company)
5 Meals / Snacks / Drinks	Meal options may be included in day-tour price or may be optional add-ons.	Owner / Manager of Excursion Attraction Tour Guide Tour Operator Input Provider (Restaurant, Concessionaire, Food and Beverage Distributors and Manufacturers, Raw Material and Packaging Material Supplier)
6 Souvenirs	Meal options may be included in day-tour price or may be optional add-ons.	Owner / Manager of Excursion Attraction Tour Guide

Excursion Element	Comments	Value Chain Actors
7	Donations	Voluntary contribution to support conservation activities and other operating activities.
		Tour Operator Input Provider (Manufacturers, Raw Materials and Packaging Material Supplier) Owner / Manager of Excursion Attraction

Source: Wilson, S., Sagwan-Alli, I., and Calatayud, A. (2014). The Ecotourism Industry in the Caribbean: A Value Chain Analysis, Inter-American Development Bank Publication.

For Sri Aman, the accommodation and catering side will mainly involve individually or family-owned businesses that will enable more contact between local communities and guests. They mainly be located in the Rumah Panjang, villages etc. In the process of fulfilling the numerous demands of an extensive range of visitors, tourism will create job opportunities based on the different types of accommodations below:

Table 6-23: Accommodation and Catering Options in the Ecotourism Industry and the Relevant Value Chain Actors

Accommodation Type	Comments	Value Chain Actors
1	Open Air / Tents / Campsites	Camping may range from minimalist-type accommodation, with limited amenities to accommodation with a number of amenities. Camping equipment may be rented. Because of remote settings, meals are generally provided or visitors may be involved in meal preparation as part of the experience. Accommodation option may be advertised on excursion attraction website or by travel agent, tour operator or tour guide.
		Owner / Manager of Excursion Attraction Tour Operator Input Provider (Private Company Renting Equipment, Food and Beverage Supplier)
2	Host Homes	Visitors stay in accommodation provided by local community residents. Meals are generally provided or visitors may be involved in meal preparation as part of the experience or not included in accommodation fee. Accommodation option may be advertised on excursion attraction website / host community website or by travel agent or tour operator.
		Private Host Home Owner Local Community Tour Operator Input Provider (Food and Beverage Supplier)
3	Specialist Eco-type Communal Accommodation	Tour group uses shared accommodation, inclusive of sleeping quarters, eating areas and toilet and bathing facilities. Meals are generally provided or visitors may be involved in meal preparation as part of the experience. Accommodation option may be advertised on specialist or mainstream travel website, communal accommodation website or by travel agent, tour operator or tour guide.
		Owner / Manager of Excursion Attraction Accommodation Provider Travel Website / Travel Agent / Tour Operator Input Provider (Food and Beverage Supplier)
4	Specialist Eco-type Private Accommodation	Private accommodation. Inclusive of sleeping quarters, and toilet and bathing facilities.
		Accommodation Provider Travel Website / Travel Agent / Tour Operator

Accommodation Type	Comments	Value Chain Actors
	Catering options may range from self-catering to all food and beverage provided. Accommodation option may be advertised on specialist or mainstream travel website, accommodation website or by travel agent, tour operator or tour guide.	Input Provider (Food and Beverage Supplier)

Source: Wilson, S., Sagwan-Alli, I., and Calatayud, A. (2014). *The Ecotourism Industry in the Caribbean: A Value Chain Analysis*, Inter-American Development Bank Publication.

6.3.4.5 Manufacturing

Manufacturing has been pinpointed as a high growth potential for skilled-jobs creation. Future jobs in Sri Aman's manufacturing sector will mainly be driven by the expansion in the agriculture, aquaculture and fisheries upstream value chains. Taking this into account, the labour composition within the food manufacturing segment is predicted to be as follows:

Table 6-24: Labour Composition for the Manufacturing of Food-Related Products

Labour Composition	Percentage (%)
Food preparation assistants	39
Cleaners and helpers	21
Business and administration associate professionals	14
Food processing and related workers	8
Sales workers	4
Personal services workers	3
Services managers	2
Hospitality, retail and other services managers	2
Office clerks	1
Hospitality and related services professionals	1
Others	5

Source: UNIMAS Holdings Analysis

The above labour composition means that high numbers of semi-skilled and skilled employees will be needed to develop the food processing and food packing segments. With the adoption of Industry 4.0, this will radically change the job environment on how the manufacturing employees perform their tasks and responsibilities. Entirely new jobs will be generated that will require very different skill requirements, while certain positions especially unskilled job categories will become obsolete. Based on the consultants' estimation, the entry-level employees currently lack skills in the following areas:

Table 6-25: Skill Gaps of Entry-Level Employees within the Food-Related Manufacturing

<i>Skill Gaps of Entry-Level Employees</i>	<i>Percentage (%)</i>
<i>Technical skills</i>	35
<i>Skills to operate computer-based machinery</i>	27
<i>Mathematical skills</i>	35
<i>Critical thinking</i>	35
<i>Creative/innovative thinking</i>	35
<i>Problem solving skills</i>	30
<i>Project management skills</i>	32
<i>Communication skills</i>	35
<i>Ability to work independently</i>	32
<i>Team work</i>	40

Source: UNIMAS Holdings Analysis

The labour composition above will also take into account the need for the setting-up of Collection Processing & Packaging Centres (CPPC). These CPPCs will lead to job creation in various categories such as [i] Sorting & grading, [ii] Processing, [iii] Packaging, [iv] Palletizing, [v] Cold Chain services, [vi] Retail & export management, and [vii] Distribution. Potential workers that have ICT skills will also be needed as the CPPCs will act as one-stop centre for certification services such as GAP and HACCP, custom documentation, information and advisory services, and GAP and HACCP certification and accreditation. The CPPCs in Temudok and Lachau will also be linked to the exchange portal to trading houses, supermarkets, exporters etc for efficiency, production planning, trading, inventory control etc. With this in mind, the future jobs in the manufacturing sector (such as in the CPPCs, for instance), will involve manpower that have the following knowledge and skills:

Table 6-26: Future Jobs in Sri Aman's Digitalized Manufacturing Sector

<i>Future Jobs that require knowledge in:</i>	<i>Description</i>
<i>Additive Manufacturing (AM)</i>	With job holders' ability to create customized physical models and apply them directly for use in the farms, AM brings creativity to the agricultural sector. This includes the food preparation operations. It also enables workers to design/produce innovative food products such as chips, coffee, kerepek etc as per the required amount of ingredients, color and shape. It enables testing of design before the actual production in the factory. Farmers will be able to obtain ergonomically useful and custom-made tools based on their requirements in terms of shape, size, and design.
<i>Artificial intelligence (AI)</i>	Jobs based on the application of machine learning to develop computer programs that can train actuator/robot to perform a duty as described by the programmer. AI technology can be used to build a smart plant factory, in which data from supply chains, design teams, production lines and quality control are linked to form a highly integrated and intelligent system.
<i>Big data analytics (BDA)</i>	Skills in the analysis of data collected by sensors and observe the trend of the data to make real-time decision. BDA can be applied to improve product quality, energy efficiency and perform predictive maintenance.
<i>Advanced materials</i>	Development of new materials and nano-structures components with better durability and strength. For example, material with good shape retention and thermoelectric efficiency.
<i>Internet of things (IoT)</i>	IoT is the platform which connect different sensors at one time. Jobholders with this IoT skills can be combined AI and big data to develop autonomous systems which can transform crop production.
<i>Autonomous robots</i>	Jobholders that have the ability to develop this robotics can greatly reduce the need for unskilled labour in the production lines. Autonomous robots can

<i>Future Jobs that require knowledge in:</i>	<i>Description</i>
	perform their jobs based on the prescribed order programmed to them. Autonomous robot can think, act and react autonomously similar to common human movements.
<i>System integration</i>	System integration is created to share the data and information amongst the industry players. The system exists within the industry value chain and also across multiple value chains.

Source: Lazim, Rabiah, Nawi, Nazmi, Masroon, Muhammad, Abdullah, Najidah, and Iskandar, Maryani. (2020). Adoption of IR4.0 into Agricultural Sector in Malaysia: Potential and Challenges. *Advances in Agricultural and Food Research Journal*. 1. 10.36877/aafmj.a0000140.

The digitalization of the manufacturing sector will enable sectoral linkage and support services between the food-processing industry and other related industries. For instance, local manufacturers of machineries will be able to collaborate with the agriculture and aquaculture industry players to customise their machines and equipment. Furthermore, the tourism and food products manufacturer will make use of the packaging industry to develop their brand and utilise up-to-date technologies to meet the changing customers expectation and preferences.

6.3.4.6 Business and Digital Services

In addition to the manufacturing sector that utilises high-technology production processes, skills in ICT will also be needed within the business and administrative services such as finance, insurance, and business endeavours that create linkages between the various productive sectors such as agriculture, tourism etc. These forward linkages or downstream services indicate the importance of the business services as a supplier of support services and reflect the potential of multiplier effects of this industry to Sri Aman's economy. Financial, insurance, IT, professional (such as real estates, architecture, engineering, surveying, legal etc), wholesale and retailing will pose the strongest support services to the productive sectors. For future jobs listed below, their demand will encompass different levels such as: [i] managerial and professional, [ii] technical and supervisory, [iii] clerical workers, and [iv] general workers.

Table 6-27: Future Jobs in the Professional Services

Accredited Professional Services	Non-accredited professional services
<ul style="list-style-type: none"> • Legal • Accounting • Architectural • Engineering • Surveying consultancy services 	<ul style="list-style-type: none"> • Market research services • Management consultancy (IT, financial management, feasibility study services, strategic planning, business process re-engineering, risk management, & other advisory services) • Marketing and Advertising services • R&D services • Energy services (energy sources, including petroleum, natural gas, renewal energy) • Environmental services (treatment of waste water, waste handling, air pollution control, treatment & disposal of toxic and hazardous waste, etc.) • Education and training services

Source: UNIMAS Holdings Analysis

With the increase in the number of industry players and investment, there is going to be a critical need for environmental services to ensure that firms adhere to the use of clean and efficient production technology that is in-line with the SDG policy. The potential of professional services expanding,

especially in finance & R&D, is high as industry players focus on business expansion, and product development and innovation, as well as expanding into downstream activities. Below is the type of jobs that will be in demand, and the skills needed to fill the digital business services' employment landscape:

Table 6-28: Future Jobs in the Digital Business Services

<i>Domain</i>	<i>Job Title</i>	<i>Job Descriptions</i>
<i>Finance and Accounting Process</i>	Financial Analyst	<ul style="list-style-type: none"> • Conduct complex financial analysis and forecasting • Monitor financial performance and costs • Provide analytic support to business initiatives • Support policies and process improvement • Record to Report includes transactional General Ledger management, inventory, fixed assets, intercompany and month end closing process and reporting.
	Risk Management Analyst	<ul style="list-style-type: none"> • Monitor market and liquidity risk exposures • Ensure risk policies comply with internal procedures and regulatory guidelines • Perform market-to-market valuation for treasury portfolios • Identify risk profile and conduct SWOT analysis/ impact assessment • Support policies and process improvement
	Investment Analyst	<ul style="list-style-type: none"> • Review feasibility studies that include projected financials and prepare investment recommendation reports • Conduct complex financial analysis and forecasting for prospective investment • Engage in financial optimization modelling / analysis • Perform quantitative analysis including portfolio valuation, comparable company analysis, value driver analysis and performance attribution analysis
<i>Content Moderation</i>	Associate / Specialist	<ul style="list-style-type: none"> • Responsible for user-generated content submitted to an online platform. • The content moderator's job is to make sure that items are placed in the right category, are free from scams, doesn't include any illegal items, and much more. • Understanding client policies and guidelines, and making decisions based on them • Reviewing user reports regarding website content • Liaising effectively with other internal and client teams.
<i>Sales and Marketing</i>	Marketing Specialist	<ul style="list-style-type: none"> • Contributing to the development of marketing strategies. • Conducting marketing research on rival products or services. • Designing and implementing marketing plans for company products or services. • Tracking sales data to ensure target achievement.
	Customer Services Associate / Specialist	<ul style="list-style-type: none"> • Answer incoming phone calls and provide support to callers. • Maintaining a positive, empathetic and professional attitude toward customers at all times. • Handling customer enquiries and feedback for further action. • Communicating with customers through various relevant & appropriate channels (e.g., social media, telephone, email, etc) • Acknowledging and resolving customer issues by acquiring sufficient product knowledge.
<i>Backoffice Support</i>	Associate / Specialist	<ul style="list-style-type: none"> • Gathering and processing data. • Performing basic admin duties e.g., printing, sending emails, documentation etc • Assisting and coordinating with other teams.

<i>Domain</i>	<i>Job Title</i>	<i>Job Descriptions</i>
		<ul style="list-style-type: none"> Organizing meetings. Assisting and supporting management.
<i>Engineering and Technical Support</i>	RPA Program Manager	<ul style="list-style-type: none"> Mapping end-to-end business processes and identifying opportunities for automation. Designing, testing and launching RPA solutions. Training users in RPA technologies and best practices. On-going maintenance and enhancement as and when required. Developing Centre-of-Excellence capabilities for clients, helping client to implement long-term RPA strategies.
	Associate / Specialist / IT Helpdesk	<ul style="list-style-type: none"> Try to diagnose tech issues and ways to fix various problems. Raise ticket for problems that cannot be resolved & to escalate to the relevant team. Database maintenance. Maintain log call according to time and date. To handle enquiries made through chatbot, phone, chat and emails.
<i>Human Resources</i>	Associate / Specialist	<ul style="list-style-type: none"> Communicate personnel policies. Compile employee report. Assist in arranging training activities. Update database with new hires' data. Prepare documentations including employee files, payroll processing, records, etc. Assist in administering employees benefit program and activities.

Source: UNIMAS Holdings Analysis

As the needs for a qualified and trained workforce increase, the education and training service sub-sectors will also play an important role in ensuring the number of skilled workforces are enough to meet industry's needs, especially in the TVET field. International standards and certification are crucial to assist the professional service providers to gain international recognition and to export their products that meet global standards. Workers that have qualification and knowledge in managing global supply chains are also predicted to be in high demand.

6.3.4.7 Final note on future jobs in Sri Aman

In summary, although there is a high number of potential jobs that could be generated due to the adoption of digital technology and the incoming of investors into Sri Aman, certain caveats should be exercised. This is because these employment opportunities are based on the premise that a job may be pushed into a more value-added category due to the likelihood that mechanisation, automation or digitalization of the value-chains should have occurred. Given the high financial costs often associated with introducing and implementing new technology, the gap between "could be" and "will be" is likely to be important, particularly early in the development plan. Furthermore, the elimination of particular tasks inside a workplace does not inherently indicate that the job as a whole will be eliminated; it will simply require employees to adjust to new work environments in which they will collaborate with machines and robots. Thus, this differing effect of job replacement versus job creation will ultimately decide what the job scenario will be like in Sri Aman within the next 5 to 10 years.

SECTION 6.4 RECOMMENDATIONS FOR THE SUSTAINABLE DEVELOPMENT OF HUMAN CAPITAL

For the human capital development aspects, there is balanced allocation that ensures all communities within Sri Aman will benefit from these endeavors. The strategies and recommendation for sustainable human capital development encompasses both urban and rural communities. Based on the economic sectors identified to be developed, the HCD strategies will spur the communities towards full employment and increases in living standard through the following strategic thrust:

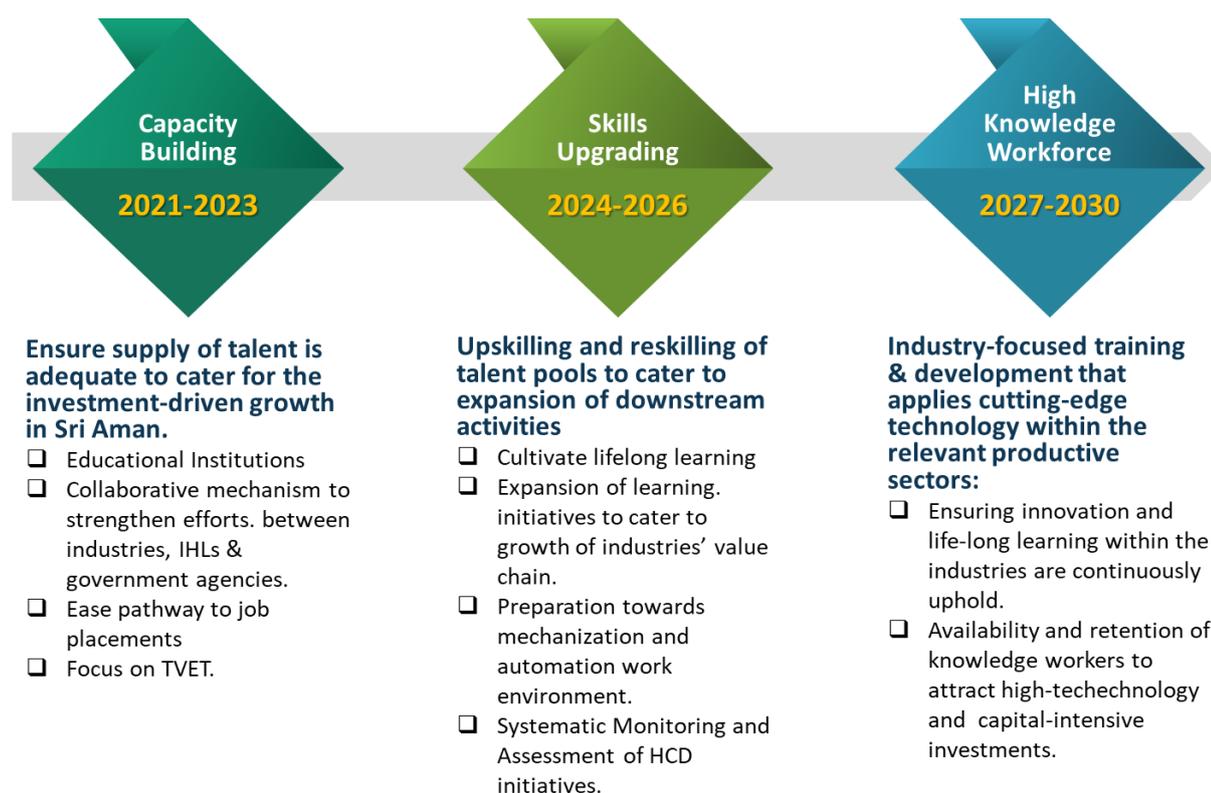


Figure 6-10: Strategic Thrust of Sri Aman HCD

Source: UNIMAS Holdings

For the initial capacity building, the development of early childhood education is emphasized for all the districts (both rural & urban areas) as per section 6.4.1.1. In terms of upskilling and reskilling of Sri Aman talents, the pools initiative suggested in the HCD 's section encompasses all the economic sectors identified by the other consultants. Provision of more scholarships and education-funding programs is also highlighted. This is because current assistance/scholarships mostly cater to tertiary education level, thus a more focused funding/education assistance is needed for the children within the rural communities of Sri Aman that encompasses primary, secondary and tertiary educations. This is to ensure sufficient manpower is available at various level of the business value chain in the productive sectors, and also to discourage the local youths from migrating.

6.4.1.1 Capacity Building

With the current youth outmigration, lack of education establishments such as secondary schools, TVETs and higher learning institutions, there is a need to ensure an adequate supply of skilled workforce for the industries planned for Sri Aman within the next 10 years and onward. As Sri Aman strive for fast industrialization, initiatives on capacity building need to be done in a systematic way. To ensure a sustainable human capital growth, the strategy in capacity building is focused at the pre-employment and during employment stages.

Table 6-29: Capacity Building Stages

<i>Pre-employment</i>	<i>During employment</i>
Increasing the number of pre-schools, maximise the capacity of the primary and secondary schools especially within Sri Aman's rural areas.	Encouraging more employers to undertake on-the-job training for their employees.
Increasing the number of technical, vocational, and community colleges in Sri Aman to provide more opportunities for school leavers to gain relevant skills;	Promoting a culture of lifelong learning to enhance skills and employability.
Creating networks between higher education institutions, alumni, and industry to improve career growth, training, and R&D;	
Strengthening the apprenticeship and internship programme for students at the tertiary level;	Systematic career-pathing and developments by the individual industry players to ensure talent retention among the local youth of Sri Aman
Developing industry-based curricula that are adaptable to the changing needs of industries in Sri Aman.	

Source: UNIMAS Holdings

Currently there is a lack of early childhood education in Sri Aman. The success of any human capital development plan is dependent on fulfilling the development needs of learners at every phase of his/her life. With the increase in the number and quality of childcare facilities, it will also encourage working-age women to enter/re-enter the labour force. This is to ensure all communities have the same opportunities for development, irrespective whether they are located in the urban or rural areas. Investment in early childhood education should take into account appropriate allocation of funding for this human capital formation. Below is the recommendation towards this end:

Table 6-30: Development of Childcare Centres in Sri Aman

Strategic Objective	Development of Childcare centres to address the lack of early childhood education in the Sri Aman Division								
	Strategic Initiative (Program/ Project)	Owner	Location	Budget Estimate (RM)	IMPLEMENTATION/OUTCOME				
					Short Term	Mid-term	Outcome	Long Term	Outcome
				2021 - 2022	2023 - 2025	2025	2026 - 2030	2030	
New Pre school / TABIKA at SPS Batang Ai, Nanga Kumpang, Lubok Antu Town Area, Lubok Subong	KEMAS	Lubok Antu	40 Mil		√	Proper early education			
New Child Care Centre to cater for Governments Servant at Simanggang town	KWKPK / JKMS	Simanggang (Wisma Penyayang)	300,000	√	√	1 CC fully operate by 2025	√	2 CC fully operate by 2030	

TASKA/ TABIKA in rural areas	KPLB/ KEMAS	Bkt. Begunan; Lubok Antu; Balai Ringin	800,000	√	√	1 TASKA/ TABIKA fully operate by 2025	√	2 TASKA/TA BIK fully operate by 2030
New child care center to cater for government servants at Simanggang town.	KEMAS	Simanggang	300,000		/	Proper early care education		
Grand Total			5.4Mil					

Source: SADA Lab and UNIMAS Holdings Sdn Bhd analysis (2020)

To address the mismatch between the current supply of labour and future demand, a comprehensive HC plan that encompasses structured academic-industry collaboration to curriculum development is proposed. Rather than just having the government and large-size companies involved in R&D initiatives, local companies, irrespective of size, should also be assisted so that all stakeholders will focus on R&D efforts to facilitate the shift towards higher value-added activities.

To identify the type and levels of HC supply needed for a sustainable workforce, analysis of the data is segmented by levels of qualifications, educational institutions and field of study. This educational segmentation is as below:

Table 6-31: Educational Institutions and Level of Qualifications

Educational Institutions	Level of Qualifications	Graduates Skill Levels
Public Universities (IPTA)	Certificate, Diploma, Bachelor Degree, Master, PhD	Skilled Graduates: Graduates with DKM, DLKM, Diploma, Degree, Master and PhD qualifications Semi-skilled Graduates: Graduates with SKM, SMK, SKK, and certificate qualifications
Private Universities and Colleges (IPTS)	Certificate, Diploma, Bachelor Degree, Master, PhD	
Polytechnics	Diploma, Advanced Diploma, Bachelor Degree	
Community Colleges	Community College Certificate (SKK), Work Based Learning Diploma, Sijil Kemahiran Khas (SKK) Lifelong Learning (Short Courses).	
Vocational Training Institutions (government, private and industrial)	Sijil Kemahiran Malaysia (SKM), Diploma Kemahiran Malaysia (DKM), Diploma Lanjutan Kemahiran Malaysia (DLKM)	

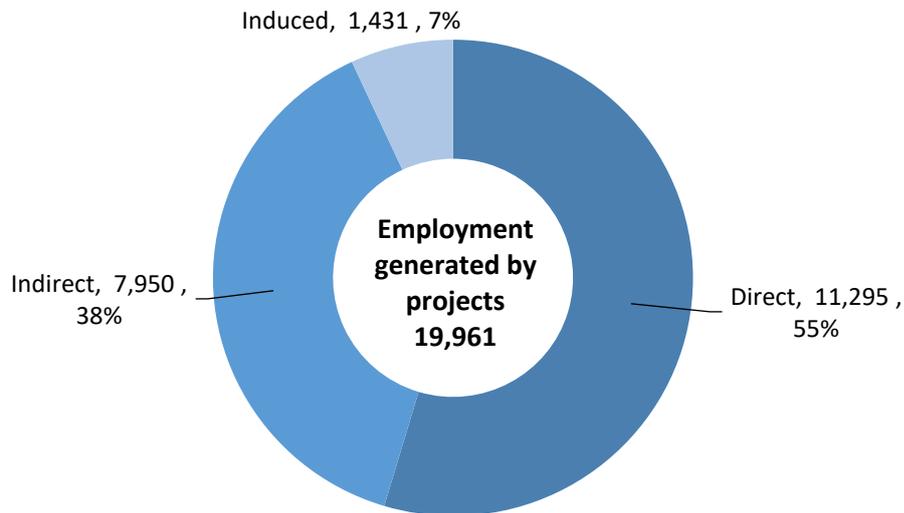
Source: SADA Lab and UNIMAS Holdings Sdn Bhd analysis (2020)

Thus, there is a need to take a holistic viewpoint of both Federal and State level commitment for the development of high knowledge workers that will extend beyond the time-frame of the Master Plan. However, to initiate and propel the momentum towards this objective, the immediate need is towards the setting up of state-based IHLs to trigger the momentum. These state-owned IHLs have the flexibility in introducing academic programs and curricula that can be tailor-made to Sri Aman industries' needs, which are crucial to develop the capacity. Once the number of investors has increased and upstream activities have expanded significantly, then there will be more opportunities for attracting other type of IHLs, that are, public and private federal-owned ones. With this in mind, below are the recommendations for the development of human capital in Sri Aman:

6.4.1.2 Technical-Based Learning Institutions

Based on the proposed projects recommended by the consultants, it is estimated that Sri Aman will be able to generate an additional 19,961 jobs by 2030 (please refer to section 8.2 on the Economic Impact from the Propose Projects). Among the sectors that will have high scalable potentials are agriculture, manufacturing, tourism, services and digital businesses. Out of the 19,961 additional jobs, 55% will

come from direct employment in the various proposed projects within the Sr Aman's economic sectors. About 38% will come from indirect sources, that is, supporting business services. This is followed by induced jobs - occupations that will be created due to the spending by those employees that will be working in the proposed projects. Below is the breakdown of employment (direct, indirect, induced) by 2030:



This indicates there will be a high demand for all levels of workforce, especially within the semi-skilled and skilled categories. Due to the urgency and dynamic nature of the skill requirements within Master Plan's 10-year period, Sarawak-owned educational institutions should be in the forefront to offer training and education from certificate-level onwards. This is because these IHLs can be established faster & curricula can be tailor-made to address the megatrend industries that will be set up in Sri Aman. The IHL that is proposed to spearhead this endeavour is Centex. The second state-owned IHL will be the International College of Advanced Technology Sarawak (i-CATS). Both of these IHLs will involve the development of IR4-based programs that focus on modern agriculture and aquaculture, sustainable eco-tourism, business, digital and ICT educational programs.

In terms of the type of educational programs that will be introduced in these IHLs, they should be tailored to match with the future expansion of Sri Aman economic sectors' value chains. In reviewing the curriculum for long-term future need, the academic programs should tally with those future jobs highlighted in section 6.3.4. (potential future jobs based on sectors). However, for the short-term, there is a need for the IHLs to start small by catering to the immediate need of the industries that are just beginning to set up businesses in this division. Thus, the recommended way forward for these IHLs are discussed below.

6.4.1.2.1 Centre of Technical Excellence (CENTEX)

The Centre of Technical Excellence (CENTEXS), which is a wholly owned subsidiary of Yayasan Sarawak, was established in 2014 to provide technical education to assist in the industrialization of Sarawak's economy. This centre was given the responsibility to train and upskill the young generation to meet the technical needs and requirements of the State's various industries, and to assist its graduates to build a

strong career upon completion of their training. The exceptional aspect of CENTEXS is that almost all its programmes offered international certifications and are developed in close consultation with the State government and direct involvement of industry players in assuring the relevancy of training to meet the demands of the industries and for job assurance. Currently CENTEXS has branches in Lundu, Dalat, Lawas, and Betong. It is recommended that CENTEXS to be established in Sri Aman with details as below:

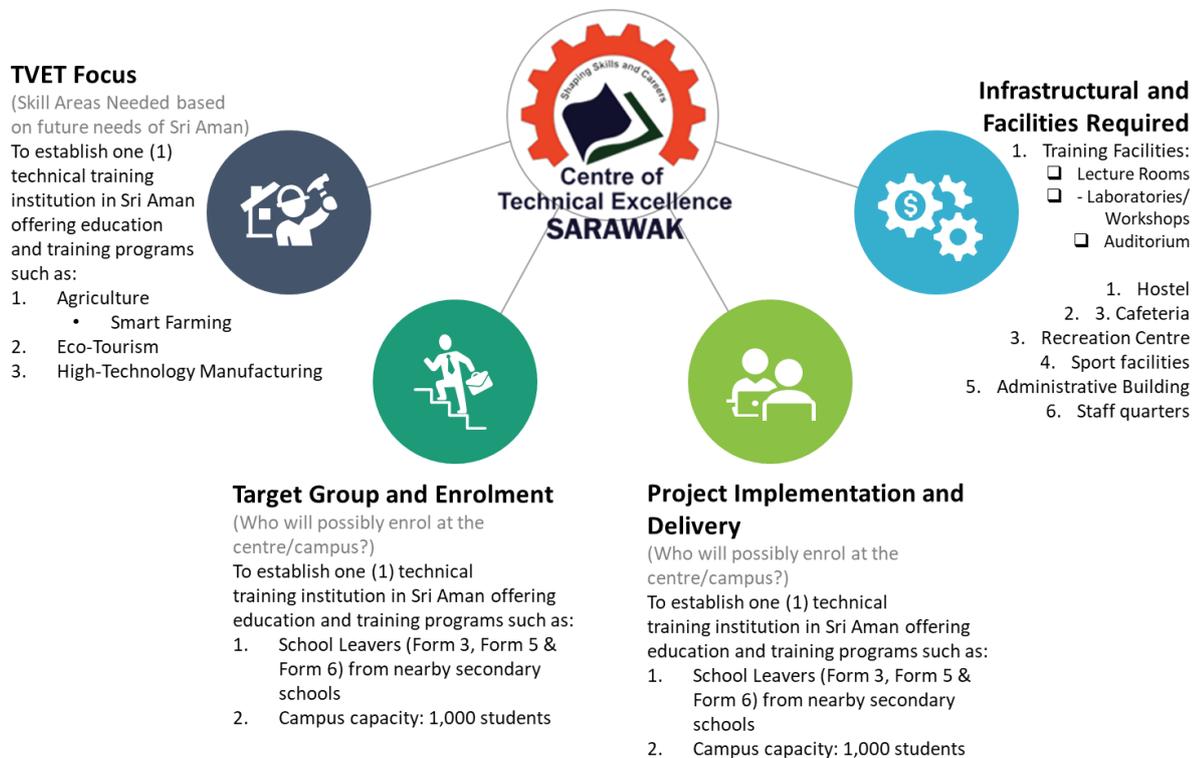


Figure 6-11: Details of CENTEXS Establishment in Sri Aman

Source: UNIMAS Holdings

The establishment of CENTEXS in Simanggang would likely start relatively small, taking into account the corresponding number of investors coming into this division. The types of courses being offered should match the growth of the downstream value chains as identified in section 6.3.4 on future jobs. It was proposed that CENTEXS should open a learning center in Simanggang by renting strategically located shophouses so that the business model highlighted in Figure 6-11 can be operationalize effectively.

With the presence of CENTEX in Sri Aman, this will also kickstart the collaborative endeavours between industry, IHLs and government agencies as currently CENTEX has a strong framework in place as shown below:

Table 6-32: CENTEXS Ongoing Industrial Collaborations

List of Industrial Collaborations with CENTEXS and how they operate.

<p>Digital Academy</p> <ol style="list-style-type: none"> a. Digital Hardware: Huawei Technologies b. Immersive Technologies: EON Reality c. Internet of Things: Keysight Technologies d. Industry 4.0: Bosch Rexroth <p>Partnership with Technology Partners: Equipment and Train the Trainers (TTT) programmes. Industry Certification: Competency certification and/or joint Certification.</p> <p>Technical and Heritage</p> <ol style="list-style-type: none"> a. Oil and Gas: MIWT Global Resources Sdn Bhd, Amaida Resources Sdn Bhd & Serba Dinamik Sdn Bhd b. Electrical and Port: Pusat Latihan Proaktif Sdn Bhd c. Construction: Zwageri Sdn Bhd d. Hospitality: Blue Point School of Hospitality & Culinary Arts & Roszall Beauty Academy

e. Fashion Technology & Heritage: Arena Cipta Classic Sdn Bhd & Asia Pacific Professional Development

Partnership with local industry: Trainers, equipment and consumables.

Industry Certification: Competency certification (International certification, national certification and local certification)

Source: CENTEXS

6.4.1.2.2 International College of Advanced Technology Sarawak (i-CATS)

I-CATS is wholly owned by PPKS Ilmu Sdn Bhd, a subsidiary company of the Sarawak Skills Development Centre (SSDC). This college adopts an industry-based curriculum, developed by the i-CATS academic team in collaboration with leading industrialists. This will ensure that the students attain the relevant technical and soft skills to succeed in careers within the IR4 business ecosystem. Currently, there are a lot of opportunities for i-CATS students to earn recognized post-secondary and tertiary-level qualifications. The wide range of courses covers the broad spectrum of Business Administration, Engineering, Information Technology, Nursing, Plantation Management and Tourism. Their academic staff are professionals who have a combination of academic and industry credentials. They adopt a hands-on learning approach, which will enable their students to excel in technical and vocational fields.

Table 6-33: Estimated Cost for Setting up I-CATS Branch in Sri Aman

No.	Facilities and Equipments	Unit	Cost (RM)
1	Computer Lab	4	400,000
	Plantation Lab	2	400,000
	Smart Classroom	8	600,000
	Admin Office	1	150,000
	Hostel	1	600,000
	Electrical Labs	2	1,550,000
	Seminar Room (60 pax)	3	300,000
	Building Construction and Acquire Land		6,000,000
	TOTAL		10,000,000
No.	Human Resources	No.	Annual Cost (RM)
2	Lecturers	18	700,000
	Lab Assistants	3	80,000
	Admin Staff	3	100,000
	Branch Campus Director and Management Team	3	180,000
	TOTAL		1,060,000
No.	Marketing and Internet	Annual Cost (RM)	
3	Marketing and Promotion	200,000	
4	Internet Dedicated Line	240,000	
	TOTAL	440,000	
No.	Enrolment Forecast for 10 Years	No. of Students	
5	1	75	
	2	150	
	3	225	
	4	225	
	5	300	
	6	300	
	7	300	
	8	375	
	9	375	
	10	375	

Source: UNIMAS Holdings

For the first year of operation, ICATs will be offering academic programs that cater to the needs of the industry players that are undergoing business expansion in Sri Aman. These courses include both bachelor and diploma programs, details as below:

Bachelor Degree Programs: -

1. Bachelor of Business Administration (Hons.) Major in E-Commerce
2. Bachelor of Software Engineering (Hons.)
3. Bachelor of Tourism and Hospitality (Hons)
4. Bachelor of Agriculture Management (Hons)

Diploma Programs: -

1. Diploma in Civil Engineering
2. Diploma in Mechanical Engineering
3. Diploma in Electrical Engineering (Power)
4. Diploma in Software Engineering
5. Diploma in Business Administration
6. Diploma in Accounting
7. Diploma in Hotel Management
8. Diploma in Culinary Arts
9. Diploma in Plantation Management
10. Foundation in Management

ICATs should also promote flexible admission system based on Accreditation of Prior Experiential Learning (APEL.A) to enable candidates who do not have the necessary academic credentials be enrolled to pursue its programmes. Flexible learning environment such as day-release or work-based learning should also be enhanced to enable those who are working to continue their studies. Mobility or progression from diploma to degree programmes within the institution should also be further facilitated.

6.4.1.2.3 Sarawak Skills Development Centre (SSDC)

Other than Centex and ICATS, it is also proposed that Sarawak Skills Development Centre (SSDC) to be set up in Sri Aman. SSDC is a training and education provider that receives funding from the state government in the form of infrastructure and an annual operating grant, as well as federal funding in the form of student grants and loans. Since its inception 26 years ago, SSDC have been among the leading provider of TVET education in Sarawak. This can be seen from its branch campuses in Miri, Mukah and its subsidiaries – the International College of Advanced Technology Sarawak (i-CATS), Automotive and Welding Institute of Sarawak (AWISAR), Sarawak Electrical Industry Training Institute (SEITI), Sarawak Agriculture Vocational Training Institute (SAVTI) and PPKS Private Vocational College. Among the milestones of SSDC include:

- Approved Training Centre for Centre of Excellence in Technology (COET) – National Empowerment in Certification and Training for Next Generation Workers (NECT-Gen – Industry 4.0)
- Approved International Accredited Centre by Jabatan Pembangunan Kemahiran (JPK) for Diploma in Computer System
- Winner of Human Resources Development Award 2015 (Training Provider Category) by Ministry of Human Resources Malaysia
- Main organizer of the World Technical Vocational Education and Training (TVET) Conference 2015 in collaboration with the International Vocational Education and Training Association (IVETA) and the Sarawak State Government
- More than 61,000 graduates since 1994
- 16 programmes with 5-Star and 4-Star Rating from the Department of Skills Development Malaysia (Jabatan Pembangunan Kemahiran)
- Employability rate of 90% within 6 months after graduation
- Strong support from Sarawak Skills’s Members, comprising 69 members from various industries.
- Collaboration with international and local learning institutions
- Appointed Private Vocational College by Ministry of Education

- Main organizer of the Technical Vocational Education and Training (TVET) Symposium 2019
- Winner of Chief Minister’s Industry Excellence Awards 2019 (Sarawak Business Federation Recognition Award)
- Approved training provider for HDRF SME Skills Scheme in Sarawak
- Received Gold Award for Successfully Completing Annual Quality Environment Challenge 2020

Thus, with such a distinguished track record, the opening of SSDC would cater to the needs of skilled staff within the focused industries. The programs proposed are as below:

Proposed Programme & Certification		
Programme	Certification	Duration
Electrical	Wireman G2 -EIU	Min 32 hours (Min : 7 days; Max : 40 days)
Short Courses	Short Courses – Electrical/Solar/HVAC/IT/Network	2 to 3 days
Welding (3G & 6G)	JPK/TWI	6/9/18 months
Oil Palm / Agriculture	JPK/MPOB	12 months

The cost for setting up SSDC is as below:

Table 6-34: Estimated Cost for Setting up Sarawak Skills Development Centre in Sri Aman

No.	Estimation of Investment (Using Shophouses)	Cost (RM)
1	Training Equipment, Material & Consumables	3,000,000
	Building Construction	8,000,000
	Acquire 10 acres of land for building and agriculture	2,000,000
	TOTAL	13,000,000
No.	Estimation of Annual Operating Cost	Annual Cost (RM)
2	Admin Staffs & Trainer (RM 35k/month)	420,000
	Utilities expenses (RM20k/month)	240,000
	Internet dedicated line(RM 20k/month)	240,000
	Marketing & Promotion	200,000
	TOTAL	1,100,000
No.	Enrolment Forecast for 10 Years	No. of Students
5	1	190
	2	200
	3	200
	4	300
	5	300
	6	300
	7	300
	8	400
	9	400
	10	400

Source: UNIMAS Holdings

6.4.1.3 Develop Collaborative R&D Hub Between Universities and Industries

Within the duration of the Master Plan being in place, it is foreseen that there will be a corresponding increase of downstream activities within each of the productive sectors. Thus, most of these industry players will be faced with the need to keep pace with, and apply up-to-date technologies in their product and business process. It is imperative to have a dedicated R&D hub to undertake R&D on technology innovations that can be customized to meet the needs of the productive sectors and thus increase the knowledge of the Sri Aman workforce. Although this might not be much of a problem for MNC or large-sized organizations, SMEs might be constrained by their limited resources in R&D in improving their products/services and progressing up the value chain. For the whole workforce to be able to upgrade their technical knowledge, there is a need for a critical mass of SMEs to undertake the R&D endeavors. Apart from obtaining new technologies that are developed internationally, the Sri Aman's productive sectors will also benefit greatly if they are able to develop their own technological capabilities. Assistance will be needed in developing in-house R&D that matches with the respective organization's technology needs. To do this, Sri Aman can leverage the resources and expertise of IHLs, research institutes and specialised government agencies.

Currently, there are numerous government agencies that offer incentives and assistance to encourage innovation and automation/mechanization such as MIDA, MITI, MARDI etc. However due to lack of experience, personnel and confidence among the industry players, these incentives do not seem to have many takers. Towards this end, it is proposed that there should be a more concerted effort to include education institutes so that, not just large companies, but also SMEs could undertake R&Ds efforts. Thus, incentives should be introduced to induce both public and private institute of higher learning such as Universiti Malaysia Sarawak (UNIMAS), University of Technology Sarawak (UTS), or Swinburne University etc to develop R&D centres in Sri Aman to focus on agriculture, aquaculture, tourism and ICT-based researches. This will be in line with the strategic plan of making Sri Aman a digitally-advanced business ecosystem to attract both local and foreign investors. By having a collaboration between industry players, government agencies, and academic institutions, a faster and more structure efforts in R&D is possible to ensure facilitating services such as testing, calibration, advisory personnel etc are available to support R&D activities.

Table 6-35: Innovation Agencies in Malaysia

Malaysian Investment Development Authority (MIDA)	"MIDA is an agency under the Ministry of International Trade and Industry (MITI). MIDA's main objective is to develop manufacturing and services sectors by offering several incentives to encourage innovation and automation. The Industry4WRD Readiness Assessment Intervention Programme, also known as 'Industry4WRD Intervention Fund', was launched by the Federal government during Budget 2019. The fund offers financial support facility for Malaysian SMEs in the manufacturing and related services sectors to embrace Industry 4.0. for all SMEs. The fund will be provided on matching basis (70:30) based on eligible expenditures, up to a maximum grant of Ringgit Malaysia Five Hundred Thousand (RM500,000.00) only. MIDA has been appointed as the implementing agency for Income Tax (Accelerated Capital Allowance) (Automation Equipment) Rules 2017 initiative. This tax allowance is eligible to deserving companies through MIDA."
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National Innovation Agency Malaysia	Agensi Inovasi Malaysia (AIM) is a statutory body created to accelerate wealth creation through knowledge, technology and innovation to ensure high innovative eco-system in Malaysia. This is achieved by enabling collaboration between government, academia and industry towards the consolidation and execution of new ideas in innovation.
MyIPO	MyIPO was set up mainly to boost the development of intellectual property at the national and global levels. This is done by providing a solid legal infrastructure and administrative system.
Yayasan Inovasi Malaysia (YIM)	YIM is an agency under the Ministry of Energy, Science, Technology, Environment & Climate Change (MESTECC) to stimulate and advocate innovation through the proliferation of innovative mindsets and sustainable support ecosystem. YIM also promotes collaboration between government research institutes (GRIs), institutions of higher learning (IHLs), and industry.
Malaysia Global Innovation and Creativity Centre (MaGIC)	MaGIC's objective is to help achieve the aspirations of the National Entrepreneurship Policy 2030 (Dasar Keusahawanan Nasional 2030) of making Malaysia into an entrepreneurial nation. This is done by helping the entrepreneurs at every stage of their journey by collaborating with government agencies, stakeholders and industries. The agency offers programs and capacity-building initiative to enable an innovative entrepreneurship ecosystem.
Malaysian Agricultural Research and Development Institute (MARDI)	MARDI which is under the Ministry of Agriculture and Agro-Based Industry (MOA) has been mandated to conduct research in agriculture, food and agro-based industries that generated many new crop varieties and clones, animal breeds and its management practices. Cutting edge technologies in food processing, and post-harvest handling and ICT for "precision farming" are also undertaken. Besides performing R&D projects, MARDI also provides technical services and entrepreneurship development in food, agriculture and other fields related to the industry.

Sources: Respective agencies' website.

At the state level, the existing Sarawak Digital Economy Strategy (SDES) 2018-2022 can help in the development of the R&D hub. The agencies in-charge of implementing this SDES are the Sarawak Multimedia Authority and the Sarawak Digital Economy Corporation. The Sri Aman R&D hub stakeholders could utilise the provision given to the focused industries within agriculture, manufacturing, and avenue to propel E-Commerce adoption within the productive sectors.

Following are the Sarawak Digital Economy Opportunities that could be grasp for the R&D hub:

AGRICULTURE



Future Fertigation at Rejang through Precision Farming



Objectives:

- To improve productivity and efficiency of agricultural sector
- To access to new markets for agriculture produce and products

STRATEGIC ACTIONS

ACTION 1 Adopt ICT and digital technologies in transforming the agricultural sector and driving innovation

Programme Examples:

- Implementation of IoT and sensor technology for smart farming (soil nutrient checking, precision fertilisation, smart fertigation, intelligent swiftlet forming, precision Empurau farming) implementation of geospatial system for agriculture planning and operation support development agro park, development of anchor farmers.

ACTION 2 Establish efficient distribution system for agriculture inputs and products

Programme Examples:

- IoT for Collection, Processing and Packaging Centre, Collection Centers (Processing, Distribution), Intelligent Supply Chain Management, Logistic

ACTION 3 Develop new markets and expand existing ones for agriculture produce and products

Programme Examples:

- Collaborate with Domestic and International Investors and venture capitalist, Branding, e-Commerce

Proposed Smart Farming at Rampangi Using IoT, Sensors and Mobile Apps

<p>Controller</p>	<p>Integrated System - IoT, Sensor, Mobile Apps</p>	<p>Fertigation</p>
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Source: Sarawak Digital Economy Strategy (2018-2022)

MANUFACTURING INDUSTRY 4.0



Objectives:

- To improve manufacturing competitiveness using the applications of technological and business tools
- To create more technology driven SMEs

STRATEGIC ACTIONS

ACTION 4

Adopt Industry 4.0 to fuel the digital transformation of the manufacturing Sector

Programme Examples:

- Automation, adoption of IoT, Application of Big data, Application of advanced Human Computer Interaction

ACTION 5

Explore various opportunities for alternative energy

Programme Examples:

- R&D on Hydrogen Fuel Cell technology and application

ACTION 6

Provide incentives to grow local SMEs and to provide opportunities for globalisation

Programme Examples:

- Funding support for strategic SMEs, Investment incentive, Entrepreneur development, Commercialisation & Acceleration Support

TOURISM



Tourist Attraction - Sarawak Regatta



Objectives:

- To position Sarawak as a major tourist destination using digital technology
- To create better presentation of tourism product and services using digital technology to enhance tourist experience

STRATEGIC ACTIONS

ACTION 7

Promote Sarawak through Digital Media

Programme Examples:

- Building the Sarawak tourism content and promote it through blogs, websites, Facebook, and other digital channels

ACTION 8

Provide a digital platform for tourism product and service providers to enhance their business

Programme Examples:

- Create one-stop digital platform supported by big data analysis to promote and transact tourism-related products

ACTION 9

Personalisation of tourist experience online

Programme Examples:

- Standard Portal and App Development, Improve websites and portals, User friendly Tour planning, applications/functions, AR/VR



Source: Sarawak Digital Economy Strategy (2018-2022)

E-COMMERCE

**Objectives:**

- To increase sales and revenue from export of Sarawak products globally
- To improve the marketing of local products via e-commerce strategies and platform

STRATEGIC ACTIONS

ACTION 22 Improve the Sarawak e-Commerce and services ecosystem

Programme Examples:

- Intelligent supply chain management, Policies, DFTZ, fulfilment hubs, applications (online auctions, online shopping), eMarket Place "produksarawak.com"

ACTION 23 Increase awareness of Sarawak products and services through digital platform.

Programme Examples:

- Marketing and branding, digital networking

ACTION 24 Increase e-Commerce adoption.

Programme Examples:

- Business assistance, education, R&D.

ACTION 25 Create a FinTech platform that provides technological and business tools to secure a competitive advantage in current and future markets.

Programme Examples:

- Set-up FinTech platform such as SarawakPay, Provide incentive for the operation and adoption of FinTech by Government and industry and to expand the platform to cross border integration

Overall, the setting up of the R&D hub will lead to the development of knowledge workers that are acclimatized with technology-based activities and support the industries' application of leading-edge techniques. Among the activities that should be handled in this hub are:

- Conduct product/services development research to keep up with the evolving customers expectation and tastes within the agriculture, aquaculture, livestock, tourism and manufacturing industries;
- Assist industries, especially SMEs, in the implementation and diffusion of high-tech manufacturing and technologies;
- Leverage upon merging technology, process designs to improve cost and quality, and reduce the time-to-market requirements;
- R&D on food extraction, purification, processing, preservation, and packaging technologies
- develop digital technology that fit with local scenario such as virtual reality, augment reality, fintech etc especially within the tourism industry.

6.4.1.4 *Investing and Retention of High-Knowledge Workforce*

Human capital should be strengthened in the following area to support the growth of the industry and enhance productivity. These strategies would not only be able to increase the retention rate of the knowledge workforce, but also assure the investors of the sustainability and available of suitable labour to man their operations.

Create development policies that can attract businesses that are able to create higher-value jobs. This means incentive and investment promotions on knowledge-intensive areas such as IR4.0, green economy, biotechnology etc. SADA should have a mechanism to adopt stringent criterion for assessment and monitoring of business investors, which should include:

- Creation of good quality and higher-value jobs
- Expanding and boosting skills base of Sri Aman labour market
- Enabling the innovation capacity and competitive advantage of local companies, especially SMES, through joint-ventures or collaborative projects
- Adoption of socially responsible business practices such as environmentally friendly processes, promotion of gender equality, adoption of green practices etc.

The strengthening of human capital can also be done through industry-based practices such as:

- Encouraging the industry to collaborate with IHLs to produce the required workforce to support new technologies such as product and process design, new product development etc.
- Cooperation in the development of joint apprenticeship programmes
- Encourage IHLs to extend their courses in order to produce the needed expertise, such as food technologists, biotechnologists, and ICT technology specialists, among others
- Improving the knowledge and training in GMP and HACCP

6.4.1.5 Provide Scholarship and Education-Funding Programmes

Currently there are various options for students to obtain financial support in pursuing their tertiary education. Example of organisations that currently provide financial assistance or scholarship are Yayasan Sarawak, TERAS, PTPN, Sarawak Energy, Tabung Baitulmal Sarawak, Sarawak Energy, Samling Global Limited and MARA Sarawak. However, for schools within Sri Aman's rural areas there is a lack of knowledge on these assistances, or difficulty in understanding how to apply for one. Furthermore, there is high competition to secure these scholarship/assistance as they are open to all deserving children in Sarawak, and in most cases, at the national level. Bearing in mind that these assistance/scholarships mostly cater to tertiary education level, a more focused funding/education assistance is needed for the children within the rural communities of Sri Aman that encompasses primary, secondary and tertiary educations. This is to ensure sufficient manpower is available at various level of business value chain in the productive sectors, and also to discourage the local youths from migrating.

To increase the communities' awareness of these assistance programs, cooperation with the schools and also respective community leaders is needed to convey to the rural communities on the process and mechanism to secure this funding. It is foreseen that that use of online learning is going to be more pervasive in the future, not just because of the Covid19's home-based teaching and learning (PdPR) but also due to the need to be technological savvy in the era of IR4. While Covid19 has disrupted all primary and secondary school sessions across Malaysia, it is especially hard for students in rural Sri Aman where there is a lack of digital and internet infrastructure for them to do home schooling. Notwithstanding the lack of internet access in the rural communities where they live, the majority of these children also cannot afford the electronic devices to follow the online learning at home due to the Movement Control Order (MCO). By providing financial assistance such as this, the children will be more motivated to remain schooling till upper secondary school. It is feared that if the children become detached from the systems for too long due to not being able to attend classes, they will lose interest in their education and this will create more gap in the labour supply in the future.

6.4.1.6 One-Stop Centre (OSC) to Monitor and Facilitate Development of Human Capital

There is a need to have a holistic approach in developing Sri Aman's human capital. Towards this end, a Human Capital Committee comprising of members from SADA, relevant government agencies, industries, IHLs, public and private training agencies needs to be set up. This committee tasks include formulating and facilitating human capital strategy for Sri Aman. This includes provision of advisory services, coordination and facilitation task pertaining to employment matters for both local and foreign workers. With the existence of the OSC it can propel the HCD for value-added activities in crucial industries such as agriculture, tourism, manufacturing, services and ICT. In addition to the talent management, the committee will also be responsible for collecting data and setting up a data bank on Sri Aman's HR requirements and availability. This involved regular updates from industry players on future skills that they are expecting to be in demand and to identify the potential supply of these skills. This information can be compiled in the OSC database that is accessible by the local IHLs and industry players. The committee will act as a facilitator for both parties to plan on short to long term measures to address not just the future needs, but also potential oversupply. This can help to identify and fill the gaps between the demand and supply of HR in these crucial industries so the Master Plan objectives can be achieved. In addition to the above, this committee can provide a forum for HR professionals and practitioners to share and exchange expertise, insights, and best practises, as well as the latest thought and analysis on key HR topics.

Objectives of the OSC

- To serve as a one-stop centre for Sri Aman's industry players by offering consulting and advisory services relating to HR matters to meet future strategic changes of the future.
- To provide a forum for HR professionals and practitioners to share and exchange expertise, insights, and best practises, as well as the latest thought and analysis on key HR topics.
- To develop a high-knowledge and talented workforce in HR management that that meet the requirement of Sri Aman business ecosystem

6.4.1.7 Structured Apprenticeships Programs for Developing Technical Skills

Apprenticeships and traineeships are entry pathways into industry that will help to ensure that graduates are work-ready and have clear career pathways. There is a need to improve the internship practices especially in fulfilling the manpower needs for the megatrend's projects identified. Industry players involvement through the apprenticeship programs are critical because it can help students develop more practical skills, improving the educational system's response to labour market demands. This programme would encourage industry players to "absorb" students even before they begin their final year, providing training and work experience, sharing human capital requirements with the industry players, and ultimately giving preference to the "absorbed" students for employment after graduation. For company-specific tasks and processes, training is better provided by the company itself, instead of IHLS where the learning conducted is geared towards a more generalised curriculum. This collaboration should not be restricted to labour supply, but also lifelong learning and upskilling of the industries workforce. For the apprenticeship to be effective in ensuring an industry-ready workforce, the industry players involved in this apprenticeship must be able to fulfilled this kind of knowledge disseminating activities based on this framework:

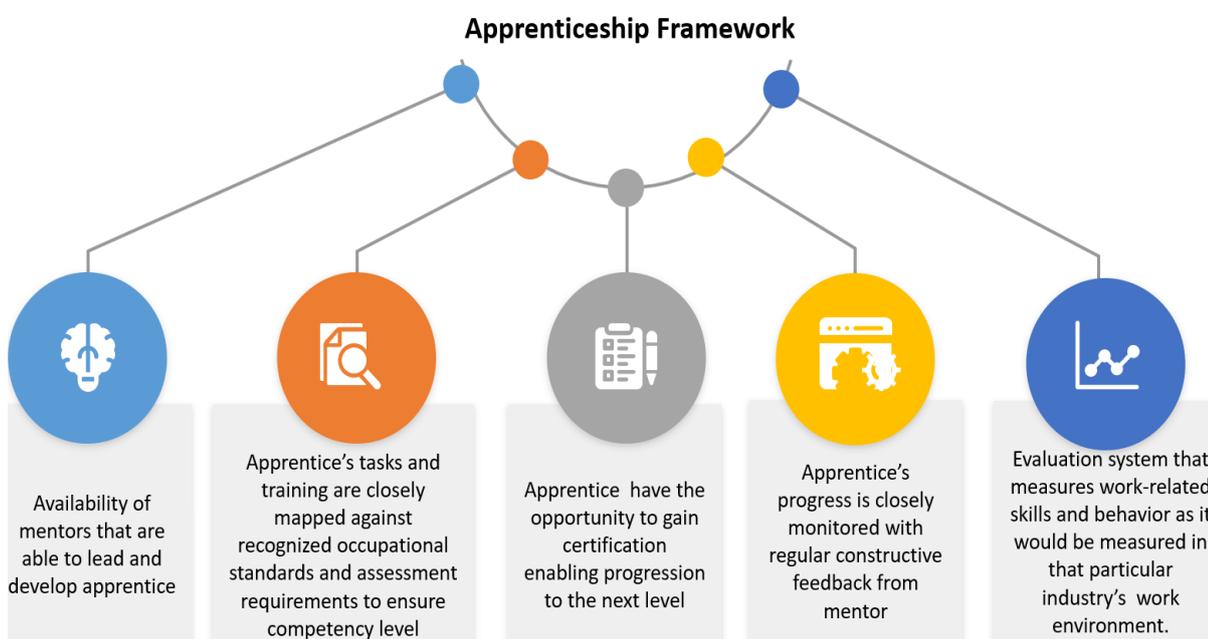


Figure 6-12: Apprenticeship Framework

Source: UNIMAS Holdings

The involvement of companies in education, and especially in TVET, is considered to be essential as they can contribute to the better development of practical skills by students, thereby improving the realistic application of such skills.

In this case, Sri Aman could emulate some of the success stories in apprenticeships programs that are currently being practised in Sarawak. Many industry players and IHLs have forged partnerships to develop human capital, some examples include:

1. Shell and Miri Vocational College have partnered in technical skills development through ProjekLINK for more than 20 years. ProjekLINK is a college-run industrial welder training programme that aims to increase the level of welders through a certification programme, with technical and financial help from Shell. These apprenticeships have trained over 800 competent welders. Shell's emphasis on professional skill growth and safety has also resulted in the PRESTIGE (Practical, Environmental, Safety, and Industrial Guidance for young Engineers), a rigorous program integrating exercises and scenarios designed to assess students' ability to grasp and apply HSE principles in the workplace, incorporating best practises and real-world examples. In East Malaysia, Shell operates the program with UNIMAS and UMS, involving about 400 engineering undergraduates there. In addition to ProjectLINK, Shell is involved in other capacity building programmes such as an in-house BTEC and EDEXCEL U.K. accredited Operation Technician training programme. Since 2002, more than 270 technicians have benefited from these programmes.
2. Shell also commenced its Asia Pacific Wells Learning Centre in Miri, the first in Asia Pacific and Shell's third globally, after United States and Netherlands. The hub is considered as one of the best in the industry, offering innovative state-of-the-art advanced simulators into its training programme.

NAIM Companies collaboration with Project Management Academy Sdn Bhd (PMA) and Akademi Binaan Malaysia was established to address the manpower shortage by upskilling human capital in project management and also upgrade construction technical skills among current workforce, to meet the growing demand of the industries.

6.4.1.8 Intensify promotion of Technical and Vocational Education to Sri Aman Youths

Based on the SES survey, the Sri Aman household heads and youths' view career in the agriculture, aquaculture and livestock sectors as predominantly only offering 3D jobs. There seems to be a lack of awareness of the potential of this sectors to boost their standard of living and offer a high-skilled career route. Thus, there should be an increased in promoting technical and vocational education, with an emphasis on altering Sri Aman communities' perceptions of technical and vocational education as a second-rate career path. This promotion could be done through education and career fairs that are easily reachable within the rural communities such as through schools and events organised with the cooperation of the communities' head, ketua kampung or tuai rumah. With the establishment of CENTEXS and I-CATS, their approach in promoting their technical programs can also be adopted. For instance, this is an example of CENTEXS existing promotion programs:

PROMOSI PROGRAM

PAMERAN
Mengikuti Pameran anjuran pelbagai agensi termasuk agensi Kerajaan, Persatuan & NGO

PEMASARAN MELALUI MEDIA MASSA

- Iklan Melalui Radio
- Temuduga TV & Radio
- Facebook
- Instagram
- Mempamerkan kain rentang CENTEXS di seluruh Daerah di Negeri Sarawak.
- Iklan melalui Media Social Influencer

MENGANJURKAN PELBAGAI PROGRAM PROMOSI

- Hari Terbuka CENTEXS.
- CENTEXS-SMA SAFARI
- CTOP
- Sesi Temuduga Terbuka
- Taklimat ke Kawasan-Kawasan kampung dan pendalaman di Sarawak
- Lawatan ke dan daripada agensi luar

KERJASAMA DENGAN JABATAN PENDIDIKAN NEGERI SARAWAK

- Taklimat ke sekolah-sekolah di seluruh Negeri Sarawak
- Mendapatkan senarai nama pelajar yang berminat melalui guru kaunseling sekolah.
- Menjemput sekolah untuk lawatan ke CENTEXS.

Source: CENTEXS

Industry clubs could be established in rural areas, and a dedicated portal for students could be developed in the respective schools, etc. Industry players should also be given incentives to be involved in setting up 'key industry clubs' in rural secondary schools to enable both parents and students to gain a deeper understanding of sectors such as agriculture, aquaculture, livestock and tourism. This includes the kind of jobs available, industry players, work environment, etc, whilst helping to increase the level of acceptance among rural communities in working in these sectors. Furthermore, students can get advice on education opportunities and career paths at these clubs, which can also serve as an education and career centre.



PART 7 FINANCIAL ANALYSIS

SECTION 7.1 ESTIMATED BUDGET FOR THE PROPOSED PROJECTS UNDER SAMP

The total budget of the proposed projects under the Sri Aman Master Plan (SAMP) is estimated to be around RM 4.51 billion (Table 7-1).

Out of the total estimated budget, projects for the purpose of infrastructure development consist of the largest portion of 58.5% from the total estimated budget with the proposed allocation of RM 2.64 billion for the period of 2021-2030. The main components of the newly proposed infrastructure development project are Simanggang Link Road, Banting - Gunung Lesong - Engkeranji Road, Lingga - Banting Road and an industrial park at Temudok.

As the backbone of the economic activity in Sri Aman, projects for the purpose of agriculture and livestock as well as aquaculture and fisheries will take up 32.6% from the total estimated budget with the proposed allocation of RM 1.42 billion for the agriculture and livestock sector and RM52.61 million for the aquaculture and fisheries sector, respectively. The majority of the proposed allocation will be utilised on commodity products for the export market without neglecting the need to improve the self-sufficiency level of food production for domestic consumption. In addition, to boost the increasingly important tourism sector and economic development locally, projects under the tourism sector and utility and social development have also taken a share out of the total estimated budget of 1.5% (RM 69.59 million) and 7.3% (RM 330.52 million), respectively.

Table 7-1: Estimated Budget by Sector and Year

Malaysia Plan	Timeframe	Estimated Budget (RM)					
		Agriculture & Livestock	Aquaculture & Fisheries	Tourism	Infrastructure	Utility & Social Development	
12 th Malaysia Plan	Short-term	2021	124,570,588	5,947,500	2,762,500	310,205,846	37,515,000
		2022	124,570,588	5,947,500	2,762,500	320,205,846	36,515,000
	Mid-term	2023	227,709,658	6,898,333	9,597,083	376,039,179	31,413,333
		2024	205,037,305	6,898,333	9,597,083	383,778,489	26,213,333
		2025	205,037,305	6,898,333	9,597,083	393,778,489	26,963,333
13 th Malaysia Plan	Long-term	2026	133,772,549	4,004,000	7,053,750	172,145,156	50,380,000
		2027	99,424,902	4,004,000	7,053,750	170,876,782	50,380,000
		2028	99,424,902	4,004,000	7,053,750	170,876,782	45,380,000
		2029	99,424,902	4,004,000	7,053,750	170,876,782	12,880,000
		2030	99,424,902	4,004,000	7,053,750	170,876,782	12,880,000
Total		1,418,397,600	52,610,000	69,585,000	2,639,660,131	330,520,000	
Grand Total		4,510,772,731					

Source: UNIMAS Holdings

The proposed allocation for the project/development on short-term and mid-term implementations under the first half of the SAMP, similarly under the 12th Malaysia Plan, would sum up to RM 2.90 billion, which is equivalent to 64% of the total estimated budget for the entire master plan. On the other hand, the project/development on long-term implementation would sum up to a proposed allocation of RM 1.61 billion, that is accounting to 36% of the total estimated budget of the SAMP. The long-term implementation timeframe is in line with the 13th Malaysia Plan for the period of 2026-2030.

The average estimated budget associated with all projects under the SAMP is 4.46% of the overall State budget on an annual basis as compared to the proposed allocation of 2021 State Budget of RM 9.83 billion. Comparing to the State development allocation under the Malaysia Budget 2021, the average estimated budget per year for the projects under SAMP is around 10.0% of the allocation from the Federal government to the State, which is RM 4.5 billion.

Table 7-2: Total Public and Private Funding by Sector

Sector	Total Public Funding (RM)	Total Private Funding (RM)	Total Budget Estimate by Sector (RM)
Agriculture and Livestock	1,348,397,600	70,000,000	1,418,397,600
Aquaculture and Fisheries	2,610,000	50,000,000	52,610,000
Infrastructure	2,639,660,131	-	2,639,660,131
Tourism	69,410,000	175,000	69,585,000
Utility & Social Development	330,520,000	-	330,520,000
Total	4,390,597,731	120,175,000	4,510,772,731

Source: UNIMAS Holdings

Majority of the budget for the Sri Aman Master Plan is of public funding. The public funding consists of 97% of the total budget estimate while the remaining relies on the investment from private sector. All of the proposed projects under infrastructure and utility & social development requires public funding which sums up to RM 2.97 billion. The major projects that require funding from private sectors are mainly agrotechnology parks and expansion of aquaculture industry in Batang Ai.

In order to achieve the strategic goals of the SAMP, the total estimated investment for Sri Aman division to reach desirable socio-economic development amounts to RM 4.51 billion. Currently, the division of Sri Aman has an average per capita income of RM 30,520 in 2020. Within the next ten years, the division of Sri Aman as a whole requires an investment of RM 40,491 per capita to reach an average household income of RM 4,559 in 2030f with a level of physical and non-physical development equivalent to major towns in Sarawak. Although these are considerable sums, the investment cost per capita is in fact moderate for a 10-year implementation. These investment sums are targeted towards those where there is the most to gain, where the benefit is highest.

SECTION 7.2 COST AND BENEFIT ANALYSIS

7.2.1 Agriculture & Livestock Sector

There are a total of 15 different agriculture and livestock projects that have been proposed in the SAMP, including the proposed agrotechnology parks development, with a total estimated budget of RM 1.4 billion for the purpose of implementation. The average estimated budget over the course of the master plan associated with agriculture and livestock projects are estimated to be 10.6% of the overall agriculture budget on an annual basis as compared to the proposed allocation for agriculture programs under the 2021 State Budget of RM 1.123 billion. In terms of the internal rate of return for the proposed agriculture and livestock projects presented in Table 7-3, the estimated figures indicate that the proposed projects are all economically viable, yielding a high IRR above the desirable discount rate of 10% for all the proposed agriculture and livestock projects. Volume C details out the cost-benefit stream for each agriculture and livestock project.

Table 7-3: Estimated Budget and IRR for Agriculture

Project/ Development	Total Estimated Budget (RM)	Estimated Budget by Timeframe (RM)			Internal Rate of Return (%)
		Short-term	Mid-term	Long-term	
Batang Lupar Integrated Agriculture Development Area (IADA)¹	337,000,000	109,954,510	121,320,000	105,725,490	22%
Pantu Specialty Rice Project	210,000,000	46,620,000	70,000,000	93,380,000	68%
Pineapple	50,000,000	5,000,000	15,000,000	30,000,000	62%
Coconut	100,000,000	10,000,000	40,000,000	50,000,000	69%
Durian	30,000,000	5,000,000	10,000,000	15,000,000	56%
Rambutan	4,000,000	800,000	1,600,000	1,600,000	38%
Sweet Corn	13,500,000	4,500,000	4,500,000	4,500,000	25%
Banana Agro-based	7,500,000	1,500,000	2,250,000	3,750,000	47%
Oil Palm	540,897,600	30,000,000	318,897,600	192,000,000	12%
Coffee	13,500,000	2,700,000	4,050,000	6,750,000	57%
Sacha Inchi	10,000,000	2,000,000	3,000,000	5,000,000	113%
Cattle Integration	5,000,000	1,000,000	2,000,000	2,000,000	47%
Swiftlet Farming	15,000,000	3,000,000	4,500,000	7,500,000	198%
Apiculture (Honey Bees)	2,000,000	666,667	666,667	666,667	111%
Agrotechnology Parks²	80,000,000	26,400,000	40,000,000	13,600,000	107%
Total	1,418,397,600	249,141,176	637,784,267	531,472,157	

Source: UNIMAS Holdings

¹ The budget for Batang Lupar Integrated Agriculture Development Area (IADA) project of RM 337 million is under existing Federal funding.

² For the agrotechnology park project, the source of funding of RM 10 million will be of public investment and RM 70 million will be of private investment.

7.2.2 Aquaculture and Fisheries Sector

Four important projects have been proposed under the aquaculture and fisheries sector, namely development of recreational fisheries, exploring the potential of the adjoining Kalimantan market for supply of additional products, expansion of aquaculture industry at Batang Ai Reservoir, and integration of 'smart farming' systems in aquaculture, with a total estimated budget of RM 52.61 million for the purpose of implementation. The estimated budget associated with the aquaculture and fisheries project are estimated to be 0.47% of the overall agriculture budget on an annual basis as compared to the proposed allocation for agriculture programs under the 2021 State Budget of RM 1.123 billion. Table 7-4 shows the estimated internal rate of return for the proposed aquaculture and fisheries projects and the projected values denote that the proposed projects are economically viable because of high value of IRR. Volume C provides the details of the cost-benefit stream for each aquaculture and fisheries project.

Table 7-4: Estimated Budget and IRR for Aquaculture and Fisheries projects

Project/ Development	Total Estimated Budget (RM)	Estimated Budget by Timeframe (RM)			Internal Rate of Return (%)
		Short-term	Mid-term	Long-term	
Development of Recreational Fisheries	1,540,000	1,500,000	20,000	20,000	39%
Exploring the Potential of the adjoining Kalimantan Market for Supply of Additional Products	350,000	175,000	175,000	0	
Expansion of Aquaculture Industry at Batang Ai Reservoir, with a View of Creating Processing Spin-offs ³	50,000,000	10,000,000	20,000,000	20,000,000	
Integration of 'Smart Farming' Systems in Aquaculture Using Remote Monitoring and Management Systems	500,000	0	500,000	0	
Masterplan for the Economic Development of Tagang Site	220,000	220,000	0	0	
Total	52,610,000	11,895,000	20,695,000	20,020,000	

Source: UNIMAS Holdings

7.2.3 Tourism Sector

The proposed projects under the tourism sector consist of product development, community-based tourism, conserving natural tourism assets, marketing and promotion, and accessibility with a total estimated budget of RM 69.6 million for the purpose of implementation. The average estimated budget associated with the tourism project over the course of the master plan are estimated to be 2.8% as compared to the proposed allocation for tourism development under the 2021 State Budget of RM 252 million. In terms of the economic internal rate of return for the proposed tourism project presented in Table 7-5, the estimated outcomes indicate that the proposed projects are economically viable. The cost-benefit stream developed by aggregating all proposed tourism projects provides an EIRR of 25% and thereby indicates that the proposed total investment is economically feasible for implementation as a whole. The details of the cost-benefit stream for each tourism project can be attained from Volume C.

³ The project under the Expansion of Aquaculture Industry at Batang Ai Reservoir, with a View of creating Processing Spin-offs will be funded by private sector.

Table 7-5: Estimated Budget and EIRR for Tourism projects

Project/ Development	Total Estimated Budget (RM)	Estimated Budget by Timeframe (RM)			Economic Internal Rate of Return (%)
		Short-term	Mid-term	Long-term	
Product Development	36,000,000	1,180,000	14,163,750	20,656,250	25%
Community-based Tourism	8,100,000	2,940,000	5,160,000	0	
Conserving Natural Tourism Assets	22,600,000	100,000	8,437,500	14,062,500	
Marketing & Promotion	985,000	585,000	400,000	0	
Accessibility	1,900,000	720,000	630,000	550,000	
Total	69,585,000	5,525,000	28,791,250	35,268,750	

Source: UNIMAS Holdings

7.2.4 Infrastructure Sector

There are 10 main proposed projects under the infrastructure sector with a total estimated budget of RM 2.64 billion for the purpose of implementation. The average estimated budget associated with the infrastructure development projects over the course of the master plan is estimated to be 4.4% of the overall development budget on an annual basis as compared to the proposed allocation for infrastructure development project under the 2021 State Budget of RM 5.939 billion. In terms of the economic internal rate of return for the proposed infrastructure development projects presented in Table 7-6, the estimated values show that the proposed projects can generate high EIRR value, and hence they are considered to be economically viable. The details of the cost-benefit stream for each infrastructure development project can be attained from Volume C.

Table 7-6: Estimated Budget and EIRR for Infrastructure projects

Project/ Development	Total Estimated Budget (RM)	Estimated Budget by Timeframe (RM)			Economic Internal Rate of Return (%)
		Short-term	Mid-term	Long-term	
Proposed New Jetties	15,400,000	400,000	5,625,000	9,375,000	48%
Proposed New Jetties at Batang Ai ⁴	21,300,000	0	21,300,000	0	-
CPPC	20,000,000	10,000,000	10,000,000	0	41%
Drainage, Flood Mitigation & River Erosion	125,000,000	0	46,875,000	78,125,000	24%
Irrigation for Paddy & Non-paddy Projects	156,000,000	0	58,500,000	97,500,000	51%
Proposed New Roads & Bridges and Upgrading of Roads	1,377,800,000	554,700,000	541,600,000	281,500,000	25%
Public Transport Terminal & Smart Centre	67,500,000	4,800,000	54,700,000	8,000,000	51%
Soft Infrastructure	16,160,131	5,809,937	4,088,263	6,261,931	43%
Industrial Park	95,500,000	6,701,754	30,157,895	58,640,351	14%
Social Infrastructure	745,000,000	48,000,000	380,750,000	316,250,000	-
Total	2,639,660,131	630,411,691	1,153,596,157	855,652,282	

Source: UNIMAS Holdings

⁴ The financial analysis for the proposed new jetties at Batang Ai is carried out under aquaculture & fisheries.

7.2.5 Utility & Social Development

The proposed projects of utility and social development consist of waste management and recycling project, telecommunication, resilience program, social development and water grid extension projects with an estimated budget of RM 331 million for the purpose of implementation. Table 7-7 shows that all the proposed projects are economically viable, viewing that they can generate high values of economic internal rate of return in the next 10 years. The details of the cost-benefit stream for each proposed project can be attained from Volume C.

Table 7-7: Estimated Budget and EIRR for Utilities and Community projects

Project/ Development	Total Estimated Budget (RM)	Estimated Budget by Timeframe (RM)			Economic Internal Rate of Return (%)
		Short-term	Mid-term	Long-term	
Waste Management & Recycling	83,970,000	18,760,000	11,485,000	53,725,000	26%
Telecommunication	2,200,000	1,000,000	1,200,000	0	35%
Resilience Program	104,950,000	20,990,000	31,485,000	52,475,000	671%
ICATS Establishment	10,000,000	10,000,000	0	0	52%
Sarawak Skills Establishment	13,000,000	13,000,000	0	0	56%
CENTEXS Establishment	10,000,000	10,000,000	0	0	69%
Early Childhood Education	41,400,000	280,000	40,420,000	700,000	29%
Water Grid Extension	65,000,000	0	0	65,000,000	45%
Total	330,520,000	74,030,000	84,590,000	171,900,000	

Source: UNIMAS Holdings



PART 8 **ECONOMICS ASSESSMENT AND IMPACT**

SECTION 8.1 GDP ESTIMATES 2020

The GDP 2020 estimates are required as part of this master plan study to address the absence of existing data at divisional level in Sarawak. Additionally, the GDP 2020 estimates for Sri Aman division provide for a baseline to evaluate the economic impact of the projects proposed in this study.

8.1.1 Approach and Methodology

There are three common approaches to the estimation of national Gross Domestic Product (GDP):

- (1) Production approach (Value-added): That is based upon the sum of value added that is derived based upon the difference between gross output value and value of intermediate inputs.
- (2) Expenditure approach: That is based upon the sum of private consumption, government final demand, gross fixed capital formation, changes in inventories and valuables, exports of goods and services minus imports of goods and services.
- (3) Income approach: That is based upon the sum of all income in the production economy such as salaries and wages, gross operating surplus, taxes and subsidies.

8.1.1.1 Data Considerations and Approach

Data availability is a key challenge in the estimation of GDP for Sri Aman as division level data points are limited or unavailable. The best available division data points that are useful for the estimation process of GDP are only available for the “Wholesale and Retail Sector” which is based upon a census carried out by the Department of Statistics Malaysia for the year 2019. Divisional level data from the economic census carried out in 2016 was not available to the research team and therefore a census-based data approach was not adopted.

Besides, the use of establishment-based data to estimate the size of the Sri Aman economy has a key limitation due to the economic structure of the division. The economy of Sri Aman is composed largely of agricultural activities that are subsistence-based and often the products are sold in local markets. This form of economic activity is predominantly unrepresented in business census responses and would contribute to under estimation of the economic activity.

The research team had developed an alternative data approach towards estimating the GDP of Sri Aman for the year 2020 based on the available instruments of research as part of this master plan study. The data captured through this study falls under the production approach (value-added) approach where GDP was estimated based on the following formula:

$$\text{Gross Domestic Product (GVA)} = \text{Value Added (VA)} + \text{Subsidies (S)} - \text{Taxes (T)}$$

Two surveys were carried out as part of the master plan study (1) Business sentiment survey; and (2) Social survey. The first survey was rejected as a basis to capture data for the GDP estimate as establishment-based data underestimates the subsistence based economic activities which form a large part of the Sri Aman division economy.

The social survey captured responses from 999 households in the Sri Aman division out of an estimated 27,850 households. The statistical representation of this survey is with a confidence interval of 3% at a confidence level of 95%. As part of the survey, household income data were captured inclusive of respective occupations concerning the source of income⁵. This survey allowed the research team to identify wages generated by economic activities which is a component of the Economic Input-Output Model explained in further detail in the following paragraph.

The input-output table describes the relationship between producers and purchasers in the economy and can be used to further identify sub-components such as final demand, intermediate goods, and wages. The input-output model is translated into the Leontief Inverse Matrix that explains the relationship between producers and purchasers in the form of economic multipliers. The input-output model provides for ratios/multipliers across all components including that of wages and salaries. The ratio of wages to final demand/gross output identified from the input-output model was used to estimate the gross economic output for each sector. The input-output model was then used to breakdown the gross economic output into data points that would fit into the production method (value-add) model of estimating GDP. Figure 8-1 outlines in detail the process of estimating the GDP of Sri Aman for the year 2020.

⁵ Note: Survey did not cover the more remote settlements (e.g. the 23 settlements upstream of the Batang Ai Dam) which are largely subsistence economy with a small cash crop component where the data may be skewed slightly towards more urban communities.

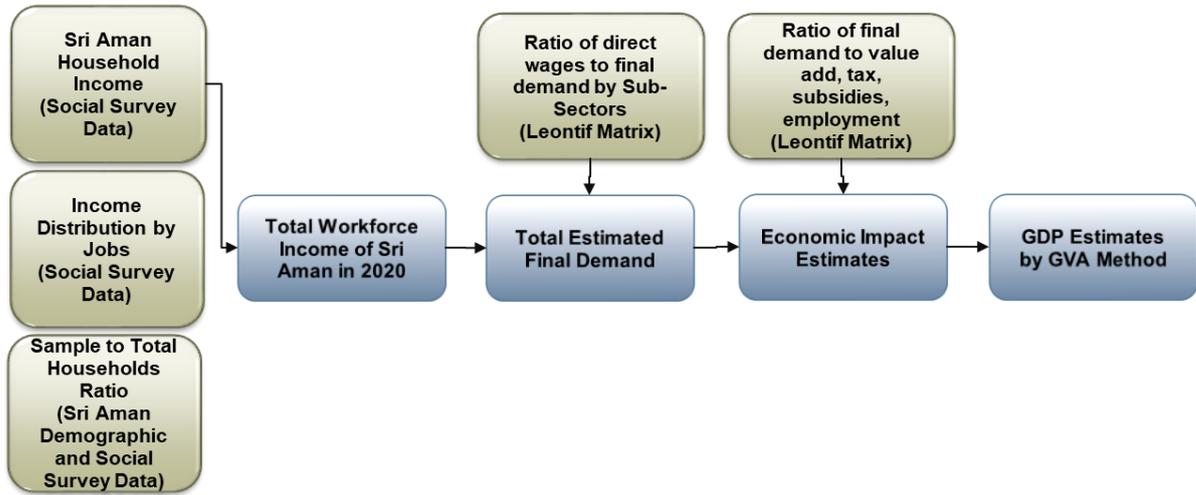


Figure 8-1: GDP 2020 Estimate Methodology using IO Tables and Social Survey Data

Source: Frost & Sullivan Analysis

8.1.2 Sri Aman Division GDP 2020

The Sri Aman division’s GDP is estimated to be RM3.4 billion in 2020 at constant prices, with the top three largest contributors being agriculture, wholesale and retail, and business services. Sri Aman accounts for an estimated 2.5% of the total GDP of the state of Sarawak.

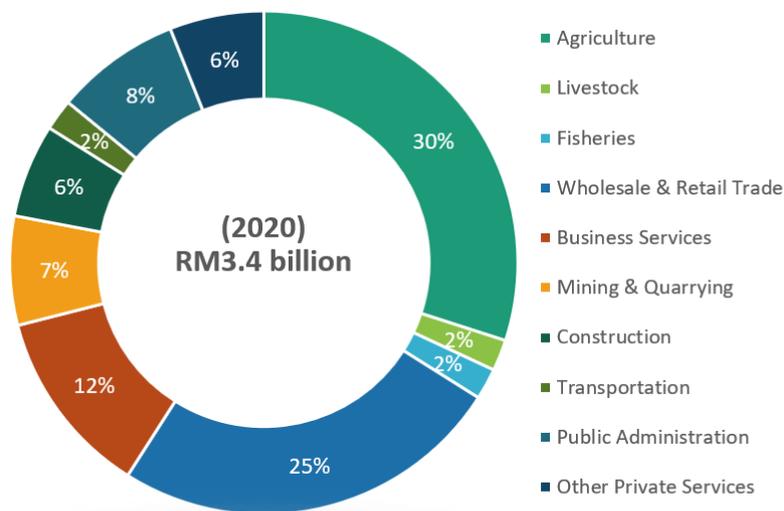


Figure 8-2: Sri Aman Division GDP 2020 at Constant Prices

Source: Frost & Sullivan Analysis

SECTION 8.2 ECONOMIC IMPACT FROM PROPOSED PROJECTS 2020-2030

8.2.1 Approach and Methodology

The economic impact estimates serve as a measure of the incremental benefit of projects towards improving the wellbeing of communities in the Sri Aman division. Additionally, the employment estimates from the economic impact assessment will aid in estimating the incremental growth in population.

The GDP forecast of the Sri Aman division over the master plan period of 10 years is broken down into two main components (1) GDP baseline projection based upon historical data trends and represents the do-nothing scenario (2) Additional GDP contribution projections that are based upon proposed new projects under the master plan; new projects include those proposed under agriculture, aquaculture, tourism, food processing, and business services.

The following figure illustrate the broad approach towards developing GDP estimates

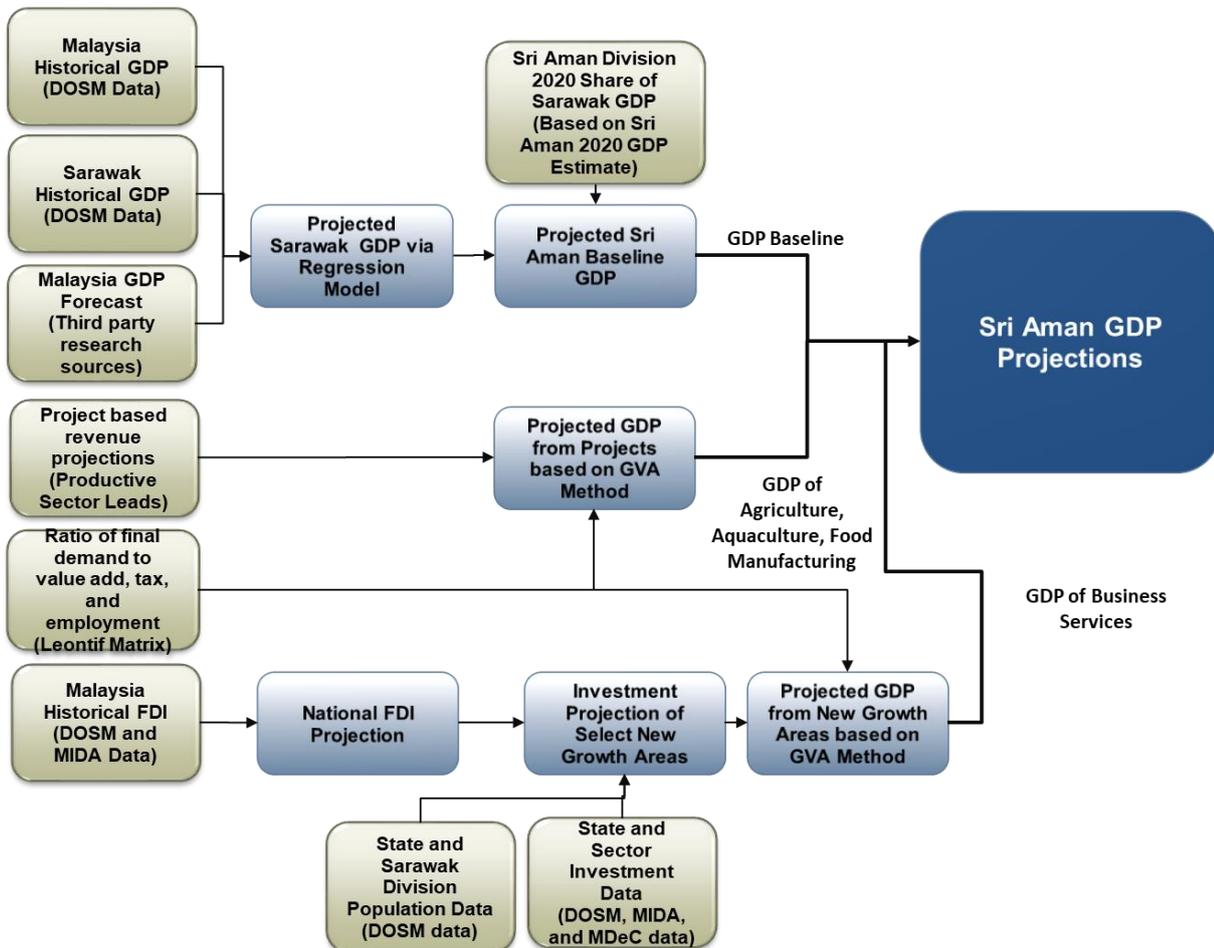


Figure 8-3: GDP Forecast Sri Aman Division 2020 to 2030

Source: Frost & Sullivan Analysis

8.2.2 Baseline GDP projections

Baseline GDP projections for the Sri Aman division are estimated using a top down approach. The growth projections are done at a state level and were then subsequently apportioned to Sri Aman’s divisional level based on a constant share. The following exhibit illustrates the broad approach towards estimating the baseline GDP projections.

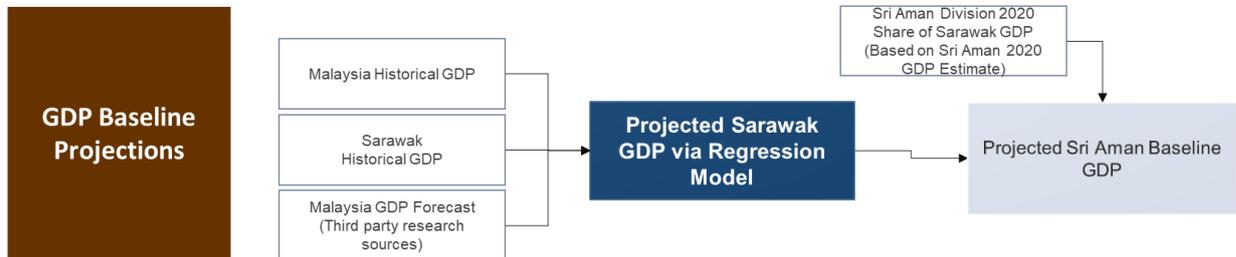


Figure 8-4: Baseline GDP projections

Source: Frost & Sullivan Analysis

The GDP of Sarawak is projected based on a regression model to Malaysia’s national GDP growth indicators. The regression model applied is illustrated in the figure below which shows a close correlation to actual GDP performance of Sarawak.

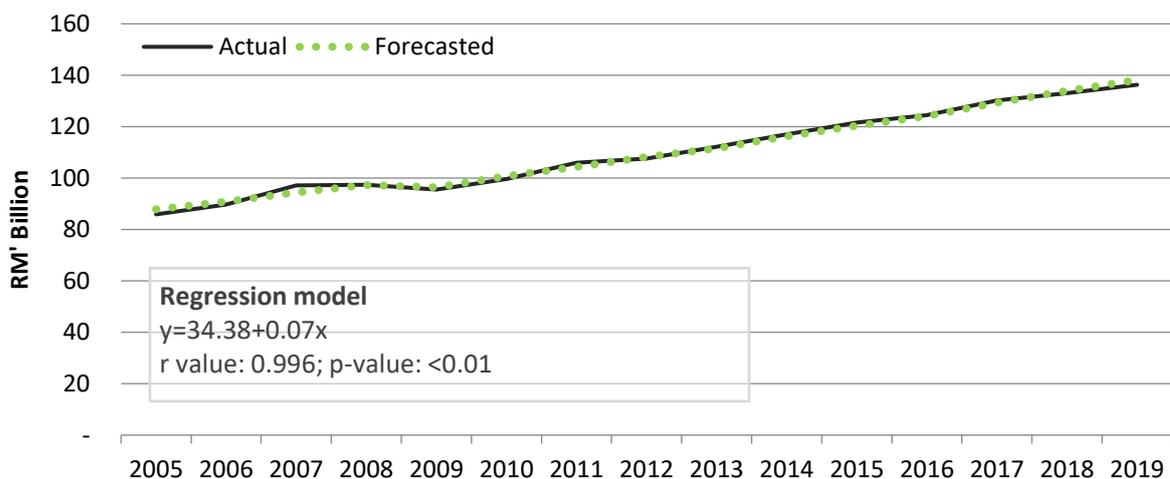


Figure 8-5: Sarawak GDP at Constant 2015 Base Prices Forecast Model Actual Vs Forecast, 2005 – 2019

Source: Frost & Sullivan Analysis

The research team applied a blend of growth projections from various established third party sources. Table 8-1 outlines the ratios used.

Table 8-1: GDP projection key assumptions and indicators used

Ratio	Type of data	Data	Source
Real GDP growth 2020	Percentage	-2.6	Blended rates (Bank Negara and UOB research)
Real GDP growth 2021	Percentage	3.7	Blended rates (Bank Negara and UOB research)
Real GDP growth 2022 – 2040	Percentage	4.7	UOB research
Sri Aman share of state GDP	Percentage	2.5%	Frost & Sullivan estimates

Note: Source included within table

The GDP of Sri Aman division is estimated to grow at 3.6% p.a. from RM3.4 billion in 2020 to RM4.8 billion in 2030 without the intervention of projects outlined in this study.

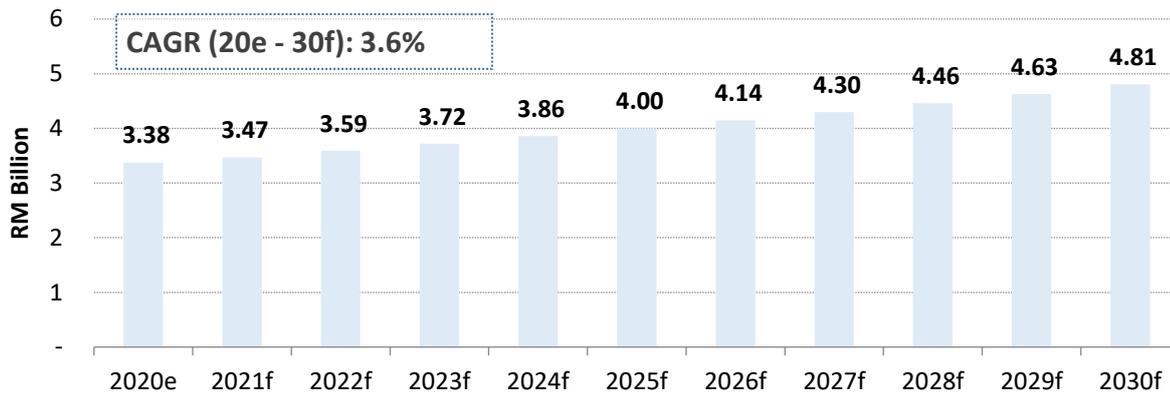


Figure 8-6: Sri Aman GDP Forecast Constant Prices, 2020 – 2030

Source: Frost & Sullivan Analysis

8.2.3 Digital Business Services Projections

Digital business services in the context of this study refers to the provision of business services such as human resources, payroll, research, accounting, marketing, and call centers that are delivered via digital platforms; services are often rendered remotely at a different location from the end user. Such services are often referred to as Shared Services Outsourcing (SSO), Global Business Services, or Business Process Outsourcing. This form of business activity exists at varying degrees in Sarawak but is not formally promoted as an economic focus area. The potential for development has been identified in this study and for the purpose of estimating its potential economic contributions given the absence of existing state level data, a top down projection approach is adopted.

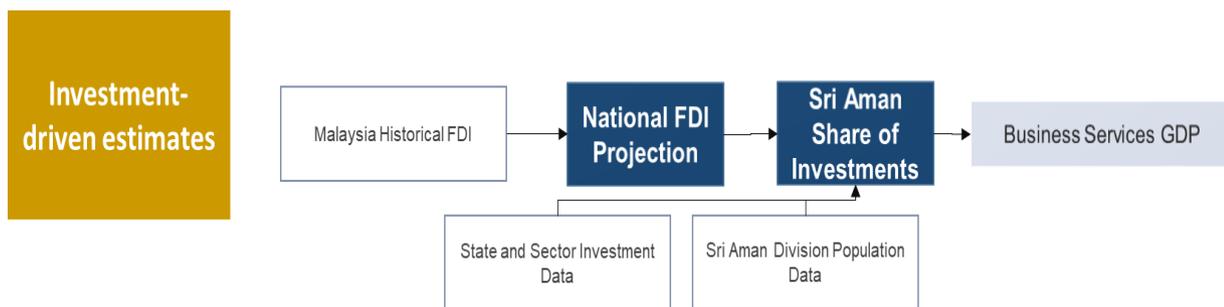


Figure 8-7: Approach in Projecting The Potential Investments and Revenues of Digital Business Services

Source: Frost & Sullivan Analysis

Digital business services in Malaysia are largely driven by Foreign Direct Investments (FDI) and the investment based forecasting model has been utilised to derive projected revenues. A linear time series projection model was adopted to derive Malaysia’s national FDI growth where the investment figures were further broken down to Sarawak state and Sri Aman division shares of investment.

The projection model is based on the Autoregressive Integrated Moving Average (ARIMA) approach where the forecast from the best ranked method was adopted. The ‘Damped non-seasonal trend method yielded the best indicators; Theil’s U: 0.9188 and Durbin-Watson 1.95.

Table 8-2 outlines the key indicators of the time series projection models and key assumptions used.

Table 8-2: Digital business services revenue projection key assumptions used

Indicator	Type of data	Data	Source
Digital services share of investments	As percentage of total investments	7.3	MIDA, MDEC, and Frost & Sullivan estimates
Sarawak share of digital services investments	As percentage of Malaysia	16.4	DoSM population data and Frost & Sullivan estimates
Sri Aman share of digital services investments	As percentage of Sarawak	4.9	DoSM population data and Frost & Sullivan estimates
Sri Aman share of state GDP	Percentage	2.5%	Frost & Sullivan estimates
Revenue per employee	RM	185,060	MDEC, and Frost & Sullivan estimates
Investment per employee	RM	153,059	MDEC, and Frost & Sullivan estimates

Note: Source included within table

The projected revenues are guided by an average annual investment target of around RM15 million per annum to be driven by investment promotion initiative of stakeholders involved in implementing the master plan. Investments begin from 2026 onwards as the development plan requires for such services to be first established in Kuching before nodal centers in Sri Aman division begin operations.

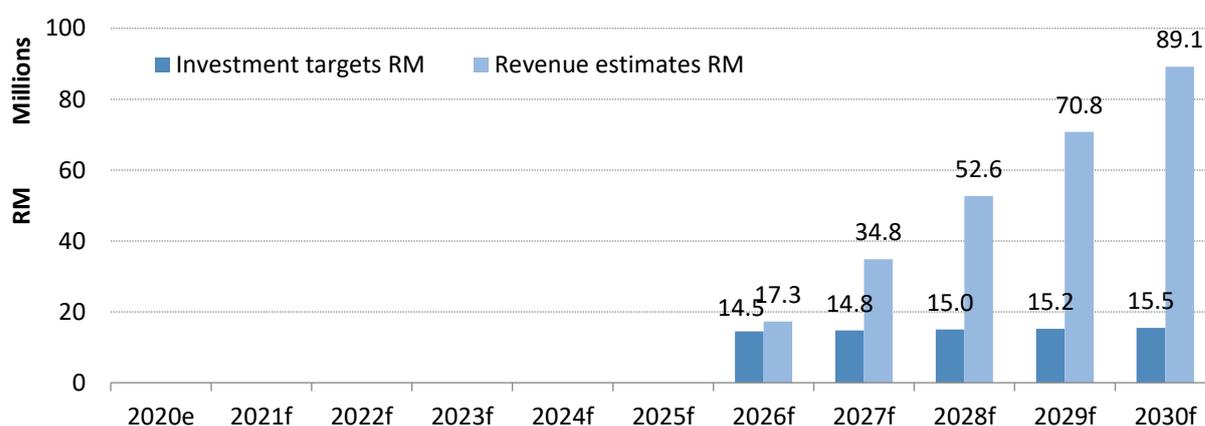


Figure 8-8: Digital Business Services Investment Targets and Revenue Estimates, 2020e to 2030f

Source: Frost & Sullivan Analysis

8.2.4 Projected Demand from Economic Projects (Agriculture, Fisheries, Aquaculture, Tourism, Food Processing)

Revenue projections for the following economic areas (agriculture, aquaculture, business services, livestock, and tourism) are based on projects outlined in this master plan study; refer to the dedicated sections relating to the economic sectors for further details. The food processing revenues were derived with the assumption of capturing 10% of the agriculture production into the food processing industry; the national average of agriculture production being used in food processing based on the 2015 census is around 86% however given that the industry in the Sri Aman division is in its infancy stage a more modest ratio of 10% was applied in alignment with the Sarawak state average of 10%.

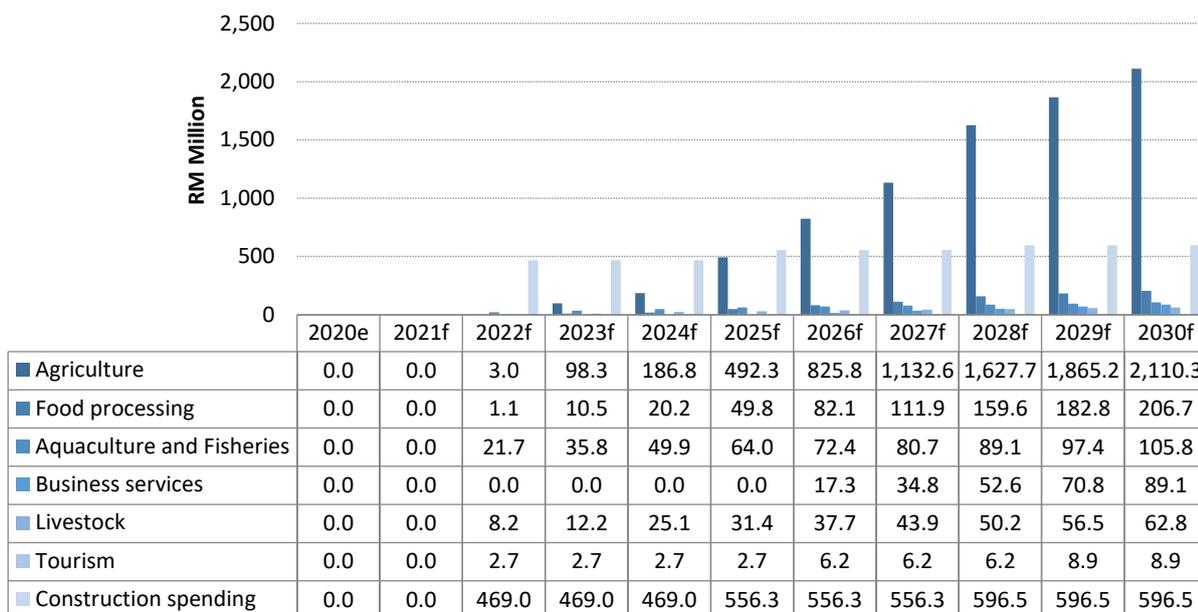


Figure 8-9: Sri Aman Division Project Revenues and Construction Spending, 2020e to 2030f

Source: Frost & Sullivan Analysis

8.2.5 Input Output Model Assumptions

The economic multiples were based on two input-output tables (1) Malaysia's national input-output tables 2015; and (2) Regional input-output tables of Sarawak 2005. Sarawak is noted to have a higher level of economic leakages as there are considerable production inputs imported from peninsula Malaysia. For the purpose of modelling the economic multipliers in this study a mix of national and regional input-output tables were applied.

For economic activities such as food processing and digital business services, the multipliers from the national input-output tables were applied as these economic activities are more established in peninsula Malaysia and the use of national input-output tables would better reflect the future multiplier effects. For the remaining economic activities, the Sarawak regional input-output tables were used.

8.2.6 Economic impact assessment and population estimates

Based on the proposed projects, the GDP of the Sri Aman division is expected to grow at 8.48% per annum from RM3.4 billion in 2020e to RM7.8 billion in 2030f. Growth, excluding construction projects which are considered to be one-off expenditures, is expected to grow at a rate of 8.2% over the master plan period to RM7.4 billion in 2030.

Among the projects proposed, those under agriculture are expected to be the largest contributor with an estimated GDP of RM2.26 billion by 2030, followed by aquaculture and fisheries at RM0.12 billion and food processing at RM0.06 billion.

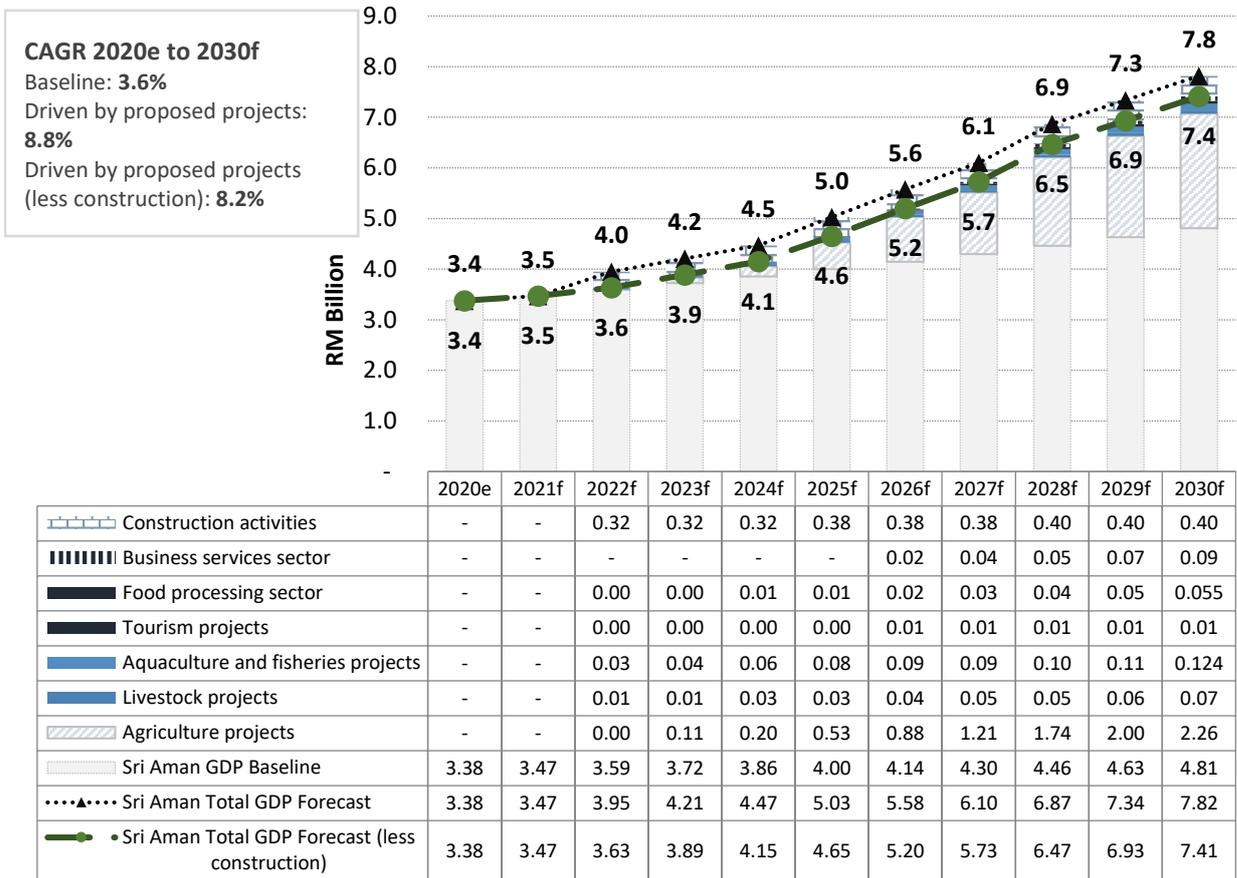


Figure 8-10: GDP Forecast Sri Aman Division, 2020e - 2030f

Source: Frost & Sullivan Analysis

The proposed projects are expected to generate an additional 19,961 jobs by 2030f accounting for 27% additional employment. The job figures include direct, indirect, and induced job creation.

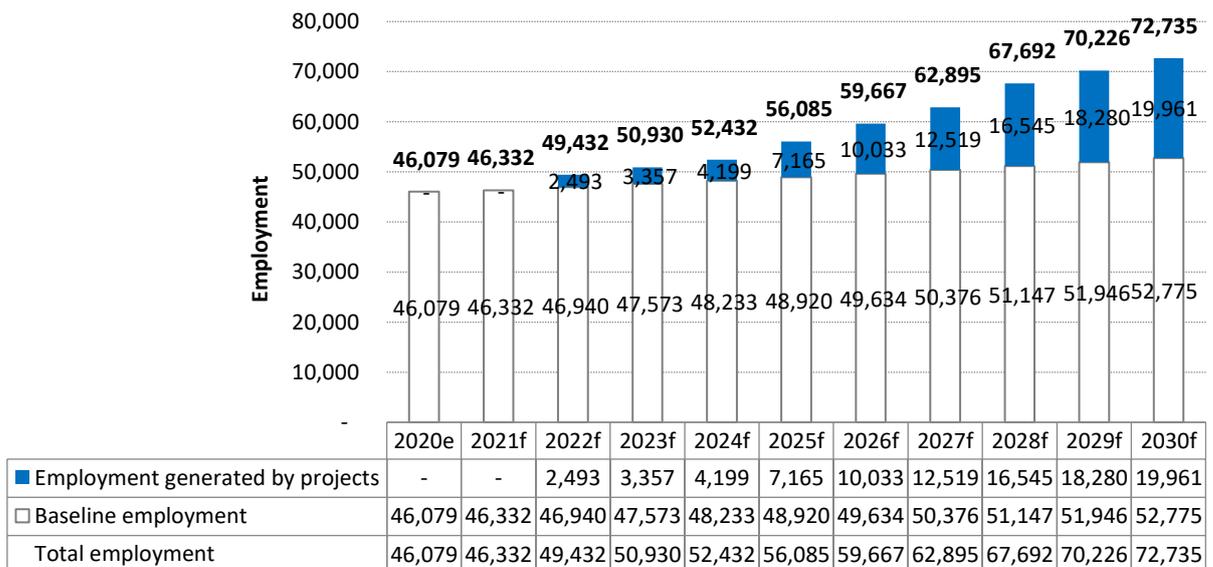


Figure 8-11: Sri Aman Projected Employment, 2021 - 2030

Source: Frost & Sullivan Analysis

An estimated 11,295 jobs or 55% are from direct employment in the proposed projects while the remainders are from indirect - supporting business services and induced – jobs created as a result of spending by those employed under the proposed projects.

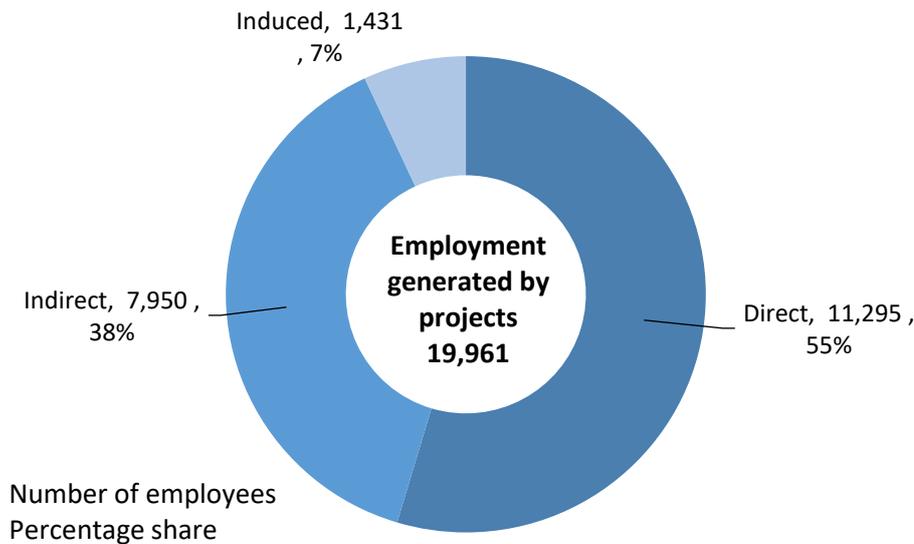


Figure 8-12: Breakdown of Employment (Direct, Indirect, Induced) By 2030

Source: Frost & Sullivan Analysis

Of the additional 19,961 jobs generated by 2030f, 17,523 are long term occupations (excluding construction) where the largest number of employment opportunities would result from agriculture activities, followed by food processing, and business services.

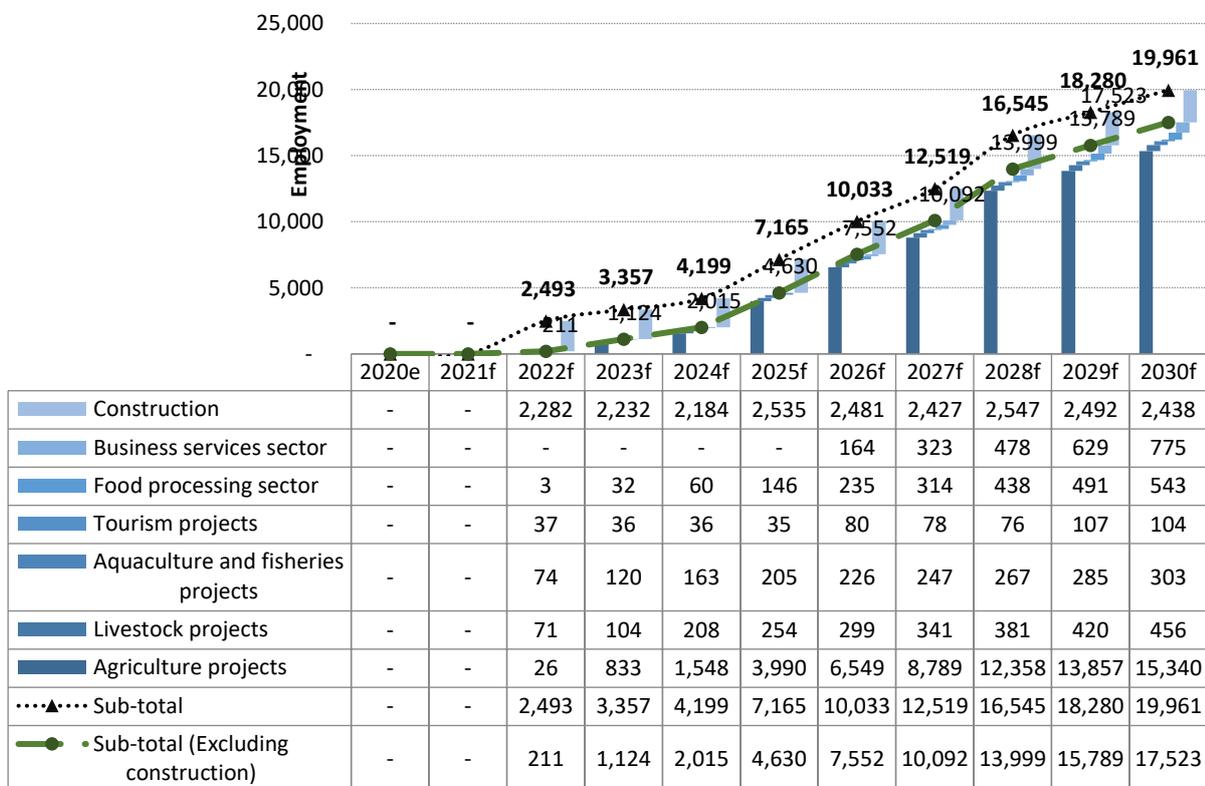


Figure 8-13: Sri Aman Division Jobs Generated from Projects, 2020 - 2030

Source: Frost & Sullivan Analysis

Population estimates were derived using ratios of income earners per household and average household sizes. The assumptions shown in Table 8-3 were used in the calculation of population.

Table 8-3: Population Estimates Key Assumptions Used

Indicator	Type of data	Data	Source
Average income recipient per household - Sarawak	Number of persons	1.7	DoSM
Average household size – Sarawak	Number of persons	4.0	DoSM
Average household size of construction workers	Number of persons	2	Assumption

Note: Source included within table

The projects proposed as part of this study is estimated to support a population of 44,089 of which 41,230 (excluding construction workers) are expected to be long term population.

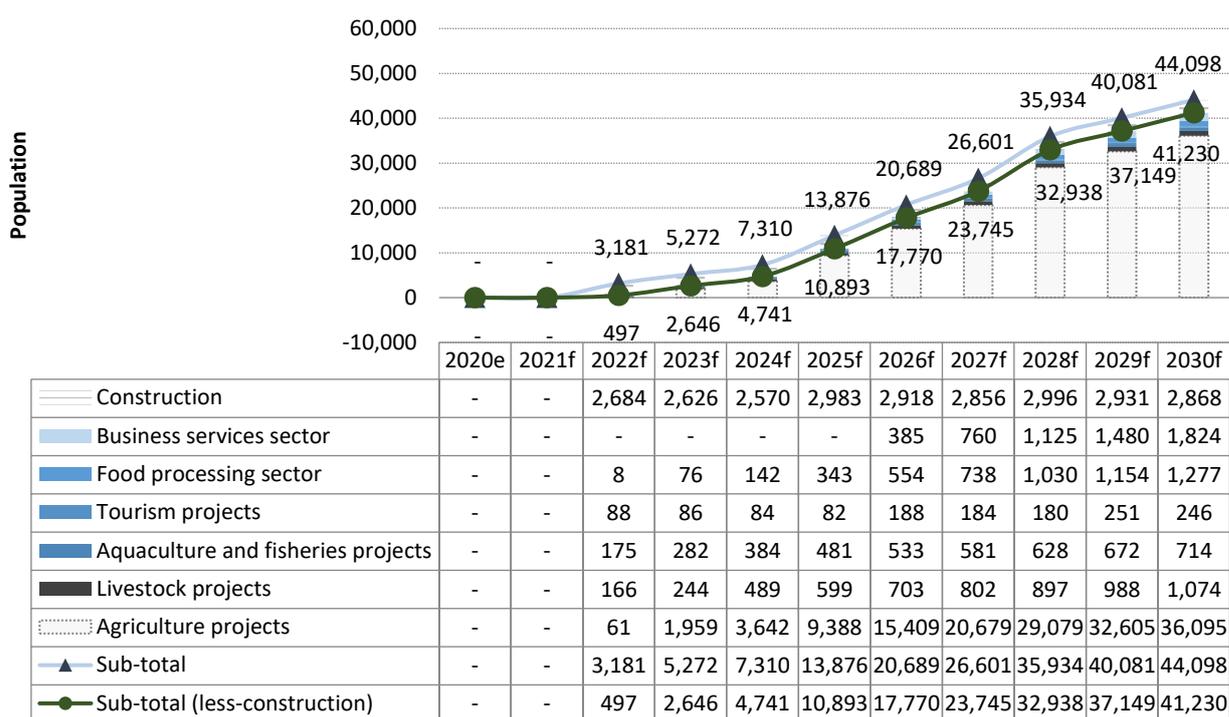


Figure 8-14: Population Projection - Projects Driven - Sri Aman Division, 2020 – 2030

Source: Frost & Sullivan Analysis

8.2.7 Household Income Estimates

The average household income of Sri Aman Division is expected to grow at a compounded annual growth rate of 7.4% to RM4,559 in 2030f from RM2,228 in 2020. Figures quoted are at constant prices (exclusive of inflation) where the base figure of 2020 was based on the social survey carried out as part of this master plan.

A key assumption in the modeling process is that significant productivity improvements are achieved through the use of technology in agriculture, livestock, aquaculture, and fisheries activities. Average wages of agriculture and aquaculture from the National Employment Returns study 2019 was used as a basis for the wages for the two economic sectors as national wages capture the productivity levels of more competitive agriculture operations across the country. The remaining wages were based on the household income census of Sarawak. For all wages, a constant increase in productivity of 2.2% per annum was applied – productivity growth based on pre-pandemic growth rates published in the MPC productivity report 2018/2019.

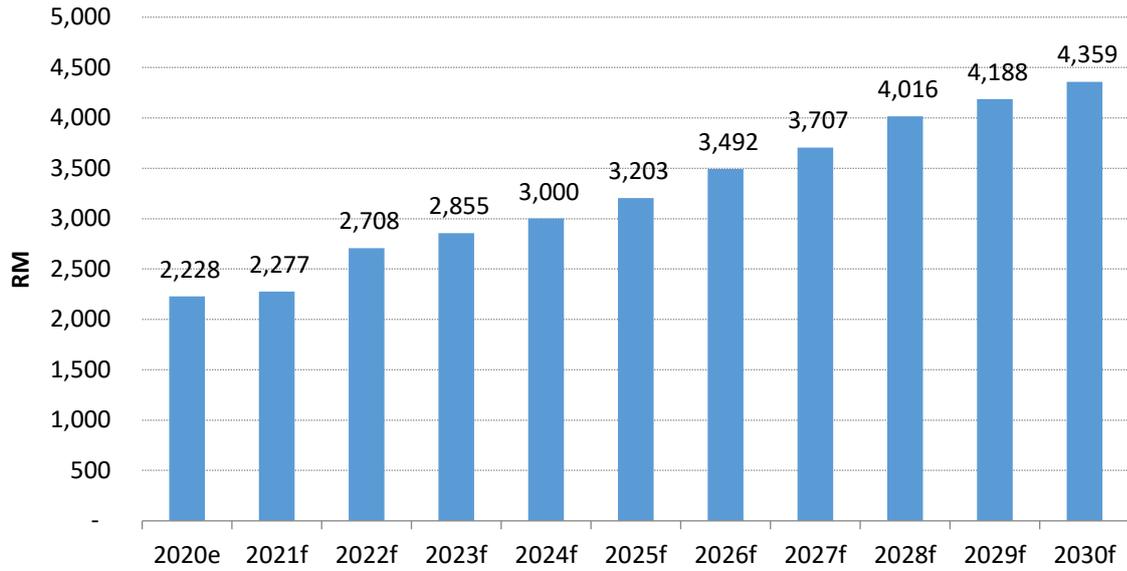


Figure 8-15: Sri Aman Division Estimated Average Household Income, 2020e to 2030f

Source: Frost & Sullivan Analysis

SECTION 8.3 INSTITUTIONAL FRAMEWORK

Key considerations

Under the current institutional arrangement where SADA is part of the Resident’s office, projects will be implemented through facilitation and collaboration with agencies both at Sarawak level and federal government; while sufficient to implement the masterplan, the ability of SADA to directly influence development projects is limited.

Through option 2, the implementation of Sri Aman masterplan will gain better access to federal government funds that are beneficial in particular for sectoral development projects. This option requires changes to the strategic focus of RECODA to include Sri Aman division within the gazetted area.

Option 3 where SADA takes on an authority status would require broader strategic focus for instance the development of Greater Kuching and border town to fill the gap of the SCORE gazetted areas.

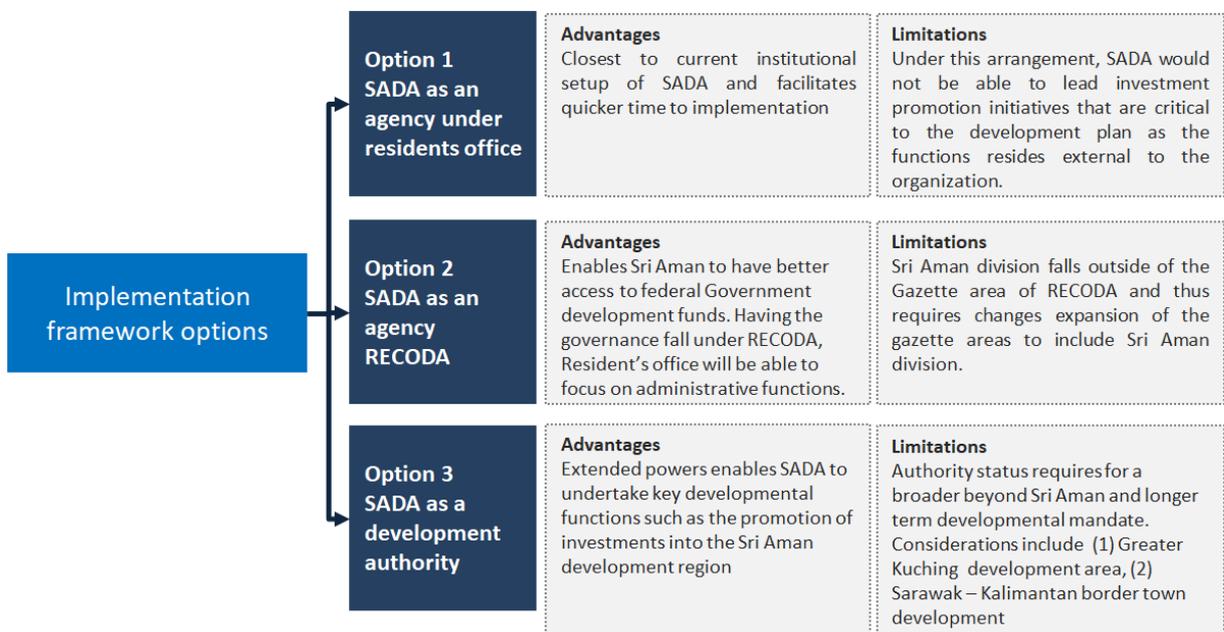


Figure 8-16: Implementation framework options

Source: Frost & Sullivan Analysis

The current gazetted areas of SCORE excludes Sri Aman division. Under option 2 where SADA would be parked under RECODA, an expansion of the gazetted areas would be required. A potential thematic focus to be considered would be the greater Kuching and border town economies as illustrated in Figure 8-17.



Figure 8-17: RECODA gazette area and proposed expansion

Source: Frost & Sullivan Analysis; Base graphic from RECODA

Taking into considerations the lead time required to implement options 2 and 3 which requires changes to the gazette of SCORE and establishment of a new authority which introduces further complexities in administration, option 1 is proposed as the most practical model with least lead time to implementation.

Under option 1 the Economic Planning Unit of Sarawak will play the role of the custodian to the SADA development plan including other areas that fall outside of the RECODA gazetted areas.

SADA would play the role of a coordinating agency and leveraging upon the resource base of the Sri Aman resident's office to aid in the implementation of the respective programs.

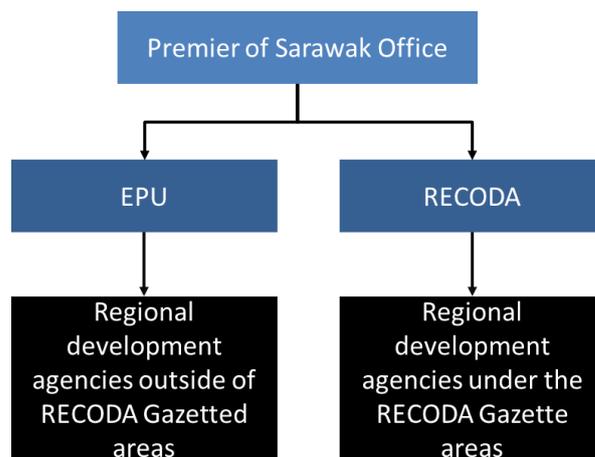


Figure 8-18: Proposed custodian structure of the masterplan

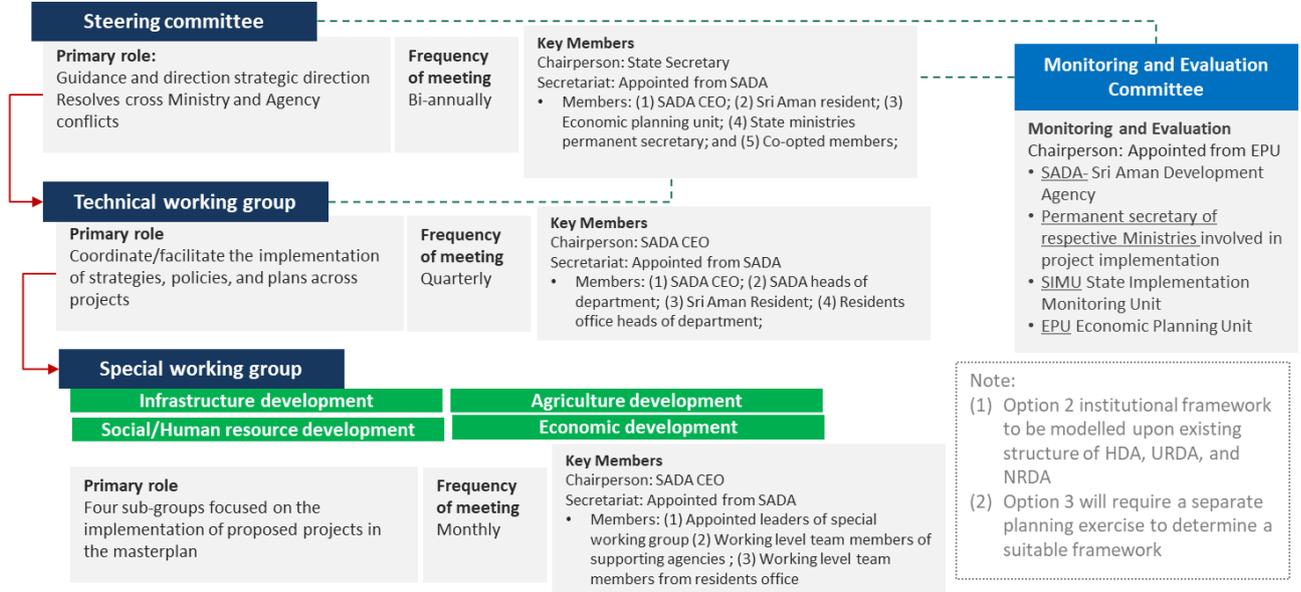
Source: Frost & Sullivan Analysis

The following proposed institutional framework under Figure 8-19 is applicable for option 1 in which SADA operates as an agency under the resident's office. The proposed institutional framework for

option 2 would be modelled upon the existing structure of regional development agencies under RECODA namely Upper Rajang Development Agency, Highland Development Agency, and Northern Region Development Agency. Option 3 will require a separate planning exercise to outline the appropriate authority roles and institutional structure.

Figure 8-19: Proposed institutional framework

Proposed Institutional Framework – For Option 1 SADA



Source: Frost & Sullivan Analysis

Figure 8-20: Supporting Ministries and Agencies of the Sri Aman Masterplan Framework

Committee/Working Group		Supporting ministries and agencies	
Steering Committee		<ul style="list-style-type: none"> State secretary SADA CEO Resident Economic planning unit 	<ul style="list-style-type: none"> Permanent secretary (Ministry of international trade and E-commerce, Ministry of local government and housing, Ministry of education science and technological research, Ministry of welfare, community well being, women, family and childhood development, Minister of rural electricity and water supply, and Minister of tourism, arts culture, youth and sport) Department heads of implementing agencies
	Technical Working Group	<ul style="list-style-type: none"> SADA CEO Resident SADA – (Infrastructure development team, Agriculture development team, SADA - Non-agriculture economic development team, Social development team) Resident office departments (Finance, Development, Social Transformation,) 	
Special working group	Infrastructure Development Special Working Group	<ul style="list-style-type: none"> Sarawak Energy Sarawak Rivers Board Public Works Department Ministry of Transport 	<ul style="list-style-type: none"> Ministry of Utility and Telecommunication Department of Rural Water Supply
	Agriculture Development Special Working Group	<ul style="list-style-type: none"> Federal Ministry of Agriculture & Food Industry Department of Agriculture Department of Irrigation and Drainage Federal Agricultural Marketing Authority Sarawak Land Consolidation and Rehabilitation Authority Department of Forest Sarawak Forestry Corporation 	<ul style="list-style-type: none"> Farmers cooperative Malaysian Agricultural Research and Development Institute Ministry of Modernization of Agriculture, Native Land and Regional Development Department Of Veterinary Services Sarawak Felcra Berhad
Special working group	Economic Development Special Working Group	<ul style="list-style-type: none"> Sarawak Forestry Corporation Ministry of Infrastructure Sarawak Tourism Board Ministry of Tourism, Creative Industry & Performing Arts Sarawak Sarawak Crafts Council 	<ul style="list-style-type: none"> Sarawak Museum Sarawak Economic Development Corporation Sarawak Digital Economy Corporation SME Corporation
	Social Development Special Working Group	<ul style="list-style-type: none"> Ministry of Youth and Sports Local councils IHLs and Training Institutions 	<ul style="list-style-type: none"> Department of Skills Development Ministry of Education, Science, and Technological Research

Source: Frost & Sullivan Analysis

SECTION 8.4 IMPLEMENTATION AGENCY ROLE

Outlined in this master plan are projects with requirements that cut across a spectrum of physical infrastructure and facilitation needs aimed at enabling enterprise activities in the economic priority areas. Best practices dictate that Government participation and intervention in enterprise activities is necessary only in the event of market failures or in the instance of establishing new economic focus areas of which the long-term strategy is to have private sector take over the lead. The role of government in the implementation of the Sri Aman Masterplan shall be based on a minimal intervention approach where in the course of execution of projects private sector is expected to take a leading role.

Government participation in the implementation of the Sri Aman Masterplan covers four key areas that include (1) Infrastructure, (2) Trade and investment development, (3) Stakeholder facilitation, and (4) Administration and licensing and is outlined in further detail below.

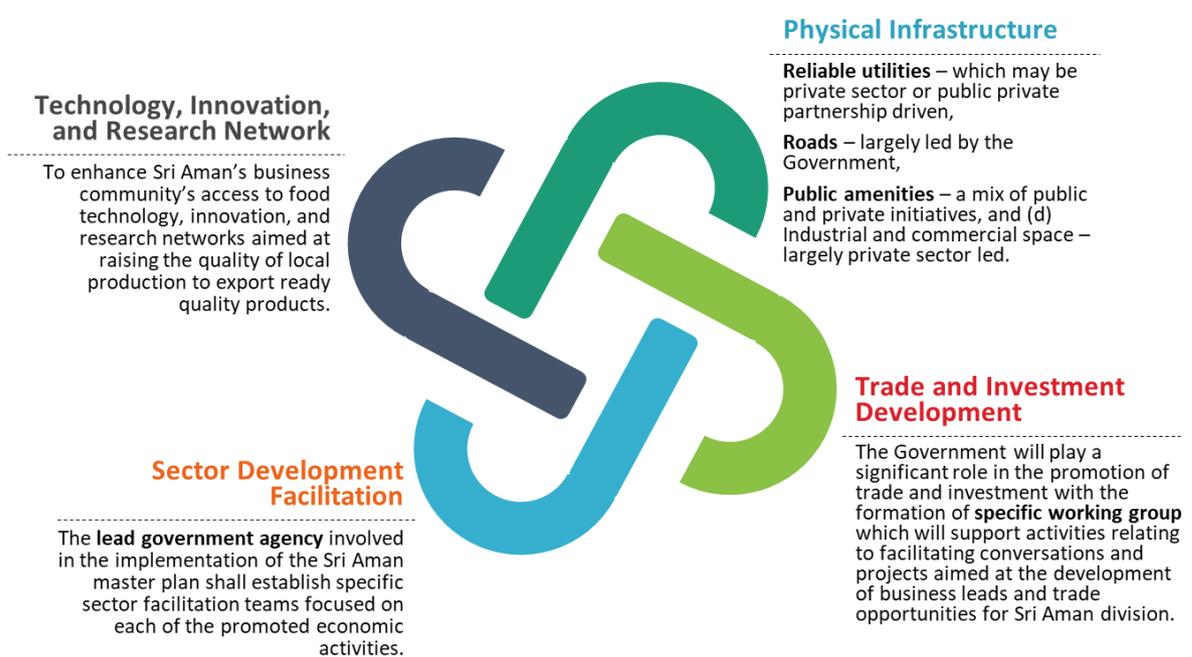


Figure 8-21: Role of government in Sri Aman Masterplan Implementation

Source: Frost & Sullivan Analysis

8.4.1 Physical Infrastructure

In the provision of physical infrastructure, the key focus areas would cover (a) Reliable utilities – which may be private sector or public private partnership driven, (b) Roads – largely led by the Government, (c) Public amenities – a mix of public and private initiatives, and (d) Industrial and commercial space – largely private sector led.

With the exception of roads which are largely non-commercially viable infrastructure investments, the Implementation of other physical infrastructure projects should give priority towards private sector-driven models. In the event where no viable commercial partners are identified, the Government shall opt for a hybrid approach through Public-Private Partnership (PPP) or the last resort is to have the initiatives driven by Government. PPPs may be considered for instance in the provision and

management of commercial and industrial space where Government participation should be limited to the provision of empty land lots and operating concessions.

8.4.2 Trade and Investment Development

The Government will play a significant role in the promotion of trade and investment where a specific working group is proposed under the institutional framework titled 'Investor and business facilitation working group'.

The proposed working group will support activities relating to facilitating conversations and projects aimed at the development of business leads and trade opportunities for Sri Aman division. Engagements are required with various business associations within Malaysia and abroad, state level trade and investment promotion agencies, federal level trade and investment promotion agencies, and through Malaysia's foreign offices conversations with trade councils in Kalimantan, Singapore, and other potential markets of Sarawak's product.

The trade and investment development discussions will focus on the promoted economic activities that include (a) Commercial agriculture and related smart farming activities, (b) Livestock, (c) High value aquaculture and fisheries activities, (d) Tourism and crafts activities, (e) Food manufacturing, (f) Business services outsourcing, and (g) Trade linkages with Kalimantan.

Trade and investment development efforts will focus on (a) Identifying potential investment opportunities – inbound, (b) Domestic investment interest, (c) Connecting potential investors with local entrepreneurs in Sarawak – via business networks including associations, (d) Connecting businesses across Malaysia and abroad with business in Sri Aman division (e) Identifying future products that have demand in regional markets and may be produced in Sri Aman division, and (f) Provide investors with seamless support from the point of expressing interest to official business setup in Sri Aman division.

8.4.2.1 Opportunities

Leverage upon the Sarawak Trade and Tourism Office Singapore (STATOS), an initiative of the State Government of Sarawak to strengthen and develop new trade, investment and tourism linkages between Singapore, Sarawak and the world. Study findings indicate that similar initiatives will be setup in Pontianak, Kalimantan.

Establish working relations Japanese companies through ASEAN – Japan Centre. The Centre introduces ASEAN products and services by organizing exhibitions and business negotiation events, together with each embassy of ASEAN Member States and related trade promotion agencies at ASEAN-Japan Hall.

Collaborate with northeast Asian countries such as South Korea and Japan. Malaysia has already working cooperation with South Korea to develop Smart Farming Project in Sabah, Malaysia, which includes bringing an integrated large-scale livestock farming and renewable energy (RE) generation project to Sabah that could generate an investment of up to RM8.34 billion over the next five years.

8.4.3 Sector Development Facilitation

The lead government agency involved in the implementation of the Sri Aman master plan shall establish specific sector facilitation teams focused on each of the promoted economic activities namely, (a) Commercial agriculture and related smart farming activities, (b) Livestock, (c) High value aquaculture and fisheries activities, (d) Tourism and crafts activities, (e) Food manufacturing, and (f) Business services outsourcing.

The sector facilitation activities aim to facilitate regular cross stakeholder discussions in relation to the implementation of the proposed business models in the master plan. For instance, the development commercially viable smart agriculture will require the participation of various stakeholders that include (a) Land ownership, (b) Irrigation, (c) Mechanisation and automation, (d) Seed banks, (e) Localized collection and processing, (f) Food manufacturing, (g) Wholesale and distribution, (h) Technology providers in particular in food processing and packing, and (i) Digital marketing.

Facilitation activities will encourage a better coordinated approach towards the development of the respective economic sectors and will be a key differentiator over previous development initiatives that were largely focused only on production.

8.4.4 Technology, Innovation, and Research Network

Central to the Sri Aman economic development strategy is increasing exports of Sri Aman products. With a heavy orientation towards agriculture, livestock, and aquaculture economic activities, it is imperative for the Government to enhance Sri Aman's business community's access to food technology, innovation, and research networks aimed at raising the quality of local production to export ready quality products. The research networks may not be fully based in Sri Aman as it would not be economically viable to establish a research centre in Sri Aman division in the early stages however the focus will be on facilitating local business community access through a one-stop services point to institutions that provide support and training on food technology, food quality testing, food packaging, and food product innovation.

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PART 9 **SUMMARY**

SECTION 9.1 **FINANCIAL SUMMARY**

The total cost of projects under the SAMP is estimated to be RM 4.51 billion. Out of the total estimated budget, projects for the purpose of infrastructure development make up the largest portion of 58.5% from the total estimated budget with the proposed allocation of RM 2.64 billion. This is followed by agriculture & livestock and aquaculture & fisheries projects which consist of 32.6% from the total estimated budget with the proposed allocation being RM 1.47 billion for the period of 2021-2030. The remaining of the estimated budget is allocated for the development of tourism sector, utility and social well-being projects in Sri Aman.

With the primary focus of economic development strategy for Sri Aman in reinforcing core capabilities and developing new opportunities, high-value agriculture projects are introduced, namely, Sacha Inchi, Coffee and Agrotechnology parks, besides capitalising on the core strengths of Sri Aman with its existing agricultural and tourism activities. With the potential of Sri Aman in aquaculture and fisheries, the aquaculture industry at Batang Ai Reservoir will be expanded besides developing the eco-tourism industry in Sri Aman.

The investment on infrastructure in Sri Aman, with an estimated budget of RM 2.64 billion, aims at strengthening the basic infrastructure to improve connectivity and standard of living among local community while enhancing productivity of core sectors with the proposed development of commercial wharfs and CPPCs at Lachau and Temudok. In line with the State's digital economy strategy, the proposed soft infrastructure projects will serve as e-commerce platform/channels for local businesses and develop global business services opportunities. Combining the investment on higher and early childhood education, the total estimated budget of RM 74.4 million will be allocated for human capital development in order to enhance the social well-being in Sri Aman. With the total estimated budget of RM 4.51 billion, the proposed projects under SAMP shows the State's commitment in developing Sri Aman where these investment sums are targeted towards those where there is the most to gain, where the benefit is highest.

SECTION 9.2 PROJECT PRIORITY SETTING

9.2.1 Priority Setting for Projects

The proposed projects have been allocated a priority as shown in Table 9-1. The following notes are applicable:

- Ranking 1 is the highest priority
- A comment is provided for the rationale for the ranking (in the fourth column)
- Some projects were grouped together in the main text but have been separated for the priority listing (e.g., multiple bus stations, wharves, water-based transport) generally to separate them on the basis of location.
- Resilience projects all involve annual budgets and thus no ranking is applicable
- Water and electricity projects are largely under agency programs and will be delivered in accordance with Agency criteria and, generally, we don't propose a priority ranking for these unless there is a clear urgency and implication for the SAMP. These are shown as NA.

Table 9-1: Priority Ranking of Projects

PRIORITY RANKING	CODE	Strategic Initiative (Program/Project)	Priority Reason	Location
1	AG-1 (a)	Batang Lupar Integrated Agriculture Development Area (IADA) - Paddy	Already underway	Batang Lupar - Batang Lingga
1	AG-2	Pantu Specialty Rice Project	Long lead time for irrigation infra	Pantu
1	AG-3	Pineapple	Easy to implement. Needed as seed project for CPPC	Lachau
1	AG-5	Durian	Needs 5 years to mature	Skrang Valley, Lachau
1	AG-8	Sweet Corn	Low hanging fruit	Sri Aman District
1	AG-12	Coffee	New crop for region. Need to establish model. Also vital to CPPC.	Engkilili, Lubok Antu
1	AG-13	Sacha Inchi	Existing entrepreneurial activity. Need to support asap	Pantu
1	LV-1	Cattle Integration	Ready to go	Lubok Antu, Batu Lintang
1	AG-9	Apiculture (Honey Bees)	Can establish quickly and easily	Skrang Valley, Lubok Antu
1	FH-2	Exploring the Potential of the adjoining Kalimantan Market for Supply of Additional Products	Consultant study can be undertaken asap	Lubok Antu
1	AQ-1	Expansion of Aquaculture Industry at Batang Ai Reservoir, with a View of Creating Processing Spin-offs	Moves currently underway to implement this	Batang Ai
1	S1-1	Develop the Gunung Lesong-Lingga Ecotourism Cluster - HQ facilities and community-managed accommodation (CBT)	Key Tourism initiative in Sri Aman	Gunung Lesong-Lingga
1	S1-3	Develop specific sites / attractions for domestic tourists and local residents of Sri Aman division, particularly for families and the youth travel segment.	Cater for domestic tourism while international tourism is still recovering	Sri Aman

PRIORITY RANKING	CODE	Strategic Initiative (Program/Project)	Priority Reason	Location
1	S1-4	Develop a Rainforest Field Studies Centre at Batang Ai National Park and partner with a local and foreign university to manage the centre and research activities.	Will require some lead time. Need to start on this asap. Stage 1 is to develop alliances with foreign universities and NGO's to participate in and contribute to the project.	Batang Ai
1	S1-5	Allocate sufficient funds for local recreation and picnic spots so that local councils can maintain facilities and keep them clean.	Essential first step in tourism development here	Sri Aman
1	S2-3	Develop a community-based tourism project, camp site and associated facilities at Wong Ajong, Engkilili.	Good prospect for tourism	Engkilili
1	S3-1	Gazette Ulu Sungai Menyang landscape as a national park (or other form of protected forest) to protect the orangutan population.	Urgently needs protection from logging, hunting and development to preserve this environmental asset	Sungai Menyang
1	S3-3	Conduct wildlife surveys to estimate the population of Bornean Banded Langur (or Sarawak langur) at Gunung Lesong & surroundings.	Important material to promote the NP.	Gunung Lesong
1	S3-4	Gazette the proposed extensions to Batang Ai National Park	Urgently needs protection from logging, hunting and development to preserve this environmental asset	Batang Ai
1	S3-5	Re-assess the need to build roads through irreplaceable orangutan habitat. Instead of roads in these fragile areas, improve river and lake transport for communities (new jetties, lake ferry service, etc.).	Investigate and implement riverine transport options at Batang Ai	Sri Aman
1	S4-1	Set up a dedicated website for the tidal bore (e.g. borneotidal bore.com). This site should include general information about the tidal bore; daily 'wave' times at key sites along the Lupar River (e.g. times at Seduku, Sri Aman, etc.); and webcam feeds of the tidal bore.	Low hanging Fruit but will substantially enhance tourism experience.	Sri Aman
1	S4-3	Ensure key attractions and recreation sites have correct locations in Google Maps.	Simple and effective	Sri Aman
1	S4-4	Develop interpretation materials and collaterals (trail maps, guides, etc.) and digital content (videos, photos, blog content, etc.) for the Gunung Lesong-Lingga Ecotourism Cluster	Vital to establishing the tourism credentials of this site	Gunung Lesong-Lingga
1	S5-1	Build a road from Pantu to Gunung Lesong to unlock the potential of the Gunung Lesong-Lingga Ecotourism Cluster.	Incl in priority Infra projects	Gunung Lesong-Lingga
1	S5-2	Clear the piles of logs and fallen trees (log jams) on the Ai & Delok Rivers. This should be done each year. This will create faster and safer river travel for both communities and tourists.	Enhances tourism experience and community welfare	Ai & Delok Rivers
1	S5-3	Improve river transport for upriver communities at Batang Ai. Study the merits of introducing river / lake taxis, building better jetties and boat ramps, having a fuel depot near lake, etc.	As for S3-5	Batang Ai
1	S5-5	Allocate funds to maintain the tourist jetty and reception area / toilet block at the Batang Ai. With the resort	Essential to the tourism experience	Batang Ai

PRIORITY RANKING	CODE	Strategic Initiative (Program/Project)	Priority Reason	Location
		closed this building is going into disrepair. Even without a resort, this facility is needed and should be maintained by the local council, Sarawak Energy or relevant agency.		
1	S5-7	Examine the feasibility of float plane service to Batang Ai.	This will improve access for tourists, enhance the experience and max time at the site.	Batang Ai
1		Development of Business Incubation Centre	Need a central hub	Temudok
1		Development of Training Centre	Essential for local skills development to support agri sector	Temudok
1		Small traders e-Commerce market access point (Public Private Partnership)	To support local producers and replace 'middle-men'	Temudok
1		Facilitate business match making and promotion of opportunities in Sri Aman	Simple, easy and effective	Temudok
1		Establishment of an industrial park for micro, small, medium business with primary focus on food processing and logistics	To support agri industry. Will need lead time to establish so need to start asap.	Temudok
1	S5-7	Feasibility study into amphibious plane service to Batang Ai	Important tourism initiative	Batang Ai
1	TR-2(a)	Proposed Bus Terminal/ Station/ R&R To Strengthen The External And Intra Sri Aman Connectivity	Enhance Lachau as a stop-over	Lachau
1	TR-2(a)	Public Transport Service Simanggang – Lingga - Pantu	Important for community connectivity, easy to implement	Lingga, Pantu, Sri Aman
1	TR-2 (c)	Public Transport Service Simanggang – Temudok – Lubok Antu	Will be important as Temudok activities are established. Enhance connections to Lubok Antu District.	Simanggang, Temudok, Engkilili
1	TR-4	Proposed New Jetties at Batang Ai	Important to separate aquaculture activities from public facilities	Batang Ai
1	RO-1	Proposed Simanggang Link Road	Useful to overcome congestion	Simanggang
1	RO-2	Proposed Banting - Gunung Lesong - Engkeranji Road	Top priority is to complete the Pantu - Lingga link.	Banting - Gunung Lesong - Engkeranji
1	RO-3	Proposed Lingga - Banting Road		Lingga - Banting Road
1	RO-8	Proposed upgrading of Menangkin to Engkeranji Road	Top priority is to complete the Pantu - Lingga link.	Jalan Menangkin - Engkeranji
1	RO-9	Proposed upgrading of Pantu - Keranggas - Engkeranji Road	Top priority is to complete the Pantu - Lingga link.	Pantu - Keranggas - Engkeranji
1	RO-10	Proposed upgrading of Ulu Skrang Road	Accessing proposed agricultural areas in Ulu Skrang	Ulu Skrang
1	BR-1	Proposed Reinforced Concrete (R.C.) Bridge At Nanga Entalau, Ulu Skrang	Supports Project RO-10	Ulu Skrang
1	SW-1	Drainage Upgrades for High Priority Areas	Long term project that needs to commence with the investigative study	Sri Aman
1	SW-2	Road Culvert Upgrades	Long term project that needs to commence with the investigative study	Sri Aman
1	RB-1	Infrastructure - Riverbank Erosion (Riverbank Protection Work for High Priority Areas)	Long term project that needs to commence with the investigative study	Sri Aman

PRIORITY RANKING	CODE	Strategic Initiative (Program/Project)	Priority Reason	Location
1	IR-1	Flood Irrigation for Paddy Projects	To support the agri projects	Batang Lupar, Pantu
1	IR-2 (a)	Storage Pond and Feeder Mains for Non-paddy Projects and Agrotech Parks	To support the agri projects	Pantu, Lachau
1	IR-2 (b)	Storage Pond and Feeder Mains for Non-paddy Projects and Agrotech Parks	To support the agri projects	Simanggang, Temudok
1	TC-1	Installation of 85 new towers across Sri Aman Division[1]	Already underway	Sri Aman
1	TC-2	Installation of 20 VSAT units across Sri Aman Division	Already underway	Sri Aman
1	WM-10	Solid Waste Recycling	Need to undertake feasibility study asap	Sri Aman
1	WM-1	Upgrading of existing dumpsites/landfills in Sri Aman	Health, sanitation and safety issues	Sri Aman
1	WM-2	Expand and upgrade the Lubok Antu site to a Level 4 Sanitary Landfill	Important to medium/long term strategy	Lubok Antu
1	WM-3	Waste Transfer Stations to be established	Ties in with WM-2	Entulang, Pantu, Lingga, Engkilili, and Lubok Antu
1	LW-3	Establish downstream treatment for remote communities	Important for Lake and River water quality in Batang Ai.	Batang Ai
2	AG-1 (b)	Batang Lupar Integrated Agriculture Development Area (IADA) - Pineapple	To follow AG-1 (a)	Batang Lupar - Batang Lingga
2	AG-4	Coconut	Will take time to source seed-stock	Simanggang, Engkilili
2	AG-7	Banana		Temudok
2	LV-2	Swiftlet Commercial Farming		Lingga
2	AG-10	Agrotechnology Parks at Lachau & Temudok	Further investigative studies needed before establishing	Lachau, Temudok
2	FH-1	Development of Recreational Fisheries		Batang Ai
2	AQ-2	Integration of 'Smart Farming' Systems in Aquaculture Using Remote Monitoring and Management Systems	Needs internet / communications infrastructure to be in place first	Sri Aman
2	S1-2	Promote Sri Aman Division as a camping destination and develop five high quality camping sites with a full range of facilities.		Sri Aman
2	S1-7	Develop visitor centre style attractions (e.g. handicraft centre, cultural centre) in Simanggang Town, not in small towns where use and visitation will be limited.		Simanggang
2	S1-10	Promote fishing at Batang Ai Lake as a leisure activity and way of dealing with the lake's 'feral' fish problem.	Same as FH-1	Batang Ai
2	S2-1	Pioneer a CBT kampung stay with 'stand-alone' accommodation at the base of the current summit trek at Gunung Lesong (Kpg Munggu Sawa)	Establish the site attraction first	Gunung Lesong
2	S2-2	Pioneer a community-managed 'homestay' camping site at the northern borders of G. Lesong (Kpg Menuang)	Establish the site attraction first	Gunung Lesong
2	S2-5	Continue to promote private sector led, community focused ecotourism operations at Batang Ai.	Needs procedural review and marketing	Batang Ai
2	S3-2	Establish a wildlife corridor between Gunung Lesong and Sebuyau National Parks.		Gunung Lesong, Sebuyau

PRIORITY RANKING	CODE	Strategic Initiative (Program/Project)	Priority Reason	Location
2	S4-2	Set up a photo library of high quality images of attractions and experiences in Sri Aman Division to be used for marketing and promotion.	Useful initiative	Sri Aman
2	S4-5	Consider setting up a visitor information desk at Fort Alice, the Resident's Office or somewhere on the new waterfront development.	Useful initiative	Sri Aman
2	S4-6	Produce a destination video featuring the key attractions in Sri Aman Division and a series of video blogs on different attractions and experiences.	This can be a very powerful tool, esp for domestic market	Sri Aman
2	S5-4	Build boat jetties at Banting and an appropriate site near G. Lesong to connect the tourism cluster and facilitate boat cruises along the Sungai Seterap.	Establish G Lesong Attraction first	Banting, Gunung Lesong
2	TR-3	Proposed Riverine Transport (Water Taxi)	Important community service, but no immediate project benefit	Batang Ai
2	TR-2 (b)	Public Transport Service Engkilili – Lubok Antu – Batang Ai	Important for community connectivity.	Lubok Antu, Engkilili
2	TR-5	Proposed Pedestrian Network, Cycle Track And Installation Of Smart Centre In Simanggang	Good attraction for Simanggang	Sri Aman
2	RO-4	Proposed Batu Besai/ Po Ai Shortcut Road	Facilitates alternative access to agri areas	Batu Besai
2	RO-6	Proposed Sebemban Gayau Road	Alternative access to padi project area.	Sebemban Gayau Road
2	RO-7	Proposed New Access Road To New Aquaculture Site At Batang Ai	Access for telecommunications tower and potential aquaculture landing area	Batang Ai
2	RO-14	Upgrade Engkilili – Lubok Antu Road	Important to establish good and safe link between LA and Engkilili	Lubok Antu, Engkilili
2	TC-6	Installation of 1 new tower for proposed Research Centre at Batang Ai NP	Needs to be completed in time for opening of Field research Centre	Batang Ai
2	TC-7	Installation of 1 new tower for proposed Aquaculture Complex at Batang Ai Lake	To support SMART farming initiatives	Batang Ai
2	TC-4	Establish State Government owned digital services provider	Needs to follow towers installation	Sri Aman
2	WM-4	Extend solid waste collection services to more rural areas within the Sri Aman Division	As roads are improved/extended, collection should follow these	Sri Aman
2	WM-7	Composting plant/Green centres for food waste at commercial premises	Important initiative to enhance aesthetics, and for better env outcomes	Sri Aman
2	WM-9	Waste management in Remote communities	Important for Lake aesthetics and tourism	Sri Aman
2	SC-1	ICATS Facilities Setup Cost	Important to provide training for proposed new industries	Sri Aman
2	SC-2	CENTEXS Establishment	Important to provide training for proposed new industries	Sri Aman
2	SC-3	New Pre-school/ Tabika at SPS Batang Ai, Nanga Kumpang, Lubok Antu Town Area, Lubok Subong	Will be required as population grows	Lubok Antu
2	SC-4	New Child Care Centre to cater for Government Servants at Simanggang town	Growth in govt servant population is anticipated	Simanggang
2	SC-5	Taska/Tabika in rural areas	Will be required as population grows	Bkt. Begunan, Lubok Antu, Balai Ringin

PRIORITY RANKING	CODE	Strategic Initiative (Program/Project)	Priority Reason	Location
2	SC-6	New Child Care Centre to cater for Government Servants at Simanggang town	Growth in govt servant population is anticipated	Simanggang
2	SC-7	New Secondary Schools (3)	To cater for growing population	Engkilili, Lingga, Temudok
2	SC-8	New Primary Schools (20)	To meet population growth	Various
2	HE-2	New Clinics (20)	To cater for growing population	Various
2	SP-2	New minor stadium in Lubok Antu	To cater for growing population	Lubok Antu
3	AG-6	Rambutan		Lachau
3	AG-11	Oil Palm		Lubok Antu-Engkilili
3	S1-6	Continue to fund local events and festivals (e.g. Pesta Benak).	No immediate action needed	Sri Aman
3	S1-8	Continue to allocate funds to preserve heritage sites such as Fort Arundell, Lingga Bazaar, etc.) as part of a Sarawak's wider policy of investing in important cultural & heritage assets.	Needs refreshed focus on heritage assets	Sri Aman
3	S1-9	Develop agro-tourism products around the fish cage culture at Batang Ai as an add-on tour / new attraction.		Batang Ai
3	S2-4	Develop a 'kampung stay' project with 'stand-alone' accommodation at Banting when the village is accessible by road.	Needs road access improved first,	Banting
3	S2-6	Develop a Cultural Heritage Centre at Gunung Lesong	Establish the site attraction first	Gunung Lesong
3	S4-7	Promote an adventure race in Sri Aman Division (e.g. the Sarawak Adventure Challenge). Potential locations include Gunung Lesong and Batang Ai.	Good promotional activity	Sri Aman
3	S4-8	Promote a Road Cycling Race in Sri Aman when the Borneo Highway is completed. A potential route is Lingga--Simanggang-Engkilili.	Needs road infrastructure to be completed	Sri Aman
3	S4-9	Develop a water based event or festival at Batang Ai Lake (e.g. jet ski regatta, kayaking races, longboat races, etc.).	Need to establish / upgrade facilities first	Batang Ai
3	S5-6	SEB to continue to maintain the water level of the reservoir so that upriver areas remain safe and navigable and rapids do not appear (e.g. Wong Taong).	No immediate action reqd	Sri Aman
3		Establish an outsource business services sector in Sarawak with first rural delivery centre in Sri Aman	Needs Kuching business to be established first	Temudok
3	TR-1	Proposed new jetties on Btg Seterap	Follows on from road projects	Banting, Pantu, Engkaranji
3		Set Up a CPPC	Need to get agro projects productive first.	Lachau
3		Set Up a CPPC	Need to get agro projects productive first.	Temudok
3	RO-5	Proposed Jalan Merebong - Bukit Tungku Road	Simplifies access in region	Jalan Merebong - Bukit Tungku
3	RO-11	Proposed upgrading of Jalan Akses Sri Aman to dual carriageway	To be undertaken following completion of project RO-1	Sri Aman
3	RO-12	Proposed upgrading of Merindun Merio - Engkilili Road	Useful link and access to agri areas	Merindun Merio - Engkilili

PRIORITY RANKING	CODE	Strategic Initiative (Program/Project)	Priority Reason	Location
3	BR-2	Proposed Reinforced Concrete (R.C.) Bridge Over Batang Lupar River, Engkilili Bazaar	Important link for Engkilili	Engkilili
3	TC-5	Installation of 2 new towers in Ulu Skrang	Following road upgrade works	Ulu Skrang
3	TC-3	Upgrade Telecom exchanges in Simanggang and Temudok	In accordance with increasing demand over course of project.	Simanggang, Temudok
3	WM-5	Study into Waste segregation and Scheduled collection for household bulky, green and recyclables waste	Follows after systems are established in Kuching, Sibü	Sri Aman
3	HE-1	New Hospital (Engkilili)	Not urgent as new hospital in Simanggang will cope for a few years.	Engkilili
3	SP-1	New major stadium in Simanggang	To cater for growing population	Simanggang
4	RO-13	Proposed upgrading of Batang Strap, Sapak, Isu To Simpang Ubah Road	Useful to access specialty Rice Project. Should commence after RO-8 and RO-9 are completed so that Pantu is not disadvantaged.	Isu, Simpang Ubah
NA	EL-1	Serudit to Sri Aman 132kV Transmission Line		Lachau, Temudok
NA	EL-2	33kV overhead line from Lachau EHV Substation to Temudok 33/11kV transformer station		Simanggang
NA	EL-3	Simanggang 132/33kV Substation		Simanggang
NA	EL-4	Simanggang B 33/11kV Substation		Ng Kesit
NA	EL-5	Ng Kesit Substation		Lachau
NA	EL-6	Second EHV 275/33kV transformer at Lachau		Simanggang
NA	EL-7	Upgrading of Simanggang Sub transformer		Simanggang
NA	EL-8	Double circuit from Simanggang EHV to Simanggang Sub station		Banting
NA	EL-9	33kV Covered Conductor line to Banting and new 33kV Substation at Banting		
NA	WS-1	New 75 MLD Engkilili Water Treatment Plant		Simanggang, Simpang Kiassan
NA	WS-2	Treated Water Storage System SMK Simanggang, and Simpang Kiassan		Sri Aman
NA	WS-3	Sri Aman Regional Water Supply Grid		Bukit Begunan
NA	WS-4	Water Supply System in Bukit Begunan		Engkilili
NA	WS-5	Water Supply System in Engkilili		Pantu
NA	WS-6	Rural Water Supply Project for Pantu Area (Phase III)		Lubok Antu, Skrang, Lingga, Pantu
NA	WS-7	SAWAS) for rural/remote parts of Lubok Antu, Skrang, Lingga and Pantu		



PART 10 ENVIRONMENTAL MANAGEMENT

Environmental management in Sarawak is based on the Federal Constitution and power vested in the legislature of Sarawak. It should be noted that certain special safeguards for Sabah and Sarawak are stipulated in the State list of the Federal Constitution; they include among others, agriculture, forestry, land and petroleum and mineral resources that are of relevance in this review (see Federal Constitution, June 2009 and Constitutional Federalism by J.C. Fong, 2008).

In Sarawak, (being separate territories from the Federation of Malaya), State Ministries, Departments and Statutory Bodies have been established and mandated to enforce the legislations to regulate and protect the State's interests independently of Federal Government control. However, there are some areas where the State may need the support of the Federal Government legislation and their machinery to carry out enforcement efforts. This policy is in line with the Malaysia Agreement (MA63) as conditions for Sabah and Sarawak to participate in the formation of the Federation of Malaysia. The main government agencies enforcing environmental legislation in Sarawak are discussed below.

SECTION 10.1 NATURAL RESOURCES AND ENVIRONMENT BOARD

The Natural Resources and Environmental Board (NREB), empowered by the State's legislation (Natural Resources and Environment Ordinance, 1994), is the lead agency for natural resources and environmental protection and management in Sarawak. Enacted under the powers of the NREO under Section 11(A)(1) is the Natural Resources and Environment (Prescribed Activities) Order 1994 which requires all prescribed activities to conduct environment report and to submit the report to the Board before approval to commence work is given.

Hence, it is at this stage that NREB can order the Project Proponents to implement the management plans and mitigation measures to achieve the set environment goals by setting the plans as part of the approval conditions of the projects being assessed.

SECTION 10.2 DEPARTMENT OF ENVIRONMENT

The federal department, the Department of Environment, enforces the Environmental Quality Act, 1974 which is primarily related to the prevention, control of pollution, abatement, and enhancement of the environment. Under the Environmental Quality Act, 1974, orders, regulations and rules are enacted to ensure effectiveness in the enforcement. The Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order, 2015 list the development projects which qualify as prescribed activities requiring an Environment Impact Assessment to be submitted to the Director General. Although the Order is enforceable nationwide, in Sarawak this Order only covers those activities not related to natural resources; for those activities affecting natural resources (such as plantation, sand extraction, agriculture, construction, inland fisheries and others) they are under the jurisdiction of the State's Natural Resources and Environment Ordinance and subsequently the Natural Resources and Environment Board. As far as this Order is concerned, the prescribed activities applicable to Sarawak are:

- Aerodrome
- Industries (chemical plant, cement grinding plant, lime production plant, petrochemical plants, and shipyard)
- Petroleum related developments
- Ports
- Power generation and transmission (steam generated power station, combined cycle station, coal and nuclear power station)
- Scheduled waste storage, treatment, disposal, and recovery facilities
- Mass rapid and railway transportation
- Radioactive material and radioactive waste

In addition to the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order, 2015, the DOE also enforces other notable regulations/guidelines pertaining the Study Area such as:

- Environmental Quality (Sewage) Regulations, 2009
- Environmental Quality (Industrial Effluent) Regulations, 2009
- Environmental Quality (Clean Air) Regulations, 2014
- Environmental Quality (Scheduled Wastes) Regulations, 2005
- Environmental Quality (Prescribed Premise) (Crude Palm Oil) Regulations, 1977
- Environmental Quality (Licensing) Regulations 1977
- National Water Quality Standards for Malaysia
- Guidelines for Environmental Noise Limits and Control, 2019
- New Malaysia Ambient Air Quality Standard

SECTION 10.3 OTHER GOVERNMENTAL AGENCIES

In addition to the NREB and DOE, other governmental agencies involved in environmental management are shown in Table 10-1.

Table 10-1: Governmental Agencies with Respect to Legislation

Legislation	Government Agencies
Water Ordinance, 1994	Sarawak Water Council <ul style="list-style-type: none"> • Jabatan Bekalan Air Luar Bandar (JBALB)
Fisheries Ordinance, 2003	Department of Agriculture <ul style="list-style-type: none"> • Inland Fisheries Division
Local Authorities Ordinance, 1996	Respective Local Authorities <ul style="list-style-type: none"> • Majlis Daerah Sri Aman • Majlis Daerah Lubok Antu
Veterinary Public Health Ordinance, 1999	State Veterinary Authority
Sarawak Rivers (Traffic) Regulations, 1993	Sarawak Rivers Board
Sarawak Rivers (Cleanliness) Regulations, 1993	
National Parks and Nature Reserves Ordinance, 1998	Sarawak Forest Department
Wild Life Protection Ordinance, 1998	Sarawak Forestry Corporation
Forest Ordinance, 2015	
Forest Ordinance (Planted Forests) Rules, 1997	

Source: Sri Aman Master Plan 2020-2030

SECTION 10.4 WATER CATCHMENT AREAS

In Volume A (Section 2.2.12) the Environmentally Sensitive areas were identified. Of particular significance are the water supply catchment areas (WCA) and the special conditions around the eight (8) kilometres zone within the WCAs (Classified as ESA 2).

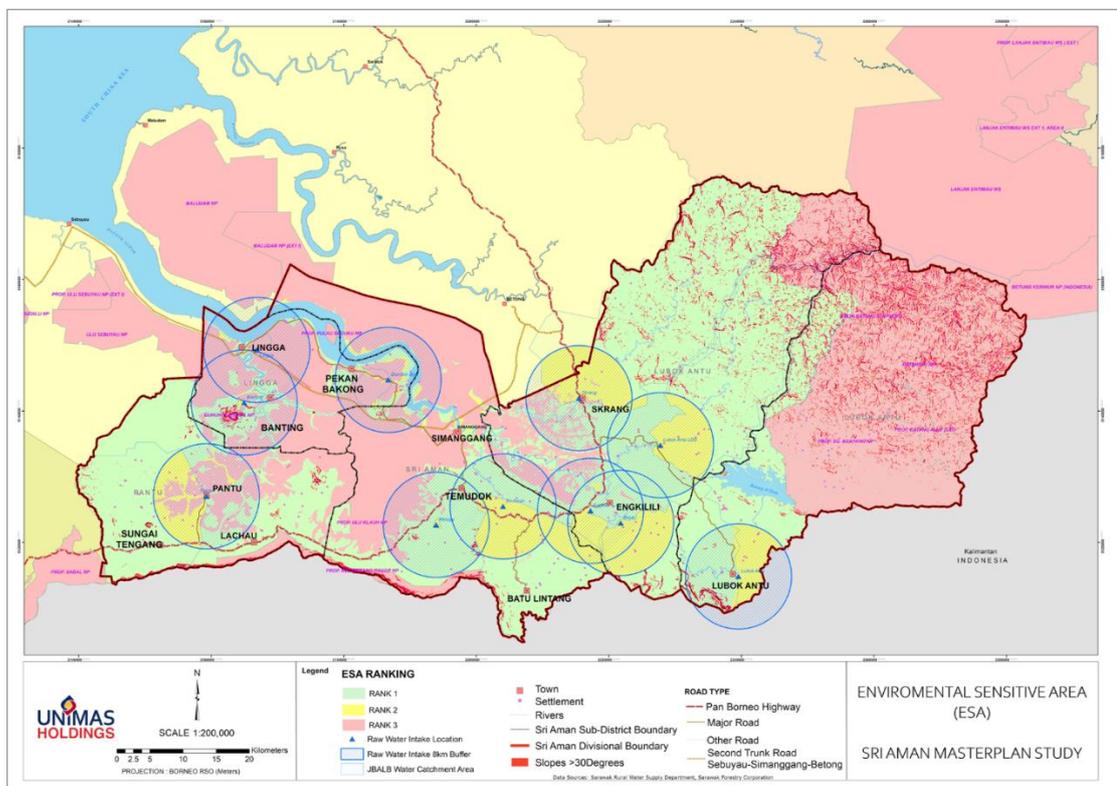


Figure 10-1: ESA Rank 2 Water Catchment Areas

Source: JBALB Sarawak and Sarawak Forestry Corporation

The SAMP has designed the proposed development works such that land development projects are not proposed in these areas. The areas are shown in Figure 10-1 and summarised in Table 10-2, together with any proposed land development projects.

By avoiding these ESA Rank 2 areas, potential impacts on water supplies are largely avoided. Developments are still proposed for ESA Rank 3 areas (outside the 8 km zone) and will be subjected to the conditions that apply to development in these areas.

Table 10-2: Analysis of proposed agricultural projects within 8 km of water catchment area

Status	Water Catchment Area	*WTP/Intake plans in the future	River Source	Proposed projects within 8km of intake point downstream of intake /outside water catchment areas	Proposed projects within 8km of intake point upstream of intake/inside water catchment area
Gazetted Water Catchment Areas	Lingga	Repurposed by 2025	Sungai Stugok	Pineapple Granary/paddy	-
	Sri Aman	Decommissioned by 2020	Sungai Undup	-	-
	Stumbin-Bijat	Repurposed by 2020	Sungai Stumbin	Pineapple Paddy	-
	Pantu	Decommissioned by 2025	Sungai Seterap	Granary/paddy Speciality rice	-
	Lubok Antu LDS	Repurposed by 2025	Sungai Lemanak	Coconut	-
	Engkelili	Decommissioned by 2025	Sungai Marup	Coffee Coconut Livestock/cattle	-
Non-gazetted Water Catchment Areas	Melugu	Repurposed by 2020	Sungai Dor	Agropark Banana Livestock/cattle	-
	Banting	-	Wong Kawi	Pineapple Granary/paddy	-
	Lubok Antu	Repurposed by 2040	Batang Ai	Coffee Coconut	-
	Skrang	Repurposed by 2050	Batang Skrang	Coconut	-
Proposed Water Catchment area	Bayai	-	Batang Lupar	Coffee Coconut	-

**based on Study on Sarawak Water Supply Master Plan and Water Grid (draft final report) by Konsortium Malaysia, 2019*

SECTION 10.5 POTENTIAL ENVIRONMENTAL IMPACTS OF PROPOSED PROJECTS AND RECOMMENDED MITIGATION MEASURES

The proposed developments for Sri Aman can be broadly categorised into agriculture and livestock, aquaculture and fisheries, basic infrastructure, and utilities (road, air link, water, electricity, and telecommunication) and facilities to support the tourism and business industries as well as social and community facilities. This section serves as a preliminary assessment as it highlights the environmental issues and impacts expected from the proposed developments that should be taken into consideration during Project execution. All prescribed activities are required to commission an environmental report and to submit the report to the Natural Resources and Environmental Board (NREB) for approval, before commencement of work as described in the Natural Resources and Environment (Prescribed Activities) Order, 1994.

The potential environmental impacts are assessed and discussed according to the development stages of the proposed Projects namely:

- i) planning and site investigation stage
- ii) land preparation and construction stage
- iii) operation and maintenance stage

10.5.1 Planning and Site Investigation Stage

The planning and site investigation stage will cover mainly undertaking of field work to collect baseline data and specific site information, as well as desktop works on analysis of field data and the detailed engineering design of the proposed Projects. Proper attention is to be given during the selection of site to avoid or minimise the impact on Environmentally Sensitive Areas identified in this Study. The field works are expected to cover land surveying, topographical survey, geotechnical and soil investigations, and environmental studies.

These activities involve the movement of field crews and the use of light tools and equipment that will not cause any significant adverse impacts on the environment. Disturbance to the existing environmental settings is, thus, minimal.

10.5.2 Land Preparation and Construction Stage

This stage involves the mobilization of the construction crews, machinery and equipment; preparation of the respective Project sites; and forthwith undertaking of the earthwork and construction works. These activities are expected to create several environmental issues and impacts as discussed below.

10.5.2.1 *Loss of Vegetation Cover and Wildlife Habitat*

Most of the Projects proposed in the Study are expected to either completely or partially remove the existing vegetation cover at the selected sites during the site preparation and construction stage. Site clearing work is expected to remove the existing vegetation cover together with any wildlife habitats

found therein to prepare the site for the proposed development Projects. The loss is unavoidable and will be permanent. Hence, the proposed Projects should be properly sited.

Mitigation Measures

- **Demarcate Project boundary clearly**
Boundary of the Projects should be surveyed and clearly marked on ground prior to site clearing to avoid unnecessary over-clearing.

10.5.2.2 Soil Erosion and Sedimentation

During site clearing works, topsoil will be stripped off, and this will expose the more erodible sub-soils in the impacted areas, leaving them vulnerable to erosion by surface runoff, especially during heavy downpour events and wind. The surface erosion will potentially contribute to sedimentation and may increase the concentration of suspended solids and nutrients into receiving waterways. This may adversely affect the water quality in the impacted areas, and eventually, it may cause stress to aquatic life and fish mortality. Aggradations occur when the sediment load is greater than the amount of material the river system can transport. The potential adverse effects are:

- Decolourisation of streams and rivers – reduces aesthetics
- Clogging of gills of aquatic fauna and filters - results in aquatic life mortality
- Increased nutrients and sediments – increase aquatic plant growth (including weeds) in the receiving waterways
- Aggradation downstream – enhances flooding and reduces navigability
- Reduced water clarity - make in-stream food harvesting difficult

Development at the riverbanks such as bridges for road linkage and jetties will also aggravate localized riverbank soil erosion contributing to increased suspended solids in the waterways. It is also crucial to maintain buffer zone during development of the agriculture and livestock Projects that are sited near waterways. Thus, measures to reduce soil erosion and sedimentation should be implemented.

Mitigation Measures

- **Erosion and Sediment Control Plan**
An erosion and sediment control plan (ESCP) needs to be prepared. The Best Management Practices outlined in the ESCP must be installed and maintained for the control and management of erosion, sedimentation and storm water for the Projects.
- **Proper scheduling of works**
Land clearing and earthwork activities should be properly scheduled and conducted systematically to minimize the area being exposed to weather elements.
- **Handling of excavated/fill materials and stockpiles**
Excavated/fill materials and aggregate stockpiles should not be placed near to the waterways and drains. Stockpile area should be surrounded by barriers such as silt fence, sandbag or compacted earth bund.
- **Compact filled areas**
Filled areas should be compacted as soon as possible after placement to reduce susceptibility to erosion and sedimentation.

10.5.2.3 Waste Generation and Management

10.5.2.3.1 Biomass/Vegetative Waste

Site clearing works will generate vegetative debris such as tree trunks, branches, roots, and grasses. The tree trunks and branches should be cut into shorter pieces and with the other biomass, should be either transported out for disposal at approved dumpsite or stacked alongside the perimeter area for natural decomposition, or to be re-used as mulches. Care should be taken that the cleared vegetation biomass and debris should not be deposited or pushed into waterways, streams and rivers.

Improper disposal of the cleared biomass may give rise to environmental problems such as air pollution from open burning; or blocking the natural flow of nearby waterways. Open burning of vegetative waste is strictly prohibited without permit from the NREB.

Mitigation Measures:

- **Proper planning and systematic undertaking**
The vegetation clearing activity should be conducted in a planned and systematic manner, and appropriate vegetation clearing sequence and biomass disposal methodology should be identified. The clearing works should be undertaken in stages and the generated biomass should be disposal at designated disposal site.
- **Prohibit open burning**
Open burning to dispose vegetative biomass waste is prohibited unless prior permit has been obtained from the NREB.
- **Proper disposal of biomass**
The tree trunks and branches should be cut into shorter pieces and with the other biomass, shall be either transported out for disposal at approved dumpsite or stacked alongside the perimeter area for natural decomposition. Care should be taken that the cleared vegetation biomass and debris should not be deposited or pushed into waterways, streams and rivers.

10.5.2.3.2 Construction Waste and Domestic Solid Waste

Common construction debris include formworks, wooden planks, excess concrete, premix, aggregates, bits and pieces of steel bars, wire mesh, cement boards, plywood, packaging and discarded containers, boxes and so on. The household or domestic waste includes empty cans, cartons, boxes, plastics bags, bottles, food remains etc. They will be made up of both biodegradable materials like paper or otherwise and recyclable materials such as metal, glass, rubber and plastic. The current Covid-19 pandemic has also introduced a new class of wastes; used personal protective equipment such as face masks.

Containers can become potential breeding ground for mosquitoes. If not properly managed, these wastes can spoil the aesthetics and pose health and safety problems. Used face masks will also be a cause of concern, as any improper disposal may become a source of disease. Untidiness can cause accidents and create fire hazards, jeopardizing the health and safety of the workers and the public.

Mitigation Measures

- **Ensure good housekeeping at the site**
Good housekeeping should be maintained at site at all times. This includes up-keeping of cleanliness and hygienic condition and provides proper wastes disposal facilities at site.
- **Prohibit open burning**
Open burning of solid wastes and any combustible material is prohibited without permit from the NREB.
- **Dispose at designated dumpsite**

Construction debris should be regularly collected and disposed at a designated dumpsite. After the completion of work, there shall be a major clean-up exercise to clear the area of all construction waste.

10.5.2.3.3 Hydrocarbon and Scheduled Waste

During the land preparation and construction stage, hydrocarbon and scheduled waste generated will be mainly in the form of used oil and grease waste that will be generated from the repair and servicing of machinery, equipment, and vehicles.

Potential impacts are anticipated if hydrocarbon and scheduled waste are not properly handled and managed. Additionally, spillage may occur from improper storage and dispensing of fuel and other petroleum products, as well as on-site servicing of machinery and equipment. This may contaminate the soils and receiving waterways, let alone the risk of fire and explosion.

The need for proper handling, storage, inventory and disposal of these scheduled waste are stipulated in the Environmental Quality (Scheduled Wastes) Regulations, 2005.

Mitigation Measures

- **Compliance with legislative requirements**

Used oil and grease and other scheduled waste generate by the Project should be handled and managed in accordance with the requirements of the Environmental Quality (Scheduled Wastes) Regulations, 2005.

- **Spill prevention containment bund**

Spill prevention containment bund should be installed around fuel tanks and storage areas for scheduled wastes, fuel, lubricant and chemical. In order to contain any leakages and spillages, the volume capacity of the bund area must at least be equivalent to 110% of the total largest storage container.

10.5.2.3.4 Wastewater Generation

The sewage and sullage will be generated mainly at construction site office and workers' quarters. It is estimated that approximately 225 litres of mixture of sewage and sullage will be generated by each worker of population equivalent (PE) per day. These are potential water pollutants and proper treatment will need to be undertaken before the wastewater is allowed to be discharged to the environment and receiving waterways.

Mitigation Measures

- **Provision of sanitary facilities**

Sufficient and proper sanitary facilities must be provided at appropriate locations at site.

- **Septic tank for sewage treatment**

Sewage produced at the Projects Site, especially at the workers' camps and site office, should be routed through septic tanks before discharging into the nearest waterways.

10.5.3 Operation and Maintenance Stage

During the operation and maintenance stage, the following potential environmental impacts and concerns for the respective Projects are listed below.

10.5.3.1 Water Pollution

During the operation and maintenance stage, agricultural and aquaculture activities are expected to significantly affect water quality of the receiving waterways. The environmental impacts from agricultural runoffs may include the presence of industrial crop fertilizers/chemicals and animal waste which may cause eutrophication in the waterways. Excess nitrogen and phosphates can also leach into groundwater polluting ground water sources.

The potential environmental impacts from aquaculture activities include eutrophication (excess phosphates and nitrogen loading), increased suspended solids and the accumulation of anoxic sediments below cages. It is noted that the environmental impacts caused by an aquaculture system is proportional to the intensity of the system and its management practices.

Any agricultural associated processing and manufacturing facilities that will generate wastewater (industrial effluent/mixed effluent) is subjected to the Environmental Quality (Industrial Effluent) Regulations, 2009.

Mitigation Measures

- **Wastewater treatment system**
Wastewater treatment system shall be installed for industrial activities or processes that discharges or is capable of discharging wastewater into the waterways.
- **Compliance with legislative requirement**
Regular water quality monitoring as required by environmental authority. The discharge of industrial effluent/mixed effluent is subjected to the Environmental Quality (Industrial Effluent) Regulations 2009.

10.5.3.2 Noise Nuisance and Vibration

The Projects that are expected to create significant noise nuisance during operation and maintenance stage are mechanised farms and swiftlet farming, followed by the collection, processing, and packaging centre (CPPC) and agriculture associated manufacturing activities as well as the logistics distribution hub. The noise impact is highly dependent on the distance and type of attenuation factors between source and receptors as well as type of land use.

In mechanised farms, the operation of agricultural machinery and equipment in the farms may generate noise that is sporadic and intermittent. During the operation and maintenance stage, swiftlet farms which utilises sound systems to attract swiftlets may create noise nuisance to the surrounding receptors. It is noted that the noise disturbance can be subjected to attenuation effects from existing buildings or vegetation. Similarly, the processing and packaging plants in the CPPC and agriculture associated manufacturing facilities as well as vehicle movements loading and unloading at the CPPC and the logistic distribution hub will also generate noise nuisance. The exposure to continuous high noise level can affect human health.

The “*Guidelines for Environmental Noise Limits and Control, 2019*” issued by the Department of Environment (DOE) specified permissible sound levels (L_{Aeq}) by receiving land use for new development (Table 10-3).

Table 10-3: Recommended Permissible Sound Level (L_{Aeq}) by Receiving Land Use for New Development

Receiving Land Use Category	Day-time	Night-time
	7:00 am - 10:00 pm	10:00 pm - 7:00 am
Low density, residential, noise sensitive receptors, institutional (school, hospital, worship)	55 dB(A)	50 dB(A)
Suburban residential (medium density), recreational	60 dB(A)	55 dB(A)
Urban residential (high density), mixed development	65 dB(A)	60 dB(A)
Commercial business zones	65 dB(A)	60 dB(A)
Industrial zones	70 dB(A)	65 dB(A)

Source: DOE

Furthermore, the Occupational Safety and Health (Noise Exposure) Regulations, 2019 stipulated a noise exposure limit for the employee at daily noise exposure level not exceeding 85 dB(A); or the maximum sound pressure level not exceeding 115 dB(A), or the peak sound level not exceeding 140 dB(A).

Mitigation Measures

- Maintenance of machinery and other noise emitting equipment
Machinery and other noise emitting equipment used should be regularly maintained in good working conditions to avoid emitting excessive noise level.
- Compliance with legislative requirements
Measures should be adopted and implemented at site to minimise noise disturbance. The noise limit prescribed in the “*Guideline for Environmental Noise Limits and Control, 2019*” and “*Occupational Safety and Health (Noise Exposure) Regulations, 2019*” should be adhered.

10.5.3.3 Air Pollution

During the operation and maintenance stage, deterioration of air quality due to smoke and exhaust emissions from the operation of vehicles, machinery and equipment at the collection, processing and packaging centre (CPPC), agricultural farms, and agricultural associated manufacturing facilities are expected. The air pollutants that may be emitted include particulate matters, carbon monoxide, carbon dioxide, nitrogen oxides, sulphur dioxide and volatile organic compounds (VOCs).

The prescribed limits for air pollutants are tabulated in Table 10-4.

Table 10-4: New Malaysia Ambient Air Quality Standard

Air Pollutant	Averaging Time	Standard (2020)
Particulate matter with the size of less than 10 micron (PM_{10})	24 Hour	100 $\mu\text{g}/\text{m}^3$
Particulate matter with the size of less than 2.5 micron ($PM_{2.5}$)	24 Hour	35 $\mu\text{g}/\text{m}^3$
Sulphur dioxide (SO_2)	1 Hour	250 $\mu\text{g}/\text{m}^3$
Nitrogen dioxide (NO_2)	1 Hour	280 $\mu\text{g}/\text{m}^3$
Ground level ozone (O_3)	1 Hour	180 $\mu\text{g}/\text{m}^3$
Carbon monoxide (CO)	1 Hour	30 mg/m^3

Source: DOE

Mitigation Measures

- **Air pollution control system**
Air pollution control system shall be installed for industrial activities or processes that discharges or is capable of discharging air pollutants into the open air.
- **Compliance with legislative requirements**
Any industrial activities or processes that discharges or is capable of discharging air pollutant into the open air shall complied with the requirements of the Environmental Quality (Clean Air) Regulations, 2014.

10.5.3.4 Waste Generation and Management

Waste generation and management at the respective Project premises, if not properly handled and managed will cause various aspects of water pollution, adversely affecting the aquatic environment, workers, public health, and livelihood of local communities.

10.5.3.4.1 Domestic Solid Waste and Wastewater

Based on the Study on Integrated Solid Waste Management in Sarawak, 2019, the Majlis Daerah Sri Aman recorded 134,145 tonnes and Majlis Daerah Lubok Antu recorded 56,864 tonnes of household waste respectively. Household waste generation is projected to increase to 260,215 and 111,267 in Sri Aman and Lubok Antu by the year 2035. The implementation of each Projects is expected to generate household or domestic waste which includes empty cans, cartons, boxes, plastics bags, bottles, food remains etc. Hence, proper waste management is required.

It is estimated that approximately 225 litres of mixture of sewage and sullage will be generated by each population equivalent (PE) per day. The discharge of untreated sewage and sullage into receiving waterways not only create a foul-smelling environment to the surrounding areas by also will degrade the water quality, depressing dissolved oxygen level, increasing biochemical oxygen demand, chemical oxygen demand and nutrient contents.

Mitigation Measures

- **Practice good housekeeping**
Good housekeeping should be maintained at all time. This includes up-keeping of cleanliness and hygienic condition and provides proper waste handling, treatment and disposal facilities at the Project Sites.
- **Provision of wastewater treatment facility**
Wastewater treatment facility should be provided to cater for sewage and sullage generated at the respective Project Sites.
- **Compliance with legislative requirements**
Legislative requirements pertaining to the protection of environment, pollution prevention and occupational safety and health should be complied with. These include, but not limited to Environment Quality Act 1974, Environmental Quality (Scheduled Wastes) Regulations, 2005, Environmental Quality (Sewage) Regulations, 2009, and Environmental Quality (Industrial Effluent) Regulations, 2009.

SECTION 10.6 ENVIRONMENTAL MONITORING

Natural Resources and Environment Board

Following the submission and approval of environment reports by the NREB, prescribed activities are also required to monitor the environmental impacts of the Projects during the land preparation and construction stage as specified in the terms and conditions of approval. For prescribed activities such as agricultural and aquaculture activities, environmental monitoring during the operation and maintenance stage is required to check, in particular, on the effects of fertilizer and agrochemical application as well as nutrient loading and wastewater discharges respectively.

Department of Environment

For the prescribed activities subjected under the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order, 2015, applicable to Sarawak as discussed in **Section 2.2**, environmental monitoring comprises performance monitoring, compliance monitoring and impact monitoring.

10.6.1 Monitoring Objectives

The objectives of environmental monitoring are:

- To monitor compliance within the recommended mitigation measures, measures stipulated in the approval conditions and other legislative requirement
- To test predictions by comparing predicted impacts and actual impacts
- To check the adequacy and effectiveness of the action plans implemented
- To provide early warning of undesirable changes to the environment so that corrective measures can be taken as soon as possible

10.6.2 Monitoring Requirement

10.6.2.1 Natural Resources and Environment Board

During the land preparation and construction stage, the environmental monitoring report shall be included as part of the management report and shall be presented at appropriate management meetings. The environmental monitoring report shall be compiled and be submitted to the NREB throughout the land preparation and construction stage on a quarterly basis based on the monitoring programmed highlighted in the environmental report. For prescribed activities such as agricultural and aquaculture, monitoring is also conducted on a quarterly basis, as and when operational activities begin at the relevant areas. Once routine activities and operation have stabilised, the frequency of monitoring may be reduced to half-yearly or yearly provided analytical data showed favourable results.

10.6.2.2 Department of Environment

The performance monitoring, compliance monitoring, and impact monitoring programme within the Environment Impact Assessment will specify the respective requirements throughout the land preparation and construction stage as well as the operation and maintenance stage for Projects subjected under the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order, 2015.

10.6.3 Water Quality Monitoring at Batang Ai

The Batang Ai reservoir has a water surface of 90 km² at full supply level and a water volume of 2650 million m³ with water depth ranges from 14 m to 63 m (Envisar Sdn Bhd, 2020). In addition to hydroelectric generation, the Batang Ai reservoir functions as a site for aquaculture, tourism, and recreational activities. Although aquaculture farms are one of the main pollution sources in the Batang Ai reservoir, it is important to maintain good water quality in the reservoir to ensure the success of aquaculture production, tourism, and recreational activities at Batang Ai. Furthermore, expansion and increase of aquaculture, tourism and recreation activities has been proposed in the Batang Ai.

Presently, there are four NREB dam reservoir water quality monitoring stations in the Batang Ai area. However, only two of the stations are established in the Batang Ai reservoir near the dam wall and the public jetty area namely station DA1 (MDLA Shophouse Batang Ai Jetty) and DA2 (Hilton Batang Ai Resort Jetty). The remaining two stations such as DA3 (Jambatan Batang Ai) and DA4 (Lubok Antu Town Jetty) are located downstream of the Batang Ai Dam. Furthermore, the NREB only monitors the water quality of the Batang Ai Dam reservoir on a half-yearly basis.

It is recommended that the existing water quality monitoring program to be expanded to include a more representative coverage of the Batang Ai reservoir. The recommended water quality monitoring program at the Batang Ai reservoir are to monitor eight (8) stations (W3-W10; Figure 10-2), corresponding with the sampling sites taken by Envisar Sdn Bhd in November 2018 in the Catchment Management Plan for Batang Ai Hydroelectric Plant (HEP). Samples are to be taken at the surface, 5 m depth and 10 m depth with the frequency of once every two months. The main parameters that are to be tested are:

- pH
- DO
- Turbidity
- Temperature
- BOD₅
- COD
- Ammoniacal Nitrogen
- Total Phosphate
- Total Coliform
- Faecal Coliform



Figure 10-2: Proposed Sampling Sites

Source: Sri Aman Master Plan 2020-2030

It is recommended for the Hydrolake Authority to undertake the recommended water quality monitoring program to monitor the water quality at the Batang Ai reservoir with the costs levied on the aquaculture farm owners. This program will allow any progressive build up of pollution in the reservoir to be readily detected allowing time for suitable action to be implemented. Prior to the establishment of the Hydrolake Authority, the Sarawak Energy Berhad (SEB) should undertake the water quality monitoring program at Batang Ai.

The Hydrolake Authority will be established to deal with the multi-task needs of managing the catchment resources and activities associated with them. It is proposed to provide the institutional platform for all relevant agencies to work together in a coordinated and integrated manner. Some of the tasks include provide direction on management of the reservoir and catchment, approving all development activities proposed in the reservoir and catchment as well as maintaining environmental standards.

10.6.4 Water Quality Monitoring for Aquaculture Farms at Batang Ai

The success of aquaculture production at Batang Ai is highly dependent on maintaining good water quality in the reservoir. The aquaculture farms are, themselves, one of the main sources of pollutants to the Batang Ai reservoir, with particular concerns around nutrient concentrations and faecal coliform levels. High nutrient loads can lead to rapid phytoplankton development and eventually, eutrophic conditions in the Lake. This can impact fish production, increase fish kills, and potentially impact the power station turbines.

While improvements in feed quality and management can help to reduce this risk, the need to closely monitor water quality conditions is paramount, especially as the expansion of the farms is proposed.

Large-scale aquaculture farms at Batang Ai qualify as prescribed activities mentioned under Item 5 and Item 7 of the First Schedule of the Natural Resources and Environment (Prescribed Activities) Order 1994, made under Section 11(A) of the Natural Resources and Environment Ordinance (NREO) specifies that *“Fisheries and activities which may endanger marine or aquatic life, plants in inland waters or*

erosion of river banks” and “Any other activities which may damage or have an adverse impact on quality of environment or natural resources of the State”.

To this effect, Article 3(1) says “any person who intends to undertake any of the prescribed activities shall submit to the Board a report, which is to be prepared by such expert or authority as may be approved by the Board”. The report (Environmental Impact Assessment (EIA)/ Environmental Management Plan (EMP)) shall be approved by the Board prior to the commencement of work. The monitoring program for the aquaculture farms is specified in the EIA or EMP submitted to the Board. The monitoring program specify the proposed monitoring locations, sampling parameter, the frequency of sampling exercise to be conducted, submitting authority, and submission frequency. Presently, the findings of the monitoring program are presented in an Environmental Monitoring Report (EMR) to be submitted to the Natural Resources and Environment Board (NREB) throughout the operation of the aquaculture farms. With the establishment of Hydrolake Authority, it is recommended that the EMR to be extended to the Hydrolake Authority (Figure 10-3).

Besides the large-scale aquaculture farms, there are individual aquaculture farms which are not subjected to EIA/EMP. The individual farms should also be required to monitor water quality at the farm site. At least two samples are to be taken – one at the upstream side of the farm and one at the downstream side. Sampling and analysis are to be undertaken at a quarterly basis (once every three months) and the results are to be submitted to the Hydrolake Authority. The parameters to be monitored are:

- pH
- DO
- Ammoniacal Nitrogen
- Total Phosphate
- Total Coliform
- Faecal Coliform

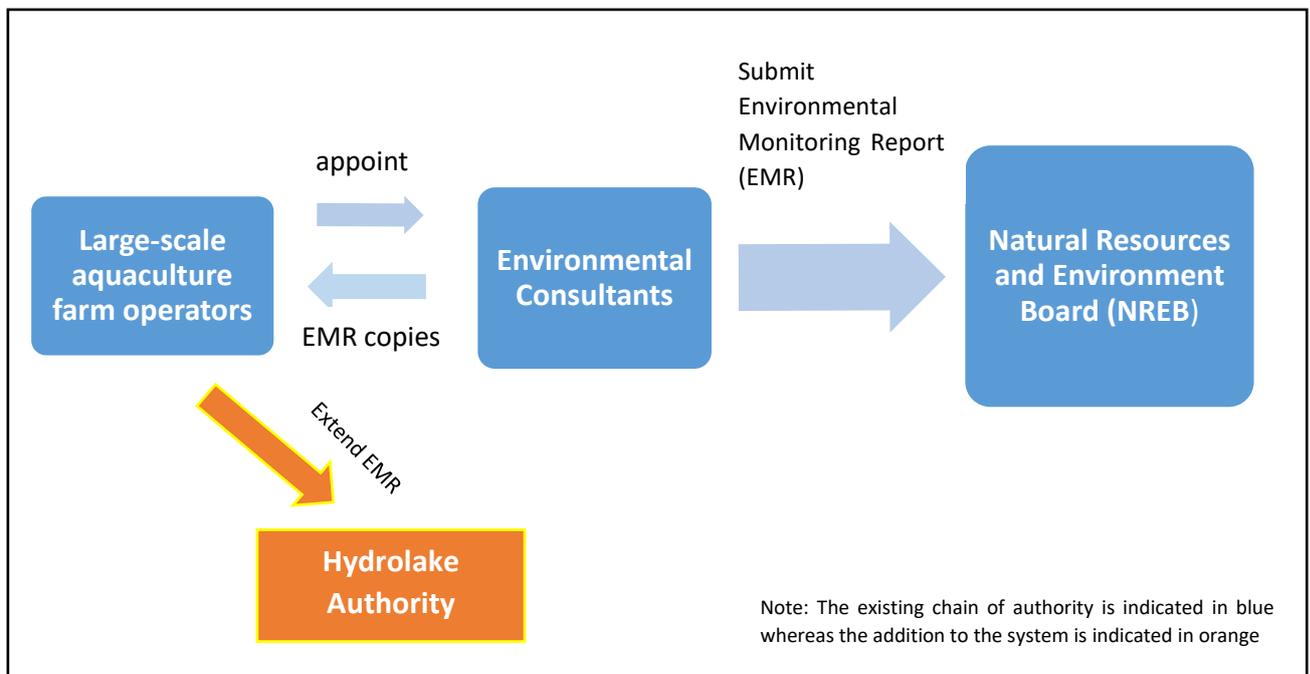


Figure 10-3: Chain of authority for the submission of Environmental Monitoring Report for large-scale aquaculture farm operators

Source: DOE, New Malaysia Ambient Air Quality Standard

SECTION 10.7 ENVIRONMENTAL AUDITING

10.7.1 Audit Objectives

The main objectives for the environmental compliance audit are:

- To function as a performance appraisal tool on the effectiveness of the pollution controls and mitigation measures implemented during Project execution so that any shortfall detected or observed could be rectified as soon as possible to prevent or avoid further deterioration of the environment
- To check that the criteria and standards for environmental performances are being complied with
- To inform the Project owner on the environmental compliance status of the Project

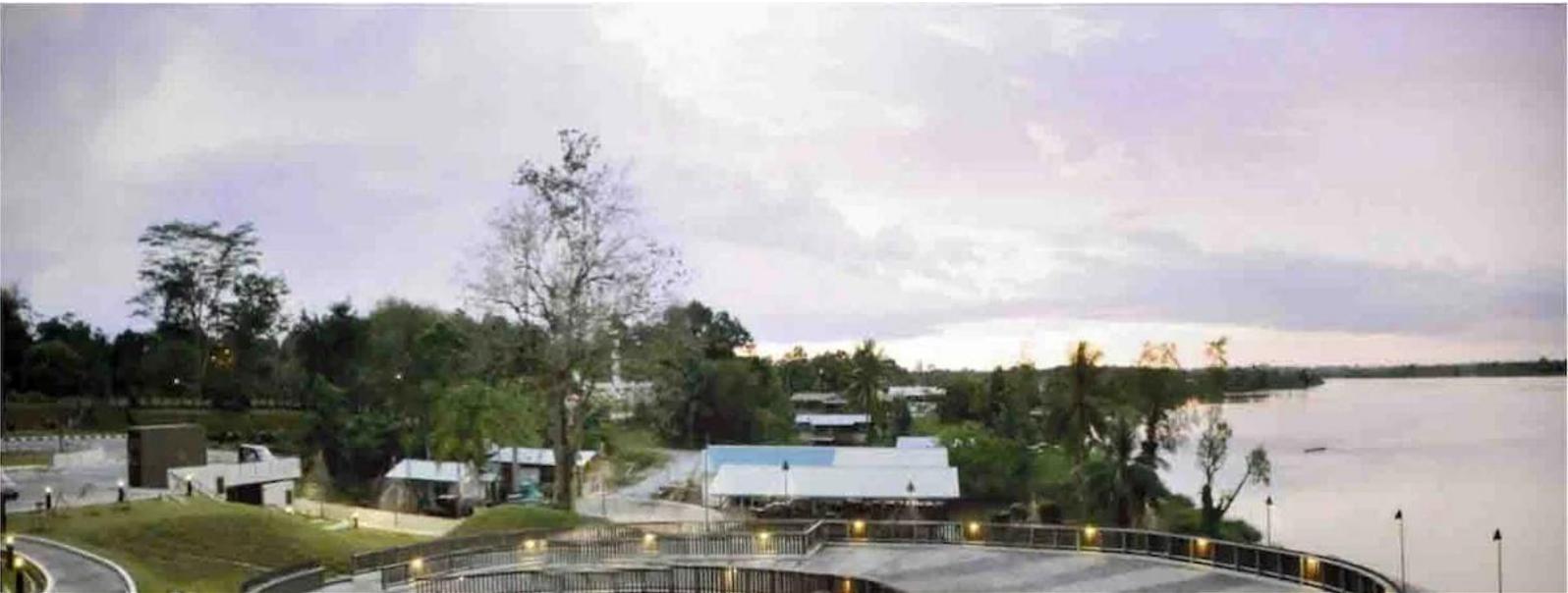
10.7.2 Audit Requirement

10.7.2.1 *Natural Resources and Environment Board*

The legal requirement for environmental audit is prescribed under Rule 3 of the Natural Resources and Environment (Audit) Rules, 2008. Based on the Guidelines for Natural Resources and Environmental (Audit) Rules, 2008, Environmental Compliance Audit shall be conducted for prescribed activities in the First Schedule for the Natural Resources and Environment (Prescribed Activities) Order, 1994 [Swk. L.N. 45/94], and/or where there are reasonable grounds to suspect non-compliance with the approval or permit conditions, directives or orders issued by the Controller of the NREB. The person(s) undertaking the compliance audit/inspection should have been trained in undertaking environmental audit in accordance to the requirements of the Natural Resources and Environment (Audit) Rules, 2008.

10.7.2.2 *Department of Environment*

In order to ensure environmental compliance and self-regulation, the requirement for environmental audit is specified in Section 33A of the Environmental Quality Act 1974. The requirement of environment audit is done through notification from Department of Environment (DOE) or as specified as condition of approval or condition of License. Environmental audit is to be carried out by auditor(s) registered with the Department of Environment (DOE).



PART 11 CONCLUSION

In conclusion, this volume encapsulates the essence of the Sri Aman Masterplan. From setting its vision, it then proceeds to outline the required strategies and key projects that need to be implemented to achieve ‘a **prosperous, competitive and sustainable Sri Aman**’. The projects have been costed and financial evaluations were undertaken.

The Masterplan enables us to conceptualize and visualize the development strategies and their impact on the economy, businesses, and lives of the population of Sri Aman.

The total projected cost of projects under the SAMP is estimated to be RM 4.51 billion. Out of the total estimated budget, projects for infrastructure development accounted for the most significant portion at 58.5%. This investment in infrastructure will improve physical and virtual connectivity and uplift the quality of life for the local community. With the intervention and implementation of proposed projects, the GDP of the Sri Aman division will grow at 8.1% per annum to RM7.4 billion in 2030.

In terms of jobs, the proposed projects will generate an additional 11,295 (55% are from direct employment in the proposed projects) jobs for Sri Aman residents by 2030, accounting for 27% additional employment. Seventeen thousand (17,000) jobs are long-term occupations related to agriculture activities, followed by food processing and business services.

In terms of Household Income, the average household income of the Sri Aman Division will grow at a compounded annual growth rate of 7.4% to RM4,559 in 2030 from RM2,228 in 2020, and this is highly dependent on significant productivity improvements using mechanization and technology in agriculture, livestock, aquaculture, and fisheries activities.

Once the development plan is accepted and implemented in its entirety, it will ultimately reshape and enhance every significant aspect of the Sri Aman economy, including its infrastructure, utilities, housing, public services, and community facilities, by the year 2030. While Volume B of the report has outlined and highlighted projects according to priority, the next volume (Volume C) will present a detailed list of every relevant project specially planned for the Sri Aman Division from 2021 till 2030 based on the feasibility analysis performed.

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
AN	Ammoniacal Nitrogen
API	Air Pollutant Index
APIMS	Air Pollutant Index Management System
APM	Angkatan Pertahanan Awam
ASMC	ASEAN Specialised Meteorological Centre
BOD	Biochemical Oxygen Demand
CAGR	Compound Annual Growth Rate
CAN	Culture, Adventure and Nature
CAQM	Continuous Air Quality Monitoring
CBA	Cost Benefit Analysis
CBET	Community Based Ecotourism
CGE	Computable General Equilibrium
CIQ	Customs, Immigration and Quarantine
CMCO	Conditional Movement Control Order
CMWQM	Continuous Marine Water Quality Monitoring
COD	Chemical Oxygen Demand
CPO	Crude Palm Oil
CPPC	Collection, Processing and Packaging Centres
CRWQM	Continuous River Water Quality Monitoring
DEI	Digital Economy Index
DELSA	Disaster Emergency Logistics System for Asean
DID	Department of Irrigation and Drainage
DO	Dissolved Oxygen
DOA	Department of Agriculture
DOE	Department of Environment
DOSM	Department of Statistics Malaysia
DPI	Dots per Inch
EDC	Environment Data Centre
EHV	Extra High Voltage
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMR	Environmental Monitoring Report
EPU	Economic Planning Unit
EQMP	Environment Quality Monitoring Program
ESA	Environmental Sensitive Area
ETP	Economic Transformation Programme

FAMA	Federal Agriculture Marketing Authority
FCC	Faecal Coliform Count
FDRS	Fire Danger Rating System
FDS	Forest Department Sarawak
FGD	Focus Group Discussions
FLR	Forest Landscape Restoration
FO's	Farmers Organisations
GDP	Gross Domestic Products
GEMS	Global Environment Monitoring System
GHG	Greenhouse Gasses
GIS	Geographic Information System
GLCBET	Gunung Lesong Community Based Ecotourism Committee
GVATI	Gross Value-Added Tourism Industry
HCVF	High Conservation Value Forest
HEP	Hydro-Electric Power
HOB	Heart of Borneo
HPD	Highway Planning Division
ICQS	Immigration, Customs, Quarantine and Security
ICT	Information and Communications Technology
IDI	In-depth Interview
IEA	International Energy Agency
I-O Model	Input-Output Model
IOT	Internet of Things
ITCZ	Inter Tropical Convergence Zone
IUCN	International Union for Conservation of Nature
JBALB	Jabatan Bekalan Air Luar Bandar
JKKK	Jawatankuasa Kemajuan dan Keselamatan Kampung
JKR	Jabatan Kerja Raya (Public Works Department)
JPAM	Jabatan Pertahanan Awam Malaysia
JPBN	JawantanKuasa Pengurusan Bencana Negeri
KPKT	Kementerian Perumahan dan Kerajaan Tempatan (Ministry of Housing and Local Government)
LCCF	Low Carbon City Framework
LFA	Livestock farming area
LOS	Level of Service
LPF	Licensed Planted Forest
MCAQM	Mobile Continuous Air Quality Monitoring
MCMC	Malaysian Communications and Multimedia Commission
MCO	Movement Control Order
MICE	Meetings, incentives, conferencing, exhibitions
MINTRED	Ministry of International Trade, Industry and Investment
MMWQM	Manual Marine Water Quality Monitoring
MNS	Malaysian Nature Society

MOH	Ministry of Health
MOHURD	Ministry of Housing and Urban Rural Development
MOTAC	Ministry of Tourism, Arts and Culture
MoU	Memorandum of Understanding
MP	Malaysia Plan
MPOB	Malaysian Palm Oil Board
MWA	Malaysian Water Association
My GAP	Malaysian Good Agriculture Practice
NADMA	National Disaster Management Agency
NCR	Native customary land
NFCP	National Fiberisation Connectivity Plan
NGO	Non-Governmental Agencies
NKRA	National Key Result Area
NP	National Park
NPP	National Physical Plan
NREB	Natural Resources and Environment Board
NRW	Non-Revenue Water
NWQS	National Water Quality Standards
O2O	Online-to-Offline
OPAL	Open Air Laboratory
OS	Operating System
P	Phosphorus
PEAA	Prime Existing Agriculture Areas
PFE	Permanent Forest Estate
PNG	Portable Network Graphics
POME	Palm Oil Mill Effluent
PPA	Prime Potential Agriculture Areas
PPACP	Public-Private-Academic Civil-Society
PPC	Pollution Prevention Control
PWD	Public Work Department
R&D	Research and Development
RECODA	Regional Corridors Development Authority
RELA	Jabatan Sukarelawan Malaysia
RES	Rural Electrification Scheme
RFT	Request for Tender
RGC	Rural Growth Centre
RMCO	Recovery Movement Control Order
RPSS	Rural Power Supply Scheme
RTVM	Road Traffic Volume Malaysia
RWQMP	River Quality Monitoring Programme
SADA	Sri Aman Development Agency
SALCRA	Sarawak Land Consolidation and Rehabilitation Authority
SARES	Sarawak Alternative Rural Electrification Scheme

SAVE	Scientific, Academic, Volunteerism and Education
SAWAS	Sarawak Alternative Water Supply
SCORE	Sarawak Corridor of Renewable Energy
SDG	Sustainable Development Goals
SEAC	Sarawak Economic Action Council
SEB	Sarawak Energy Berhad
SEDC	Sarawak Economic Development Cooperation
SES	Socio-Economic Survey
SETP	Socio-Economic Transformation Plan
SETP	Socio-Economic Transformation Plan
SFC	Sarawak Forestry Corporation
SIWRM	Sarawak Integrated Water Resources Management Resources Management
SMA	Sarawak Multimedia Authority
SME	Small and Medium Enterprises
SOM	Malaysian Organic Scheme
SOP	Standard Operating Procedure
SPV	Special Purpose Vehicle
STATO	Sarawak Trade and Tourism Office
STB	Sarawak Tourism Board
STOL	Short Take-off and Landing
STR	Second Trunk Road
TCC	Total Confirm Count
TOD	Transit Oriented Development
TPA	Totally Protected Area
TSS	Total Suspended Solid
UAVs	Unmanned Aerial Vehicles
UKPN	Unit Keselamatan dan Penguatkuasaan Negeri
UNCTAD	United Nations Conference on Trade and Development
UNIMAS	Universiti Malaysia Sarawak
VSAT	Very Small Aperture Terminal
WCS	Wildlife Conservation Society
WHO	World Health Organisation
WMAM	Waste Management Association of Malaysia
WQI	Water Quality Index
WTP	Water Treatment Plants
WWTTC	World Travel and Tourism Council

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APPENDICES

Appendix 1 – List of Focus Group Discussion

No	Cluster	Stakeholder	Consultant	Date (Time)
1	Infrastructure and Public Utilities	<ul style="list-style-type: none"> Sarawak Energy Berhad 	<ul style="list-style-type: none"> Khathijah Md Jaafar Michael Bain 	6 April 2021 (10:00 am)
2	Social Services, Human Resources and Demography	<ul style="list-style-type: none"> Centre of Technical Excellence (CENTEXS) 	<ul style="list-style-type: none"> AP Dr Kartinah Ayupp 	14 April 2021 (4:30 pm)
3	Infrastructure and Public Utilities Regional and Urban Planning	<ul style="list-style-type: none"> Sarawak Rural Water Supply Department Economic Planning Unit 	<ul style="list-style-type: none"> Khathijah Md Jaafar Michael Bain Jaclyna Dr Md Nasrudin Md Salleh 	20 April 2021 (9:00 am)
4	Social Services, Human Resources and Demography	<ul style="list-style-type: none"> Sarawak Department of Labour 	<ul style="list-style-type: none"> AP Dr Kartinah Ayupp 	22 April 2021 (10:00 am)
5	Social Services, Human Resources and Demography	<ul style="list-style-type: none"> i-CATS University College 	<ul style="list-style-type: none"> AP Dr Kartinah Ayupp 	23 April 2021 (9:00 am)
6	Infrastructure and Public Utilities	<ul style="list-style-type: none"> Sri Aman Drainage and Irrigation Department 	<ul style="list-style-type: none"> Michael Bain Khathijah Md Jaafar 	27 April 2021 (10:00 am)
7	Economic Planning and Development	<ul style="list-style-type: none"> Ministry of Tourism, Creative Industry and Performing Arts Sarawak Sarawak Forestry Corporation Sarawak Tourism Board Sarawak Museum Department Sarawak Craft Council 	<ul style="list-style-type: none"> Prof Dato' Dr Morshidi Sirat Wayne Tarman Michael Bain Khathijah Md Jaafar 	28 April 2021 (2:30 pm)

No	Cluster	Stakeholder	Consultant	Date (Time)
8	Primary Industry/Sector Business Model	<ul style="list-style-type: none"> Ministry of Modernisation of Agriculture and Regional Development Department of Agriculture Sarawak Department of Veterinary Services Sarawak HQ Sri Aman Divisional Agriculture Office Department of Veterinary Services Sri Aman Division IADA Batang Lupar Department of Irrigation and Drainage Sarawak (DID) HQ Sarawak Land Consolidation and Rehabilitation Authority (SALCRA) Land Custody and Development Authority (LCDA) 	<ul style="list-style-type: none"> Datu Dr Hatta Solhi Dato' Abdul Kadir Khathijah Md Jaafar Michael Bain 	29 April 2021 (9:00 am)
9	Regional and Urban Planning	<ul style="list-style-type: none"> Land and Survey Sarawak 	<ul style="list-style-type: none"> Prof Dato' Dr Morshidi Sirat Dr Md Nasrudin Md Salleh Khathijah Md Jaafar Howard Trett Dato' Kamal Zaharin Harem Peri Prof Dr Shahren Ahmad Zaidi Aduce 	29 April 2021 (2:00 pm)
10	Infrastructure and Public Utilities	<ul style="list-style-type: none"> SACOFA 	<ul style="list-style-type: none"> Khathijah Md Jaafar Michael Bain Prof Dr Shahren Ahmad Zaidi Aduce 	30 April 2021 (10:00 am)
11	Economic Planning and Development	<ul style="list-style-type: none"> Sarawak Economic Development Corporation Ministry of International Trade and Industry 	<ul style="list-style-type: none"> Prof Dato' Dr Morshidi Sirat Prof Dr Shahren Ahmad Zaidi Aduce Khathijah Md Jaafar Michael Bain Chia Yi Han AP Dr M Affendy Arip Barry Lim 	3 May 2021 (10:00 am)
12	Regional and Urban Planning	<ul style="list-style-type: none"> State Planning Authority Public Works Department (JKR) 	<ul style="list-style-type: none"> Prof Dato' Dr Morshidi Sirat Prof Dr Shahren Ahmad Zaidi Aduce Dr Md Nasrudin Md Salleh Khathijah Md Jaafar Howard Trett Dato' Kamal Zaharin Harem Peri Goh Bok Yen 	5 May 2021 (10:00 am)

No	Cluster	Stakeholder	Consultant	Date (Time)
13	Regional and Urban Planning Infrastructure and Public Utilities	<ul style="list-style-type: none"> Sarawak Disaster Management Committee Fire and Rescue Department Sarawak Sarawak RELA Office Sarawak Malaysian Civil Defence Force Sri Aman District Council Sarawak Contingent Police Headquarters Sri Aman Resident Office 	<ul style="list-style-type: none"> Prof Dato' Dr Morshidi Sirat Prof Dr Shahren Ahmad Zaidi Aduce Khathijah Md Jaafar Dr Ting Siew King Nordin Abdullah Michael Bain 	6 May 2021 (10:00 am)
14	Regional and Urban Planning Infrastructure and Public Utilities	<ul style="list-style-type: none"> Natural Resources and Environment Board Sarawak Department of Environment Sarawak 	<ul style="list-style-type: none"> Prof Dato' Dr Morshidi Sirat Prof Dr Shahren Ahmad Zaidi Aduce Khathijah Md Jaafar Michael Bain Jaclyna 	6 May 2021 (2:00 pm)
15	Economic Planning and Development Social Services, Human Resources and Demography	<ul style="list-style-type: none"> Centre of Technical Excellence (CENTEXS) CATS University College GIATMARA Institut Latihan Perindustrian (ILP) Miri Institut Kemahiran Belia Negara Miri Sarawak Education Department 	<ul style="list-style-type: none"> Prof Dato' Dr Morshidi Sirat Prof Dr Shahren Ahmad Zaidi Aduce Khathijah Md Jaafar Chia Yi Han AP Dr Kartinah Ayupp 	7 May 2021 (10:00 am)
16	Primary Industry/Sector Business Model	<ul style="list-style-type: none"> Department of Marine Fisheries (Biosecurity Section) Inland Fisheries Branch, Department of Agriculture Batang Ai Ecofish Sdn. Bhd. Supreme Cold Storage 	<ul style="list-style-type: none"> Prof Dato' Dr Morshidi Sirat Prof Dr Shahren Ahmad Zaidi Aduce Khathijah Md Jaafar Gopinath Nagaraj 	7 May 2021 (2:30 pm)
17	Primary Industry/Sector Business Model	<ul style="list-style-type: none"> Persatuan Nelayan Kawasan Sebuyau Persatuan Nelayan Kawasan Layar Rimbis / Pusak Jabatan Perikanan Laut Daerah Sebuyau Ibu Pejabat Jabatan Perikanan Laut 	<ul style="list-style-type: none"> Prof Dato' Dr Morshidi Sirat Prof Dr Shahren Ahmad Zaidi Aduce Khathijah Md Jaafar Gopinath Nagaraj 	10 May 2021 (10:00 am)
18	Economic Planning and Development	<ul style="list-style-type: none"> Sarawak Multimedia Authority (SMA) Sarawak Digital Economy Corporation (SDEC) 	<ul style="list-style-type: none"> Prof Dato' Dr Morshidi Sirat Prof Dr Shahren Ahmad Zaidi Aduce Khathijah Md Jaafar Chia Yi Han Barry Lim Saranya Sundaram AP Dr M Affendy Arip 	10 May 2021 (2:30 pm)