Promoting Industry Foresight

Towards an industrialisation and innovation strategy for Suriname

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Promoting Industry Foresight

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Disclaimer

The views expressed in this report are based on opinions and discussions of stakeholders participating in the *Promoting Industry Foresight* project in Suriname and do not necessarily represent those of Futures Diamond or the project sponsors. This report is complemented with the results of an online survey prioritising the economic activities for Suriname by 2025. It does not purport to reproduce all comments, debates and interventions made by experts in the workshop or the survey. None of the messages conveyed in this report may in any way be interpreted as stating an official position of the World Bank and the UN-REDD+ Programme.

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About this report

The Ministry of Trade and Industry of Suriname (MT&I) has within its mandate the development of trade, industrialisation, entrepreneurship, intellectual property and competitiveness for economic growth. Furthermore, the ministry plays a key role in improving the investment for climate, growth of the private sector and policy on monitoring and enhancing access to markets in strategic sectors. MT&I does this in coordination with other public institutions and private sector stakeholders in a national, regional (CARICOM) and international environment. In this respect the Sustainable Development Goals (SDG) 8, 9 and 12 have been identified as the primary goals within the UN system in which the MT&I can contribute notably.

- Goal 8: To promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
- Goal 9: To build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation.
- Goal 12: Ensure sustainable consumption and production patterns.

Based on this mandate the ministry in partnership with the UN agencies, UNIDO, the UNDP financed through the REDD+ programme supported a 3-day workshop, in order to **provide key inputs for the development of an industrialisation policy for Suriname**.

The importance of this policy has become even greater under the current downturn due to the dependency of the Suriname economy on oil and gold. Income from these commodities has declined by approximately 50% due to less demand and lower prices in the world market. In addition, Suriname has always been an importer of goods and services and although the potential is there, both production and exports are limited.

Through the 3-day workshop on economic sectors foresight designed and facilitated by Futures Diamond, the MT&I aimed to come to a broad consensus on which key sectors are priority for the development of current and future industries. The workshop was a high-level multi-stakeholder three-day event, with participants from the public sector, higher education and private sector including NGOs (see Annexe 1). The objective was for stakeholders to review and agree upon strategic areas for the development of production and industrialisation by identifying **key emerging and future industries**, as well as **prioritisation of sectors**. During the workshop, short presentations were held by several national experts including experts on green growth and REDD+ in order to determine the views on the role which biodiversity can play in this industrialisation policy since Suriname has 94% coverage by rainforest.

Futures Diamond consultancy services were sought to facilitate the workshop and discussions with the different stakeholders. The aim of the consultancy was to have an extensive face-to-face as well as web-based consultation across the economic sectors in Suriname. The workshop was held in June 2016. Due to the extremely active commitment of workshop participants, as well as the high levels of productivity during the 3-day face-to-face discussions, MT&I and Futures Diamond agreed to extend the original scope of the assignment and schedule in order to promote a much wider stakeholder engagement strategy through an online survey aimed to further validate workshop results and promote a more systematic prioritisation process based on the International Standard Industrial Classification of All Economic Activities (ISIC).

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Executive summary

This report integrates and summarizes the results obtained from a foresight workshop and a stakeholder survey aimed to provide key inputs for the development of an industrialisation and innovation policy for Suriname. Through a systematic and structured methodology, based on visions and plausible scenarios developed by policy-makers, business actors, academics and civil society representatives (see Annexe 1) the report reflects on emerging and future industrial opportunities. Discussions and subsequent analysis for assessing and prioritising sectors have included, among others, the study of current demographic trends, opportunities and threats analysis, sustainable competitive advantages of Suriname, employment aspects, decentralization issues, global demand, and market imperfections.

Overall, the process helped to identify:

- 42 industrial priority areas on agro-food (8), green-growth (4), energy (11), mining (6) and information technology (13), see Annexes 2, 3 and 4

  Among them, the **ten most important areas**, in terms of economic and social impact/benefit, are:

  - Agro-food sector: **Rice production**; **Aquaculture**
  - Green growth sector: **Non-timber forest products**; **Eco-tourism**
  - Energy sector: **Solar industry**; **Petrochemical industry**
  - Mining sector: **Green gold mining**; **Metakaolin manufacturing**
  - Information technology sector: **IT offshoring**; **Geo-ICT**
- 32 sector-specific recommendations on agro-food, green-growth, energy, mining and IT;
- 22 industrial landscape recommendations for better governance, stronger industrial competitiveness, as well as supporting infrastructures;
- Key ISIC sectors and sub-sectors with high growth potential (see Section 5 and Annexes 5 and 6).

The online stakeholder survey helped to validate the results of the stakeholders' workshop and further prioritise key economic activities in Suriname by 2025. All 21 ISIC sectors were rated and 57% of the total score was shared between the **Top 5 ISIC sectors** expected to experience incremental or radical positive transformations in the future: 20% agriculture, forestry and fishing (a); 10% manufacturing (c); 10% information and communication (j); 9% mining and quarrying (b); 8% education (p).

The results and insights included in this foresight report constitute a sound and key input for the formulation of the upcoming Suriname industrial policy. Although the next phase for this foresight process has yet to be agreed, further rounds of *sector-specific* and *industrial landscape-shaping* workshops and studies leading to policy and technology roadmaps, capacity building, and investment plans for prioritised areas are recommended. The cooperation between Futures Diamond, representatives from the Ministry of Trade and Industry of Suriname, and key stakeholders is seen as a sensible and strategic way forward to define what Suriname wishes to be, where the country is heading, and how different actors can respond to these aims.

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List of acronyms

CARICOM	Caribbean Community and Common Market
EBS	Energie Bedrijven Suriname
IIRSA	Integration of the Regional Infrastructure of South America
ICT	Information and Communication Technologies
IPR	Intellectual Property Rights
ISIC	Standard Industrial Classification of All Economic Activities
LTS	Lower Technical Schools
MT&I	Ministry of Trade and Industry of Suriname
NATIN	Institute for Natural Resource and Engineering studies
NIS	National Innovation System
NIMOS	National Institute for Environment and Development
NSDI	National Spatial Data Infrastructures
PICP	Paranam Industrial and Commercial Park
PTC	Polytechnic Colleges
REDD+	UN Programme on Reducing Emissions from Deforestation and Forest Degradation
SPS	Sanitary and Phytosanitary
TBT	Technical Barriers to Trade
UNASAT	University of Applied Science and Technology
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organisation

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Section 1: Introduction

Suriname economy has been traditionally anchored to primary sectors like agriculture and mining. These traditional sectors are currently exposed to numerous economic and social changes that are emerging throughout the world, and therefore could undergo a potential transformation. Together with the finalisation of alumina production, Suriname is also suffering the reduction of international prices of gold and oil, its most important commodities. According to the International Monetary Fund, five years ago these commodities covered almost 90% of exports revenues and 40% of Government income (IMF, 2016). Drop of mineral export is driving the country into recession as negative GDP growth of -2% GDP is estimated in 2016.In order to ensure that Suriname's industrial development progresses alongside the development of other South American countries, while the gap between Suriname and advanced economies decreases gradually, it is necessary to promote exercises of collective intelligence that unveil hidden expectations and opportunities, whereas consolidating stronger commitment of industrial actors with the innovation system.

Countries with low level of industrialisation often use foresight tools, as these normally contribute to better planning of balanced economic growths and avoid ineffective allocations of internal resources and foreign investments. In Latin America and the Caribbean UNIDO and other international organisations have made significant efforts to promote forward-looking projects to analyse major technologies affecting key productive and industrial sectors (Popper and Medina, 2008). In Europe, foresight has become a key component of strategic innovation policy processes providing open advice on the future of the European Research Area (Popper et al., 2015). By incorporating participatory approaches into long-term strategic processes, policy makers reinforce the level of democracy and the legitimacy of their decisions. Foresight, as an instrument of policy intelligence, incorporates the utilisation of future scenarios to the above-mentioned long-term and participative approaches. Thinking in terms of plausible future scenarios is especially useful when economies are heavily dependent on the utilisation of natural resources, long-term availability of which is often uncertain and under threat. In fact, by engaging key industrial stakeholders into strategic dialogues, the possibilities of designing innovative and smart solutions to leverage the opportunities linked to available resources, or identifying alternatives, may radically increase.

This report integrates and summarizes the results obtained from the foresight workshop on the future of Suriname's industrial landscape, held in Paramaribo during June 2016, in which varied actors participated (policy-makers, business actors, academics and civil society representatives), with the survey conducted in the country between June and October 2016.

After this introduction the workshop's methodology is described in Section 2, followed by Section 3 on industry priorities in emerging and future sectors, with sub-priorities and sector-specific recommendations. Section 4 presents structural industry landscape recommendations aimed to provide key inputs for the development of an industrialisation policy for Suriname and Section 5 offers some general conclusions. Lastly, the lists of priority areas by sector and ranking are included in the annexes, as well as the prioritised ISIC sectors and sub-sectors from the online stakeholder survey. Whilst the *Promoting Industry Foresight* report shows a great potential, the process undertaken to date requires further guidance and follow up. Furthermore, the implementation of all the recommendations contained in this report at the same time may prove challenging logistically and cost-wise. For this reason, shared ownership and commitment to follow up processes are must for a successful industrialisation and innovation strategy in Suriname.

Section 2: Methodology

Foresight is a participatory and future-oriented instrument that facilitates the generation of policy advice. The utilisation of foresight by government responds to the need of identifying priority areas for future investments and/or obtaining recommendations on system strengths and weaknesses. With this in mind, the Government of Suriname organised a foresight project with the following three-fold dimension:

- **Prospective dimension** or vision of Suriname's industrial landscape achieved through a multi-perspective scenarios approach. Future prospects for Suriname industrial sectors were based on key stakeholders' repositioning in the context of optimistic, pessimistic and transformed scenarios. This future 'repositioning' was made with the support of keynote speakers and local industry experts who presented plausible futures within selected industry sectors.
- **Participatory dimension** or interaction introduced by mobilising experts and industrial stakeholders. The representation of the National Innovation System (NIS) in the discussion groups was based on the contribution of government, industry, academy and civil society actors. The participation of NIS actors through participatory instruments like foresight increases the levels of democratic governance.
- **Policy dimension** or practical orientation of the project is given by the usefulness of outcomes to inform the Government on the formulation and implementation of new industrialisation policies.

A participatory workshop was organised to identify new industrial priorities for Surinam. Over three days, and with the support of six local facilitators guided by a Futures Diamond team, six focus groups (with more than 50 participants) debated on industrial areas of potential interest, both within established and recognised economic sectors (Agriculture, Green growth, Energy, Mining, Information Technologies) and beyond.

The workshop methodology and complementary follow up online survey put a great emphasis on the benefits of combining knowledge based on interaction, creativity, expertise and evidence (Popper, 2008). By sharing opinions the discussion groups could identify correlated recommendation amongst representatives of different sectors, groups, and organisations. Advice theory confirms that the similarity between different advisors/stakeholders' opinions is a factor that increases the confidence of a proposed solution (Budescu et al., 2003). Confidence is also higher in judgements and reflexive tasks than in simple choice-based decisions (Soll & Klayman, 2004).

Additionally, the assistance of multiple advisors combined with the utilisation of a great volume of information to prepare the recommendations (the workshop participants shared sectoral data and inputs from four specialised speakers) is said to elevate the levels of confidence in achieved results (Budescu & Rantilla, 2000; Budescu et al., 2003).

It is also acknowledged in the advice literature that the accuracy of decisions also benefits from the integration of recommendations that come from multiple and non-correlated advisors and sources (Johnson, Budescu & Wallsten, 2001).

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The analysis of results has been based on three tasks that provided the following levels of information:

- 1st round discussions served to create, for each sector and future scenario, a relation of emerging industrial areas that could be potentially be promoted in Suriname. The areas were debated, assessed and validated by workshop participants in terms of feasibility and importance, which can aid a more informed decision-making.
- 2nd round discussions were designed to select and prioritise the five most important industrial areas by sector, taking as a starting point the results of all groups obtained in the first task.
- 3rd round discussions helped each group to elaborate precise descriptions of the prioritised areas. The elaboration was assisted and guided by a detailed description of important aspects of innovation policy advice: context, people, process and impact (see Popper et al., 2016 and Tables 1-4 below). This analytical activity was conducted in order to avoid the development of over ambiguous and vague recommendations. Policy advice literature suggests that the accuracy and effectiveness of policy decisions are affected by the level of precision with which advice is presented (Rantilla, 2000).

In addition, a set of structural recommendations was extracted from the final analysis of participants' insights. This advice has emerged from empirical evidences by the following means:

- Interpretation and modulation of participants' direct recommendations;
- Inference of recommendations based on opportunities and threats identified by participants;
- Suggestions and comments obtained from the Suriname's industrial priorities survey.

Drawing on the above-mentioned theoretical backgrounds, the sequence of workshop-data, analysis-survey has produced two types of policy advice:

Advice Type 1: Key industrial areas for today's and future strategic sectors. All the tables presented throughout Section 3 show industrial priority areas according to the following assessment criteria:[1]

- Groups: number of discussions where the priority area emerged
- Soundness: average of importance and feasibility assessed by all the groups on this area
- Group score: weighting of 'Groups' score (65%) and 'Soundness' score (35%)
- All-groups score: times that the priority has been selected by the discussion groups among the top-five priorities.

The final lists of priority areas, by sector, have been sorted by the 'all-groups' score. In cases where several areas have the same 'all-groups' score it has been used the 'group' score.[2]

Advice Type 2: Policy recommendations to enhance Suriname's industrial landscape and promote innovation. Section 4 presents three types of recommendations, elicited through workshop discussions:

- Recommendations for a better governance
- Recommendations for a stronger industrial competitiveness
- Recommendations on supporting infrastructures

The above-described process led to the identification of 42 industrial areas, 32 recommendations on agro-food, green-growth, energy, mining and information technology, and 22 policy recommendations.

[1] A more detailed description of this assessment is presented in Annexe 2.
[2] See full list of priority areas by sector in Annexe 3 and by ranking in Annexe 4.

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Table 1: Advice resolution aspects related to the context dimension

CONTEXT DIMENSION ASPECTS	EXAMPLES OF DISCUSSION GROUPS QUESTIONS
MOMENTUM aspects are related to the force that gets an industrial priority moving forward. The three most common critical factors in relation to momentum are: political setting (including regulations, decisions, rules, policies, guidelines, etc.); exemplars (including pioneering or leading models, standards, examples, etc.) and problems (including challenges, complications and difficulties as drivers of change).	• What factors of the political setting are favouring this specific industrial priority? • What emerging drivers of change/ challenges/ problems/ opportunities need to be taken into account in this industrial priority?
FORESIGHT aspects deal with future-oriented strategic drivers of industrial priorities. There are three approaches to be considered in this strategic analysis: horizon scanning, i.e. proactive identification of opportunities and forward-looking goals; trends-based reaction to current developments; and a strategic targets approach, which aligns objectives with future priorities and plausible evolution of innovation systems.	• What is the expected evolution of this priority in the future? • To what global trends is it actually attached? • How would you systematically identify future directions of this priority? • How are the future directions of this priority aligned to existing and foreseen capacities of the industrial/ innovation system?
RESOURCES need to be analysed so as to understand what means are necessary to conceive and develop an industrial priority. There are five critical factors to take into account in this respect: geographical setting (specific environmental and demographic conditions); funding sources (internal and external); infrastructure (physical and virtual); data sources (including intelligence) and scalability (potential to evolve).	• What key resources are needed to promote this industrial priority? • How can these resources be developed/ obtained? • How would you address the development/ acquisition of infrastructures and other material resources? • And how would you increase/ improve the knowledge-based (intangible) resources to develop this industrial priority?
MOBILISATION refers to the capacity of an industrial priority to reach and involve key stakeholders. There are six critical factors as for the mobilisation aspect: public participation (to meet society demands); community support (to achieve social engagement); institutional support (to tackle shared perceived challenges); champions and facilitators (to get a better outreach), public-private partnerships (to address larger and strategic industrial issues); and research and education engagement that support evidence-based decision-making.	• How would you articulate industrial actors around this industrial priority? • What sort of coordination and institutional support is needed for mobilisation? • How will the evidences of innovation initiatives be collected? • How public demand will be considered in the formulation of industrialisation policies? • How to foster and strengthen the links between academic and industrial actors?

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Table 2: Advice resolution aspects related to the people dimension

PEOPLE DIMENSION ASPECTS	EXAMPLES OF DISCUSSION GROUPS QUESTIONS
APTITUDE comprises the skill and competences of people involved in the conception and development of an industrial priority. There are four critical factors linked to this aspect: leadership (to guide the priority-related teams); charisma (to inspire and mobilise key people); creativity (to reach original and innovative approaches to the priority); and knowledge (to make sound and informed decisions).	• What people aspects could better favour the development of this industrial priority? • What sorts of management skills are needed? • What type of knowledge is necessary?
ATTITUDE is related to the behaviour of people responsible for the conception and development of an industrial priority There are four critical factors linked to this aspect: enthusiasm (to spread interest and excitement); empathy (to be more responsive to the needs of potential stakeholders and beneficiaries); involvement (to promote cooperation and networking); and commitment (to achieve shared ownership).	• How can key stakeholders' behaviour be oriented towards this industrial priority? • How can cooperation and networking be reinforced around this new industrial area? • Are there any personal incentives that may favour people commitment and induce a quicker and more consistent development of this priority?

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Table 3: Advice resolution aspects related to the process dimension

PROCESS DIMENSION ASPECTS	EXAMPLES OF DISCUSSION GROUPS QUESTIONS
CATALYSTS aspects refer to the enablers of the conception and development phases of a new industrial priority. There are seven critical factors linked to this aspect: comprehensibility/ understanding (to offer user-friendly approaches linked to the priority); crowd-sourcing (to achieve bottom-up financial support); learning-by-doing (to promote more assertive evolution and incremental innovations linked to the priority); supportive services (to deal with specific bottlenecks of the industrial priority development process); absorptive capacity (to generate and act upon valuable information or intelligence); ex-ante impact evaluation (to recognise and measure important benefits and possible risks); and piloting and experimenting (to reduce the risk of fail and manage expectations).	• What actions can be implemented to support the initial conception and development of this industrial priority? • Towards which other initiatives may this priority be drawn upon? • What financial requirements are needed in the first stages? • How can impact be estimated and used to foster the new industrial priority area? • What actions are needed to pilot the effectiveness of the new area? • What sort of examples can be used to convince main actors to commit themselves/ invest in the new area?
FOSTERERS are supporting aspects that facilitate the development and continuity of a new industrial priority. There are seven critical factors linked to this aspect: incentives (to further position the priority); coordination (to manage the relationship between sponsors, supporters and beneficiaries); networking and synergy (to better capitalise momentum-related critical factors); knowledge management (to reinforce the capacity of further developments); intellectual property management (to improve the competitive advantage of the industrial priority); ex-post impact evaluation (to promote improvements through learning and demonstrate the positive environmental, social and economic impacts of the new priority); and communication and dissemination (to increase the sectoral and geographical transferability of the solutions/ innovations associated to the new industrial priority).	• What actions are needed to maintain the conditions that are actually favouring the emergence of this priority? • How the progress of the priority development may be used to support the definition of monitoring/ follow-up actions? • How can this priority be transferred to other industrial areas? • How can the intellectual property strategies be defined?

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Table 4: Advice resolution aspects related to the impact dimension

IMPACT DIMENSION ASPECTS	EXAMPLES OF DISCUSSION GROUPS QUESTIONS
TRANSFORMATION aspects are focused on the capacity of a new industrial priority to make incremental or radical changes in a given system. There are eight critical factors linked to this aspect: lifestyle changes (to promote sustainable cultural and behavioural change); economic growth (to increase the levels of productive and prosperity of a system); community sense (to increase social cohesion); entrepreneurship (to create new business opportunities); knowledge sharing (to increase creativity and foster innovation); jobs and competences (to support sustainable workforce development); stakeholders' development (to consolidate new players and promote spin-offs) and multi-challenge approaches (to better manage the complexity of dynamically changing socio-technical systems).	• How can the priority be conceived to promote more systemic change? • What economic and social transformations are expected to be achieved through the development of this industrial priority? • How the new priority will contribute to strengthen catch-up processes?
SUSTAINABILITY aspects refer to incremental or radical changes associated to the new priority. These changes usually lead to positive environmental, economic and social transformation without compromising the needs and welfare of future generations. There are three critical factors linked to this aspect: social sustainability (to improve social class structure, social interaction/behaviour); economic sustainability (to improve consumption and production patterns, labour conditions, local/national/international trade, etc.); and environmental sustainability (to protect cultural/ecological heritage, species, natural resources).	• How can the priority contribute to social, economic and environmental developments? • Is the development of this priority sustainable with the existing resources? • What obstacles could potentially emerge that may put in risk the efficiency/adequate development of this industrial priority?

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Section 3: Industry priorities in emerging and future sectors

Priority areas in the agro-food sector

Agriculture activities have a long tradition in Suriname. Suriname's climate and geographical conditions facilitate not only the cultivation of crops for local communities but also the production of alternative agro-products for international markets. However, there are some factors, like the lack of trained workforce in the sector, that are hindering the modernization of agro processes and the export of high-value products to these markets.

The following areas have been prioritised by key stakeholder groups as the most important and strategic for the future of the agro-food sector:

Table 5: Priority areas in the agro-food sector

PRIORITY AREAS	DISCUSSION GROUPS	SOUNDNESS SCORE	OWNER GROUP SCORE	ALL GROUPS SCORE
Rice	**2**	**4.50**	**2.88**	**3**
Aquaculture	**2**	**4.00**	**2.70**	**3**
Honey production	2	N/A	1.30	2
Celery	1	5.00	2.40	1
Banana	2	N/A	1.30	1
Cassava	2	N/A	1.30	1
Industrial Hemp	1	N/A	0.65	1
Organic food	1	N/A	0.65	0

Rice industry has been found by stakeholders as the most important area to develop within the agro-food sector. Three discussion groups selected rice industry among the top five priorities in the sector. The stakeholders consider the modernization and strengthening of the rice industry as important and feasible. Throughout the discussions, aquaculture has received practically equal attention to rice and was also placed by participants in the top five priority with highlighted potential.

Other agro-food strategic areas to be considered are honey production (mainly organic, thus aligned with global consumption trends), celery cultivation, banana, and cassava production. Discussions also addressed the potential of hemp to be used in the construction, textile and medical sectors.

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Priority 1: Rice

Context-related aspects

Global trends in the agro-food sector indicate that societies are gradually increasing their demand of value added products. This trend comes along with consumers' **higher awareness on quality** and a renovated interest in acquiring more and better **rice varieties**.

Rice industry in Suriname is not exempt from these global changes. Some strategic actions are actually required to synchronise internal/local production with the needs of international markets, e.g. organic production requirements, and traditionally and sustainably produced goods. Industrial stakeholders are concerned by rice production costs, which are not competitive with neighbouring countries. Modernising production processes and fostering **technical development** in the sector are crucial aspects to ensure the profitability of rice industries and the agro-food sector in general terms. In this respect, attracting **foreign investment** and international workers to the country would be important measures to make the acquisition of new technical resources even more impactful. This may be part of a strategic mobilisation process, which inspired by policy makers should encourage a more effective interaction between traditional firms and new spin-off companies. In parallel, the reactivation of the dialogue between rice producers, organizations like 'Productschap Rijst Suriname', and the Ministry of Agriculture could be a stepping stone in the creation of new **public-private partnerships** and the evaluation of the potential of new export trade agreements.

People-related aspects

Suriname has long experience in rice cultivation. However, it is necessary to improve its know-how and modernise the sector through further **labour training** and programs for reinforcing staff's **leadership skills**. Agriculture, in general, needs to become more attractive for **young generations**, thus it is crucial to promote the creation of new sector-relevant jobs and future specialisations. A mind shift in the sector should be guided by a renovated sense of responsibility, which includes a stronger commitment with **cooperation** (public-private actors) and a more confident orientation towards **external markets**.

Process-related aspects

The modernisation of the sector would not be possible without the support of the Government. Establishing **incentives for export**, launching **education and training** programmes, and providing **funding support** to firms' technology investment plans (e.g. IT equipment) are measures that usually facilitate the rational development of agricultural sector. In parallel, **public and private research** efforts are needed in the area of rice agriculture in order to align growing global challenges of agro-food. The Government has also the responsibility of putting in place **international trade agreements**. An **evaluation and monitoring** system would assist policy makers in assessing the efficacy of these measures.

Impact-related aspects

Strengthening the rice sector requires a stronger cooperation between rice-specific actors and other economic actors operating in the region. Many of these actors share mutual goals, including the reinforcement and consolidation of **rural development** processes. Making the rice sector more powerful implies to systematically analyse its added values, thus gradually making the entire **production-supply chain** more rational, profitable, and sustainable, e.g. using rice shaft in the biomass energy sector.

The sustainability of these processes should be supported by an effective regulation of **intellectual property rights** (IPR) that contributes to production modernization. This includes the utilisation of patent databases, an efficient use of branding strategies (e.g. promoting rice 'grown' in Suriname) and training plans for IPR managers to support the public or private sector. By protecting innovation outcomes innovative firms will be better stimulated and encouraged to maintain their R&D efforts and conserve their quality standards.

Priority 2: Aquaculture

Context-related aspects

Fisheries in Suriname can be classified into three areas or activities: small scale artisanal, industrial, and subsistence fishing. The Suriname fishing sector, if we considered the impact of the three activities, is facing problems related to the lack of monitoring of **exploitation of resources** and over-fishing. This, in turn, is leading to a reduction of catch and a diminution of industry profitability (Hornby et al., 2015). Aquaculture would contribute to make fishing industry sustainable. It would enable the production of new and very **profitable species**, which are currently only available in the Amazon.

Following global challenges on **food security**, the increasing demand for **exports**, and the **high prices** that some species may reach in the international market, the aquaculture sector is found by industrial stakeholders a strategic area to explore. To succeed in this sector it is necessary, however, to improve the know-how of fish farming and to recognize and accept that many initial problems are expected during the sector development process.

Although Suriname has abundance of **fresh water** for feeding the aquaculture activities, it is however necessary to guarantee that this water is not polluted by mining activities, thus ensuring that species will be no longer contaminated with mercury.

People-related aspects

Acquisition of new sectoral **know-how** and **labour training** are needed both in small scale initiatives as well as in large industrial farming projects. The consolidation of the sector represents an interesting opportunity for young people professional careers. A focus on export would actually require that schools and universities will provide prospective managers with **international management** and **business** skills.

Process-related aspects

To rationalise the development of the aquaculture industry in Suriname an in-depth analysis and **mapping of natural resources** should be carried out by the Government, which would help to identify and allocate new fish farming areas. This requires a systemic vision that takes into account the availability of **fresh water**, the profile of the **population** living in the area, the **transportation** resources needed for ensuring the distribution of fresh and non-contaminated fish to communities and the interior markets, and the access to **maritime ports** and **airport** for supplying international clients. Adequate **regulations** (incentives, subsidies, IPR issues) and **bureaucracy** simplification would warranty that start up and established firms could carry on business activities in a fair competition context.

Impact-related aspects

Promoting aquaculture in Suriname may induce changes in rural communities, which could gradually transform their artisanal or subsistence fishing activities into a more professional livelihood. Supporting sectors, like refrigerated **transportation**, **packaging**, **animal feed** production, and **water treatment** equipment could be positively affected by the consolidation of the sector, thus enabling the production of higher added value products.

The success of fish farming industries needs to draw on the respect of natural environment. Principles of **circular economy** and **sustainability** should dominate the sector through initiatives that make possible an efficient use of **residues**, the conservation and sustainability of land and **water resources**, the identification and introduction of environmentally friendly **best practices**, the control of **plagues**, and continuing research efforts on **new species** and treatments against **diseases**.

Promoting Industry Foresight

Recommendations for the agro-food sector

1. Increase of domestically-driven production is needed to substitute importation of goods. To achieve it, it is necessary to reinforce the competencies and skills for export.
2. Government should provide agro-food actors with data about external markets demand, so that the sector will focus more efficiently on high-value products.
3. Improve marketing plans for agricultural products, e.g. promote processed vegetables.
4. Improve the performance of companies and add value to food processing processes by introducing new production methods and enabling technologies, e.g. post-harvest handling equipment.
5. Create partnerships between local producers and multinationals/wholesalers that are operating in the country.
6. Analyse the actual value chain in the agro-food sector in order to optimise the cooperation and collaboration with internal and external suppliers.
7. Develop an evaluation and monitoring system for assessing strategic programs and sectoral export plans.
8. Improve the Paranam Industrial and Commercial Park (PICP) development plans with the support of specialised knowledge organizations, especially in relation to innovation and export objectives for rice and aquaculture sectors.
9. Find solutions to the problem of mercury vapours in Paramaribo.
10. Make agro-food products more competitive through disease monitoring systems, Sanitary and Phytosanitary (SPS) Measures, and the Agreement on Technical Barriers to Trade (TBT).
11. Formulate regulations and laws for ensuring animal inspections, registration and traceability of livestock

Promoting Industry Foresight

Priority areas in the green growth sector

The green growth was considered, almost unanimously, a strategic area for economic, social and environmental development. This development is consistent with sustainability challenges that, at the global level, are nowadays influencing and shaping industrial landscapes, innovation initiatives, and the formulation of public policies.

Areas that are specified in Table 6 have been suggested by industry stakeholders as the most important and relevant ones to be developed within the green-growth sector. Interestingly, they respectively represent each one of the most important concerns currently addressed by research and innovation priorities in Europe, i.e. use of raw materials, environment-related activities, resources efficiency, and climate-change oriented initiatives.

Table 6: Priority areas in the green growth sector

PRIORITY AREAS	DISCUSSION GROUPS	SOUNDNESS SCORE	OWNER GROUP SCORE	ALL GROUPS SCORE
Non- timber forest products	**4**	**4.50**	**4.18**	**6**
Eco-tourism	**3**	**5.00**	**3.70**	**6**
Fresh water	5	4.60	4.86	3
Forest conservation and CO2	2	4.00	2.70	2

All groups that participated in the workshop gave a high priority to the development of non-timber forest products. A smart and sustainable utilisation of forests implies the commercialisation of numerous and varied potential natural foods and new materials. The participants have also deemed eco-tourism activities essential to reinforce Suriname's economy, insofar as these activities have a close relationship with the preservation of natural resources and environmental protection. The third important industrial area that deserves to be developed within the green-growth sector is related to the great availability of fresh water in the country, which with the right financial and technical support could be internationally commercialised. Finally, avoiding deforestation that is closely linked to the need of promoting and commercialising non-timber products, has been considered by two discussion groups between the five most relevant priorities for the industrial context. Climate change mitigating actions were predominantly highlighted by participants in relation to the REDD+ initiative of the United Nations for 'reducing emissions from deforestation and forest degradation in developing countries'.

Promoting Industry Foresight

Priority 1: Non-timber forest products

Context-related aspects

When referring to the commercialisation of non-timber products, the workshop stakeholders suggested the development and industrialisation of the following **products**:

1. Cosmetic industries: essential oils and scented herbs
2. Chemical industries: resins, latex, pepper for industrial painting
3. Medical and pharmaceutical uses: medical plants and herbs
4. Food industries: nuts, especially the Brazilian nut, fruit juices, and other edible products
5. Construction-related industries: bamboo, rattan, ornamental plants, and small construction materials.

A sustainable industrialisation of these products needs to be based on selective and environmentally friendly extraction and re-cultivation strategies that avoid negative impacts on the forests. New laws and **regulations** are needed, for example, to address **landownership** issues and to promote a rational socio-economic development of **indigenous communities**.

The high diversity of available products constitutes a great opportunity for export to value added **international markets**. This will require a governmental support that ensures the quality of materials (e.g. strengthening quality management skills within companies through training courses), enhances the industry value chain (e.g. financing technology and equipment acquisitions), and facilitates sales agreements at international level.

Government could also reinforce those **mobilisation** initiatives that promote the connection and cooperation between affected actors. In this respect, government, indigenous and rural communities, farmers, entrepreneurs and higher education institutions should be engaged in a dialogue (info sessions, consultations, etc.) that would support the removal of potential obstacles and facilitate better understanding of the opportunities that Suriname's forests offer.

People-related aspects

The use and benefits of non-timber forest products are well known by, and sometimes only limited to, indigenous communities, e.g. understanding the side effects of medical products and herbs, applying the right dosage, etc. This **knowledge** is anchored to **traditions** and cultural **heritage**.

Some stakeholders suggest that it would be useful to create centres or **experimental labs** where the indigenous knowledge would be complemented and reinforced with more **systematic and structured research and innovation** efforts. These initiatives could take the form of public-private partnerships, supported, for example by medical institutions or industry associations.

Generally speaking, to raise motivation and engagement of indigenous and rural communities in the development of the non-timber industry is essential to acknowledge and demonstrate that **institutional support** will eventually induce more solid and stronger processes of social and economic progress.

Process-related aspects

Several important actions need to be implemented for consolidating the growth of non-timber industries. Providing financial support is one of these actions. Funding is at the basis of both, the launching and the consolidation stages of the innovation process in this sector. Apart from allocating funds in equipment investment, other economic resources need to be used in relation to brand, patents and, in general, **IP**

rights protection, thus creating the conditions for a more successful implementation of new products in the national and foreign market. Significant financial support is also needed for obtaining health-related **certifications** and for maintaining international **quality standards**. The development of entrepreneurial initiatives may be also encouraged through **incentives** for firms as well as management-oriented **awards**. Non-timber products innovation processes may also be fostered by established Multilateral Environmental agreements, and the Nagoya protocol on Access and Benefits-sharing of traditional knowledge linked to genetic resources (Convention on Biological Diversity).

Impact-related aspects

Most stakeholders were in strong agreement on the positive impacts that developing non-timber new industries could have in the Suriname's economy. For indigenous communities, it will imply the generation of alternative **livelihoods** and better **employments** in the medium term. It was pointed out that the Government should pay more attention to this sector, especially since the promotion and creation of jobs in this economic area would also contribute to preservation of the **Surinamese culture**, reduction of **poverty**, maintenance of the **identity of communities** and favouring their **social inclusion**.

Long-term successful expectations in the sector would include the acknowledgement of Suriname as a reliable international supplier of affordable natural medicines and high quality beauty-oriented products. In parallel, well designed publicity **campaigns** would highlight the potential benefits of Suriname's forest raw materials on humans well-being, and communicate the respect that Suriname's industries have towards the **environment**.

Promoting Industry Foresight

Priority 2: Eco-tourism

Context-related aspects

Tourism still represents a small part of total GDP of Suriname. There are, however, numerous opportunities in the sector that could be explored to improve the situation within the sector. Eco-tourism provides such opportunity, as it is consistent with customers' international preferences, which demonstrate an **increasing demand** for natural, ecologic and environmentally sustainable tourism services.

The preservation of Suriname's **biodiversity** and the conservation of its forests should be at the basis of the eco-tourism sector. In fact, eco-tourism has strong **synergies** with industries that, by manufacturing and offering natural and healthy non-timber products from the forest, can promote the image of the country as an attractive destination while avoiding deforestation.

Attracting international tourists to the country requires developing new **infrastructures**, renovating and making existing **facilities** more tourism-friendly, and upgrading current **customer services** to higher standards. These measures, together with a policy that ensures affordable **prices**, would help to get from eco-tourism its real revenue potential.

Reinforcing the sector also implies to mobilise some strategic actors. **Local communities**, for example, need to be aware of the importance of environmental protection and the impact that sustainable initiatives of eco-tourism may have on their economic welfare. In this regard, **governmental tourism bodies** should put in place new educational programs (including primary schools) that raise such awareness. In parallel, **NGOs** may also facilitate the connection with international stakeholders and environmental agencies through information campaigns. Dialogue between **public** and **private** actors could also give rise to partnerships that support the development of other promising tourism niches within the country, e.g. creating tourism parks and new establishments around water reservoirs in Brokopondo.

People-related aspects

With independency of the type of tourism to be developed, it is widely accepted that the success of tourism-related services has to be based on the **excellence** of the services provided. In the case of eco-tourism the excellence of services also needs to be complemented by a profound **understanding of the benefits** that products can offer (food, cosmetics, treatments, etc.), an adequate **knowledge** on Suriname's **traditions**, **habits** and **heritage**, and a solid assumption that tourism-related activities have to be aligned with the **protection** of natural environment.

Achieving a collaborative and constructive attitude of people with regard to eco-tourism may represent challenges in some cases, since indigenous communities could eventually interpret these activities as intrusive. **Communication and education programmes** are recommended as a mean to induce positive **mind shift** in people, facilitate **adaptation** and **behavioural change**, and create a sense of **ownership** around new eco initiatives. The impacts of specific eco-tourism projects should be based on factual data, realistic estimations, and their alignment with people's individual and shared expectations.

Process-related aspects

The existing initiatives for promoting eco-tourism in the country seem somewhat decentralised. A strategic plan to coherently develop and reinforce the sector would imply more **centralized** and **coordinated** policy actions, at least during the first stages of the process.

Promoting Industry Foresight

The sector development, for instance, has to be underpinned by adequate **regulations**. Laws and licenses should try to guarantee that the sector actors run eco projects transparently and efficiently, while keeping minimum standards of quality.

The implementation of **ICT** infrastructures would facilitate networking processes both at local and international levels. Internally, they would make interaction between local communities and the communication with government more fluent and efficient. Internationally, ICT infrastructures would help to promote and disseminate domestic products and services globally, thus establishing the marketing conditions for connecting firms with potential foreign customers.

The stakeholders also noted that the sector would benefit from investing into initiatives that aim to reinforce logistics and other **tourism-oriented infrastructures**, e.g. renovating boats or improving the harbour.

Impact-related aspects

For local communities, the development of eco-tourism implies the creation of new **jobs** and the emergence of new **entrepreneurial** initiatives. The adaptation of rural economies to this development model would, in addition, favour the conservation and protection of forests, especially due to the decrease of timber manufacturing and the reduction of mining dependency.

Eco-tourism policy programs should also be designed to positively transform neglected areas and regions of Suriname, which would benefit in the long-term from the protection, maintenance and aesthetic improvements.

Promoting Industry Foresight

Recommendations for the green-growth sector

1. Develop feasibility studies that support decisions on investments and development of new industries like precious goods or healthy products.
2. Stimulate public-private partnerships in order to launch new sustainable development joint projects.
3. Reinforce property rights of new green products.
4. Identify and provide incentives to investors who may bring funds to the tourism sector, e.g. encouraging the promotion of tourism resorts around water reservoirs.

Priority areas in the energy sector

The energy sector was heavily debated by the stakeholders in most groups, with a particular attention towards the implications that climate change challenges have on the sector. The effects of climate change can provide practical explanation to many energy related challenges and the consequent policy decisions.

Questions like the decentralisation and security of the Suriname's energy system, as well as supply reliability aspects dominated discussions amongst stakeholders. The promotion of socially accepted solutions and the urgency of promoting efficient/rational energy consumption behaviours were also marked as important. Furthermore, the stakeholders also addressed the need of exploring new off shore oil sources with little references to the necessary reduction of fossil fuels utilisation.

Table 7 reflects diverse stakeholders' opinion with respect to energy priorities. More than ten different energy sources were considered appropriate to address the above-mentioned challenges.

Table 7: Priority areas in the energy sector

PRIORITY AREAS	DISCUSSION GROUPS	SOUNDNESS SCORE	OWNER GROUP SCORE	ALL GROUPS SCORE
Solar industry	**4**	**4.50**	**4.18**	**5**
Petrochemical industry	**4**	**4.70**	**4.26**	**3**
Wind energy	4	4.00	4.00	3
Natural gas	1	4.75	2.31	3
Bio Mass	2	3.50	2.53	2
Hydro energy	3	4.50	3.53	1
Waste to Energy	1	4.50	2.23	1
Mini hydropower	2	N/A	1.30	1
Rice shaft energy	1	N/A	0.65	1
Energy from Algae	1	N/A	0.65	1
Tidal energy	1	N/A	0.65	1

Solar energy was found by the majority of stakeholder groups as the most important energy solution to be developed in Suriname. Although not being renewable, crude oil occupied the second position amongst stakeholders' preferences. Wind energy was considered a clean energy option that could also be explored and promoted. Other alternative sources included the utilisation of natural gas, biomass, water, algae and tides. The use of agriculture waste, in particular rice shaft, to generate energy, is aligned with sustainability goals and may constitute in the future a relevant industrial option.

Promoting Industry Foresight

Priority 1: Solar industry

Context-related aspects

There is an increasing trend in demand and the price of energy in Suriname. This, together with the **abundance of sun** in the country, provides a great opportunity for the solar industry. Compared with other energy alternatives, solar installations can also reduce energy **transportation** costs. Solar energy oversupplying may be actually injected to a **distributed energy network**, thus contributing to the development of a national smart grid.

The development of the solar energy sector requires the **interaction**, among others, of emerging entrepreneurs and innovators, the support of the government through funding programmes and adequate regulation, the collaboration of the Institute for Natural Resource and Engineering studies (NATIN), the commitment of EBS (Energie Bedrijven Suriname), the contribution of University of Applied Science and Technology (UNASAT), and the involvement of Technical schools (LTS) and Polytechnic college (PTC).

People-related aspects

Firms involved in this sector should combine efforts to improve their **know-how** on solar energy (e.g. technical learning, training and construction-related education) with education initiatives that allow them to gradually reinforce their **management skills**. It is also important to have a clear and realistic vision of the **energy system**, including a solid understanding of affected or influencing actors, thus enabling more coherent and efficient decisions in relation to company's position and its contribution to the national network.

The development of this industry also requires that capacity building activities are provided in order to instill relevant stakeholders with skills and values that permit to effectively compete in the energy sector, i.e. by reinforcing **leadership** aspects, promoting **cooperation** within the sector, fostering **openness for change and innovation**, and consolidating managers' commitment with **environmentally sustainable growth**.

Process-related aspects

Solar energy needs to be stimulated by private funding. In this respect, the Government might consider the preparation of a sectoral plan so that potential investors are timely informed about potential returns on their **investment**. Accompanying the process, new solar-based **equipment** could be gradually introduced into the market in order to substitute expensive and less efficient apparatus, e.g. electric boilers. The creation or acquisition of new equipment in the sector should comply with **technical standards** and international **certifications**.

Impact-related aspects

Solar energy industry has strong linkages with the **construction** sector. The development of solar-based solutions may actually have implications in the design of new residential buildings and industrial facilities. **Manufacturing industries** could also benefit from the commercialisation of green electric appliances. Other activities positively affected by the investment on the sector could be those related with technical **assistance** and **maintenance**.

The sustainability of the solar industry growth may be favoured by the implementation of specific measures that monitor **generation costs** and avoid the rise of unjustified **energy prices**.

Priority 2: Petrochemical industry

Context-related aspects

Geographically, Suriname is well located for the shipment of oil products to Caribbean countries and beyond. Recent expansions of the oil industry activities aim to reduce the **dependency** of foreign fuel and transform the country into a net exporter in the medium to long term. Most stakeholders expressed particular interest in the drilling activities that the state oil company Staatsolie is undertaking **offshore**.

The potential of Suriname's oil industry is nowadays being reinforced by the cooperation with several **multinational partners**. This reinforcement may eventually have positive implications in the development of urea, plastic, and synthetic textile industries, among others.

People-related aspects

Collaborating with international oil companies to carry out drilling projects will stimulate **knowledge transfer** processes. It could contribute to overcoming the lack of know–how and the strengthening of staff's technical skills. Other aspects to be considered and developed are those related to leadership and management skills.

Process-related aspects

To consolidate the growth of the oil industry it is important to improve the regulations that affect the sector. The stakeholders pointed out that the Government should, for instance, demonstrate its supporting and endorsing public role by providing well-justified **concessions** to the national and international oil companies operating within the country.

Authorities should also launch and facilitate the conversations between international partners, thus guarantying and maintaining healthy and effective **partnerships**.

Impact-related aspects

Despite the low prices that dominate the oil market nowadays, off shore crude oil activities are found highly strategic for the country. Successful **exploration** and discovery of new wells would have positive effects on macroeconomic rates, like the level of **employment** and the **trade balance**. The development of the sector may also have implications in other sectors, e.g. a potential reduction of carbon extraction activities.

The sustainability of oil industry and other energy sector activities could be to some extent guaranteed by sovereign wealth funds. **State funds** may actually better integrate and allocate (invest) those revenues generated with natural and mineral resources, as well as incomes associated to industrial taxes, and accumulated budget surpluses.

Promoting Industry Foresight

Recommendations for the energy sector

1. Set up a new and more diversified energy distribution network or smart grid that avoids redundancy and improves efficiency, thus facilitating the participation of new energy providers.
2. Introduce a mix of renewable sources, thus reducing the dependency of hydro and thermal energy industries.
3. Promote public-private partnership investments in renewable sources, thus increasing the reliability and sustainability of the energy system.
4. Raise industries' awareness on energy efficiency and energy saving, e.g. fostering new education programmes.
5. Reinforce industry know-how on alternative sources of energy.
6. Explore the production of alternative products, e.g. led light.
7. Strengthen energy storage industries.
8. Improve the mapping of existing underground networks.
9. Encourage firms to make an effective use of the patent licensing system, especially in relation with alternative and innovative forms of renewable energy

Promoting Industry Foresight

Priority areas in the mining sector

Mining has been traditionally a strategic sector of Suriname's industry. Gold and bauxite industries have been very relevant for the country economy during decades. The closure of Suralco alumina refinery in 2015, mainly due to the weakness and turbulences of the international market, has led to a reduction of national revenues.

In this context, Suriname industrial stakeholders have explained their preferences and opinions on the future of the sector. Table 8 presents six new mining areas that could be subject to further research and analysis.

Table 8: Priority areas in the mining sector

PRIORITY AREAS	DISCUSSION GROUPS	SOUNDNESS SCORE	OWNER GROUP SCORE	ALL GROUPS SCORE
Green gold mining	**4**	**4.90**	**4.32**	**5**
Metakaolin	**3**	**4.30**	**3.46**	**3**
Crushed stones & chippings	3	N/A	1.95	3
Other minerals extraction	3	4.00	3.35	2
Granite	2	3.50	2.53	2
Gravel production	2	N/A	1.30	2

Gold industry has been found the most important area of development in the Suriname mining sector. However, this implies the acknowledgement of necessity to transform gold extraction and manufacturing processes into more green and sustainable activities. The second most relevant area to consider is the industrialisation of metakaolin. Crushed stone is other mining product that, according to the majority of stakeholders, needs to be taken into account for international commercialisation. Not least important is the extraction of other minerals and materials, like phosphates, especially by the importance that some of them have for agriculture and other industries. Finally, granite and gravel production were found by participants as promising alternative areas to explore.

Promoting Industry Foresight

Priority 1: Green gold mining

Context-related aspects

There is a **big international market** for gold. The existing **high demand** and the quality of Surinamese gold seems to be the most important reasons why gold mining remains as first priority in the mining sector, in the eyes of the stakeholders. However, there is unanimity on the necessity of reducing the **environmental risks** associated to the sector, i.e. deforestation and mercury pollution, and transforming the gold industry into a more environmentally sustainable economic activity. In parallel, there were opinions suggesting that, although the development of agriculture and tourism will gradually reduce the dependency of the gold sector, this industry will continue being predominant at least over the next decade.

The sector generates important **Government revenues** that may be strategically allocated in initiatives that will address environmental-friendly solutions in gold production processes. Innovations for transforming gold mining into a green and sustainable activity may also come through multinational direct investments and **public-private partnerships**. Mobilising private and public actors in the sector would catalyse spill-over and technology-transferring processes.

People-related aspects

The potential of the industry was discussed by the stakeholders from the perspective of utilising existing resources and procedures, which can result in the upgrading and reutilisation of gold mines, and also from the point of view of labour force, which needs to be accordingly informed and educated in **cleaner** and **greener methods**.

Although the existing knowledge and people's expertise on traditional mining processes are highly valuable aspects to be preserved and constitute the baseline for the modernisation of the sector, the participants also observed that some efforts, e.g. training programmes, could be done in relation to labour **productivity** and **efficiency**.

Process-related aspects

One of the most important actions to transform gold mining into an environmentally friendly industry is the attainment of **foreign capital**. International investment may be combined with smaller local funding that could address small-scale projects.

The economic activity within the sector should be better regulated in order to achieve: (a) more reliable and updated **information** of legal gold-related activities; (b) clearer information of **available gold resources**, e.g. by using forest management systems; (c) more favourable conditions for the creation of new **mining and manufacturing start-ups**; (d) a more systematic and efficient procedure to **certificate** or **protect** new products and processes; and (e) a more rapid materialisation of companies' **export** objectives.

Impact-related aspects

Reducing small-scale illegal gold mining would contribute to slowing down of the **deforestation** process in the country. The lack of capacities for collecting and storing **mercury** when separating gold from sand is giving rise to illegal activities that cause very important contaminations problems in soils and rivers. Furthermore, the consumption of river fishes has become a threat in people's diet, thus any development of the gold mining sector needs to be mainly focused on solving these environmental and health related challenges. As for the economic transformations of the sector, stakeholders envisaged interesting future improvements in **gold manufacturing**. For instance, investing in additive manufacturing processes, based on 3D printing technologies, would be an opportunity to create much more added value gold products.

Priority 2: Metakaolin

Context-related aspects

Metakaolin is obtained through the calcination of the mineral **kaolinite**. The process enables metakaolin to react with lime and cement, i.e. the components of concrete. As it is widely known in the construction sector, concrete deteriorates over time and is vulnerable to water and salt (corrosion). The use of metakaolin addresses this problem and enhances the **mechanical** and **chemical** properties of concrete. Applications of metakaolin include:

- high durability cements
- cast-in-place concretes for road and maritime covers
- precast concretes
- shotcretes
- mortars

The material can be easily combined with other materials, e.g. adhesives or pigments, which favour the utilisation of metakaolin as an input in the **construction** sector and **other industries**.

Due to the large **variety of applications** and the **abundance** of **high-quality** kaolinite in Suriname, the workshop stakeholders found this product highly interesting for international markets. In this respect, the mobilisation of capital **investors** is considered relevant by industrial stakeholders to initiate or stimulate the metakaolin **export** processes.

People-related aspects

An effective development of the sector would require the acquisition of more advanced technical resources. This requirement demands the implementation of **capacity building** programs for the sector, with a particular focus in the construction industries. **Research** may be promoted in technical universities so as to increase the knowledge of **new materials**. More research is needed, for example, to understand the physical and mechanical properties of available natural resources, as a previous step to devise new industrial applications.

Process-related aspects

The development of metakaolin, especially with regards to the study and development of new applications, needs to be supported by **piloting** and **learning-by-doing** processes. Collaboration between research teams and industry, which often implies **experimenting** over new materials, is important to develop innovations in the construction sector. New management and marketing initiatives would help firms to foster these product innovation processes.

As the exploration and mineral extraction costs are rather high, it is necessary that improvements in the sector will be supported by financial **public incentives**. Businesses **partnerships** are also recommended so as to improve the competitiveness of this industry.

Impact-related aspects

Some sectors may be also affected by the characteristics of metakaolin, e.g. the ceramics industry or any other activity linked to the construction sector. Its effects on Suriname's economy, e.g. the contribution to the country economic **growth** or the influence on the creation of **new companies**, can only be expected in the long term. The stakeholders, however, gave most importance to guarantying that the industrial development of this material would be rational, planned, environmentally friendly, and economically sustainable.

Promoting Industry Foresight

Recommendations for the mining sector

1. Make compatible the activity of mining industries with the conservation of forests and agriculture lands.
2. Review and improve the regulation of small and medium size mining activities, e.g. tax incentives for decreasing pollution and avoiding deforestation.
3. Ask for professional assistance and external know-how on mining infrastructures.
4. Invest in mining workforce training, thus raising awareness on sustainability and environmental protection issues.

Promoting Industry Foresight

Priority areas in the information technology sector

Information technologies (IT) have the potential to horizontally enable and support the development of other industries in the country.The sector may become a competitive hub that helps to attract investments and foster industrial development. It generates an increasing interest in the education and labour market.

Operating in the IT sector implies the participation and interaction of designers, developers, and users at the global level. The dynamic nature of the sector facilitates the development of multiple and very different technology specialisations. This dynamism also calls for continuously reviewing emerging solutions worldwide, both at the hardware or software level.

Table 9 presents a detailed list of IT priorities. They have been considered by the stakeholders as the most important and interesting areas or specialities to be developed within the IT sector.

Table 9: Priority areas in the information technology sector

PRIORITY AREAS	DISCUSSION GROUPS	SOUNDNESS SCORE	OWNER GROUP SCORE	ALL GROUPS SCORE
IT offshoring	**4**	**5.00**	**4.35**	**4**
Geo-ICT	**1**	**5.00**	**2.40**	**3**
E-waste processing systems	2	4.00	2.70	1
Big Data	2	3.00	2.35	1
Data hosting	1	4.25	2.14	1
Business intelligence and consultancy	1	4.00	2.05	1
ICT for Agro-food sector	N/A	1.00	3.50	2
3D animation and printing	2	5.00	3.05	1
Software development	2	4.00	2.70	0
International Hub for Latin America	2	3.50	2.53	0
Manufacturing and assembly industry	1	5.00	2.40	0
Internet of things	1	3.50	1.88	0
Computers production	1	N/A	0.65	0

The first priority is related to the international outsourcing of IT services. It embraces, among others, data and content management activities, testing, piloting and technical support. Geospatial technologies occupy the second position based on stakeholders' preferences. Other potentially interesting area to be explored is the management and processing of electronic waste, which has positive implications on environmental sustainability. The attention to big data applications and the interest in exploring or developing the 'internet of things' are two specialities clearly aligned with current global trends.

Promoting Industry Foresight

Priority 1: IT offshoring

Context-related aspects

Industry stakeholders believe that Suriname has the conditions to be a relevant actor in the global IT offshoring market. IT offshoring includes, among others, data and content management services, testing, and technical support.

Although the country presents some advantages in relation to **labour costs**, an effective and sustainable development of IT global outsourcing services requires, however, higher investments in all levels of IT education, upgrading of existing IT facilities, and improvement of Internet infrastructures.

Numerous potential services could be actually offered internationally, especially to the Netherlands and English-speaking countries. They may cover a broad spectrum that goes from simple **data entry** to advanced **software programming**, phone **applications designing**, or even **3Danimation** development.

People-related aspects

Being successful on IT offshoring activities implies to offer high quality and excellent IT services. Given that high skilled labour is often difficult to be found and recruited, a thriving development of the sector need to be anchored to a systematic and effective investment plan that promotes **efficient education**, **training** and **skills enhancing** processes.

Some stakeholders suggested that **IT education** itself may be seen an interesting service to be offered in the long term. In fact, high demand for IT learning in the Caribbean region is expected in the future.

Process-related aspects

Some measures to reinforce the sector include the financial support of **start-ups**, and the elimination of **bureaucratic** barriers that at the present moment avoid engagement and smooth collaboration with international businesses.

An improved and more reliable **Internet connection** in Suriname is also essential to facilitate the development of the IT offshoring sector. Government has to acknowledge that, given the nature of the IT sector, promoting the IT industry does not only require occasional financial interventions but a **continuous plan** for educating people and improving existing infrastructures.

Impact-related aspects

It is rather difficult to assess the impact of IT outsourcing services on the country's economy, it is accepted, however, that a powerful IT sector would in general contribute to the reduction of **unemployment rates** and provide more **dynamism** to the labour market.

In practice, applying this sort of added value services and IT improvements, not only internationally but also at the national level, should have **positive effects** on a wide range of Suriname industrial activities.

Promoting Industry Foresight

Priority 2: Geo-ICT

Context-related aspects

Geo-ICT refers to the utilisation of IT for capturing, recording, digitalising, and analysing **geo-information**, thus supporting spatial decision-making. This is particularly relevant for Suriname, since many policy decision processes in the country are based on the availability and administration of national **land** and **natural resources**. Geo-ICT can provide a precise understanding of the location and accessibility to these resources. Global challenges like climate change, urbanisation, food security and energy supply reliability can be more easily understood with these technologies. In particular, they can help to better approach most of UN **sustainable development goals**. Collaboration between stakeholders is important to address spatial/geographical challenges. Geo-ICT also assists in presentation and advanced analysis of data for **policy decisions** related to shared infrastructures and land agreements with neighbouring countries.

People-related aspects

Strengthening the Geo-ICT sector requires an important governmental support at the academic level, which includes the implementation of specific **high-level education plans**. A combination of IT specialists and geo-data scientists would be necessary in the country that can also foster the **cooperation** with international partners. The development of **software** applications based on geographic information systems (GIS) is a promising field that can potentially give rise to the creation of technological start-ups. The sector would also benefit from specialised education programs on **hardware** systems design and development.

Process-related aspects

Reinforcing the Geo-ICT sector would help to update and integrate those existing sets of geo-data that are currently disconnected. The **consolidation of data** are at the basis of some international institutions, e.g. **National Spatial Data Infrastructures** (NSDI) in the U.S., main objective of which consist of coordinating people, technology, data and procedures, in order to generate geospatial knowledge. Apart from the effects that data and knowledge offered by NSDI may have in addressing global and societal challenges, they also have the capacity of inducing **technological and economic opportunities** across sectors. An **open access** to geo-data would eventually promote more solid research on natural resources and favour industrial innovation.

Impact-related aspects

Geo-ICT can assists in the analysis and design of new **land developments** and in the planning of future **infrastructures**. Negative environmental impacts of these projects would be thus reduced or even eliminated.

The consequences of a smart utilisation of geo-technologies in Suriname can also be seen in relation to UN sustainable development objectives. For instance, a rational and sustainable use of land for agriculture and farming would have a positive impact on national **food security**. Other example refers to the capacity of geo-ICT to provide reliable information of Suriname's natural resources, thus enabling a more effective **management of water and energy**. Cities and **human settlement** developments throughout the country can be also improved by the analysis of geo data. The same happens with regards to sustainable **industrialisation plans**. Other impact of applying geo-ICT in Suriname relates to current processes of **deforestation**, **land degradation** and **diversity loss**. Illegal mining activity, for instance, which constitutes a very important threat for the environment and people's health, could be more effectively identified and controlled with geo technologies. Finally, an efficient development of the geo-ICT sector may be useful to preserve and make a sustainable utilisation of Suriname **marine resources**, **rivers** and **seas**.

Promoting Industry Foresight

Recommendations for the IT sector

1. Review and improve ICT regulation to achieve better business conditions, e.g. reinforcing IT infrastructures, ensuring Internet accessibility, and strengthening ICT services.
2. Invest in the development of local talent, thus reducing the dependency of external IT support.
3. Build and reinforce ICT competences, capacities and skills of the business sector.
4. Leverage competitive IT labour costs to provide international services, especially to the Netherlands (Dutch speaking countries).
5. Encourage the utilisation of social media by Government departments, thus fostering transparency and providing timely responses to societal and business problems.

Section 4: Structural industry landscape recommendations

Recommendations for a better governance

Table 10: Recommendations on governance

ISSUES	RECOMMENDATIONS
Institutional vision	Build a shared and long-term vision of industrial development that includes the prioritisation of industrial areas. This may be achieved by promoting a better understanding amongst public sectors' ministries/institutions and different economic sectors champions.
Competencies	Strengthen public institutions competencies by incorporating knowledgeable staff, specialists, academics and experts from the private sector.
Transparency	Improve the transparency and stability of the policy action, by minimizing the influence of political lobbies.
Regulation	Re-define existing regulations to strengthen prioritised sectors and eliminate challenges to improve business activities and opportunities. This should include the development of fiscal and legal laws for local and foreign investors, the improvement of IPR, and the formulation of effective science, technology and innovation policies.
Evidence based policies	Promote evidence-based policies that make a more effective use of data collection and analysis.
Communication	Foster multi-sectoral communication by disseminating information about common issues and opportunities across innovation system actors.
Resources intelligence	Map the current state of all Suriname's natural resources, as a baseline for land allocation long-term strategies.

Promoting Industry Foresight

Recommendations for a stronger industrial competitiveness

Table 11: Recommendations on competitiveness

ISSUES	RECOMMENDATIONS
Foreign Direct investment	Make an effective foreign direct investment plans that includes incentives for investors. FDI contributes to increased employment, access to new technologies, and development of new personnel competences. An agency for investment promotion could promote Suriname as a country with investment opportunities.
Actors' interaction	Strengthen collaboration between public and private actors, e.g. by encouraging stakeholders' interaction and more effective engagement.
Culture of innovation	Raise awareness on the importance of innovation as a measure of economic regeneration. A stronger culture of innovation is needed in higher education institutions, policy makers and the private sector. This would help businesses to gradually increase the added value of the products and services they offer, thus reinforcing them to compete more effectively in international markets.
Internationalisation	Facilitate international activity of firms by promoting knowledge partnerships, establishing international market alliances, and eliminating bureaucracy obstacles to export.
Education	Link existing education programmes with the emergence of new economic areas and industrial priorities.
Labour training	Invest in human capital by creating long-term labour training plans and entrepreneurship-oriented education programmes.
Entrepreneurship	Provide financial support to new projects and business development initiatives, which may require the creation of new incubators and strengthening of the Suriname Business Development Centre.
Productivity and efficiency	Develop programmes that incentivise and encourage higher efficiency, including the rationalisation of energy costs in industrial production.
IPR	Formulate innovation programmes that encourage firms to establish branding, IP and certification strategies. Strong independent institutes such as the Bureau of Standards may support the process.
Enabling technologies	Support the development of ICT capabilities/structures and promote organizational changes so that firms can better achieve a mature level of operations, especially those related with export.

Recommendations for a supporting infrastructure

Table 12: Recommendations on infrastructures

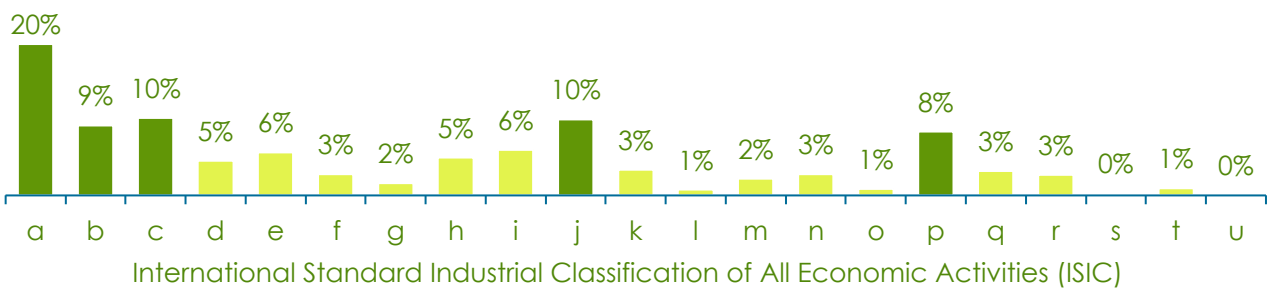
ISSUES	RECOMMENDATIONS
Industrial park	Promote the Paranam Industrial and Commercial Park (PICP) in order to attract the attention of industrial investors.
Shipping industry and ports	Enhance the shipping industry while reinforcing the Paranam port. Improved shipping services and facilities would make the activities of PICP investors more efficient and fluent.
International airport	Explore the possibility of improving the international airport in order to leverage PICP's future industrial and commercial activities.
Interior transport	Improving transport infrastructures is critical for industrial development, e.g. tourism and non-timber products sectors. Trade within the region often requires bypassing Suriname due to poor road infrastructure and non-existent rail connections. The largest port in the region, Paranam, could be utilised more effectively if there was a better accessibility to the interior of the country once reaching the port.
External gateways	Analyse Suriname's MOU agreements, especially in relation to commercial gateways (port, rail, highways) to Brazil. The strategy would comply with IIRSA strategy (Integration of the Regional Infrastructure of South America)

Section 5: Validation and Prioritisation Survey

Complementary prioritisation of ISIC sectors

A complementary online survey was conducted to validate the stakeholders' workshop results and further prioritise key economic activities in Suriname by 2025. All 21 ISIC sectors were rated by national experts mobilised by the Ministry of Industry and Trade of Suriname and 57% of the total score was shared between the following **five sectors** expected to experience incremental or radical positive transformations in the future: 20% agriculture, forestry and fishing; 10% manufacturing; 10% information and communication; 9% mining and quarrying; 8% education (see Figure 1 and Annexe 5). These results confirm the relevance of sectors discussed during the stakeholders' workshop but also highlight the need to organise additional workshops to identify priority areas in the *education* and *manufacturing* sectors.

Table 13: Suriname's ISIC sectors expected to experience positive transformations by 2025



a	Agriculture, forestry and fishing
b	Mining and quarrying
c	Manufacturing
d	Electricity, gas, steam and air conditioning supply
e	Water supply; sewerage; waste management and remediation activities
f	Construction
g	Wholesale and retail trade; repair of motor vehicles and motorcycles
h	Transporting and storage
i	Accommodation and food service activities
j	Information and communication
k	Financial and insurance activities
l	Real estate activities
m	Professional, scientific and technical activities
n	Administrative and support service activities
o	Public administration and defence; compulsory social security
p	Education
q	Human health and social work activities
r	Arts, entertainment and recreation
s	Other services activities
t	Activities of households as employers; producing activities of households for own use
u	Activities of extraterritorial organisations and bodies

Promoting Industry Foresight

Complementary prioritisation of ISIC sub-sectors

Within the five prioritised ISIC sectors, the following 15 ISIC sub-sectors were the most highly rated in terms of their positive transformation potential in Suriname by 2025.

- Agriculture, forestry and fishing:
  - Fishing and aquaculture.
  - Crop and animal production, hunting and related service activities.
  - Forestry and logging.
- Information and communication:
  - Computer programming, consultancy and related activities.
  - Information service activities.
  - Telecommunications.
  - Motion picture, video and television programme production, sound recording and music publishing activities.
- Manufacturing:
  - Manufacture of food products.
  - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials.
  - Manufacture of beverages.
  - Manufacture of furniture.
- Mining and quarrying:
  - Extraction of crude petroleum and natural gas.
  - Mining support service activities.
  - Mining of metal ores.
- Education:
  - Education (at all levels).

While the prioritised ISIC sub-sectors validate and reinforce the importance of several priority areas discussed in the workshop (e.g. aquaculture, green gold mining, petrochemical industry, IT services, etc.), they also help to identify additional areas where MT&I and other ministries in Suriname could apply similar forward looking and participatory approaches to further research them. Future workshops or stakeholder surveys aimed to contribute towards the industrialisation and innovation strategy of Suriname in these ISIC sub-sectors would benefit from the active engagement of the following Government bodies: Ministry of Transport, Communication and Tourism; Ministry of Education, Science and Culture; and Ministry of Agriculture, Animal Husbandry and Fisheries.

Section 6: Conclusions

During the next decade Suriname is likely to address two types of challenges. On the one hand, the country must remain aware and responsive to global threats, thus problems like climate change or food and energy security will continue influencing and shaping the policy agenda. On the other hand, Suriname shall maintain and strengthen efforts to achieve the right balance between nature preservation and industrialisation, since the latter typically implies the exploitation of country's vast, yet limited, resources. The interconnectedness of both challenges was clearly demonstrated in stakeholders' insights, which revealed a variety of solutions for regional development that are being applicable to varied sectors and economic areas, while linked to a sustainable utilisation of resources and the achievement of environmental goals.

Traditional sectors like green gold mining and petrochemical industry are still seen strategic for Suriname's industrial development. However, technological advances and environmental-friendly solutions are still necessary to support and sustain efforts in these areas. In other sectors, like rice agriculture and aquaculture, creating favourable conditions for export are highly recommended, with particular focus on targeting higher value added markets, e.g linking to trends in organic agriculture. A shared opinion between stakeholders was also reached with regards to the promising potential and future opportunities represented in other industrial fields, such as non-timber forest products, eco-tourism, solar energy and IT off-shoring. Similarly, other important priority areas such as fresh water and wind energy would benefit from further attention in future follow up activities. Attracting private investment was seen particularly important for the petrochemical and chemical industry. The stakeholder survey results also highlight education and manufacturing as key sectors, thus Suriname should plan coordinated inter-ministerial efforts to achieve positive transformations in these sectors. Efforts should also target resource and non-resource based manufacturing added value products. Stakeholders also mentioned the potential of Suriname as a hub for services: ICT, banking, transportation (goods and people), and tourism are some plausible options.

Following the prioritisation of Suriname's future economic sectors, the project has also allowed the identification of structural messages or recommendations that can potentially enhance the industrial system of Suriname. One of the most relevant recommendations refers to the importance of developing a long-term institutional vision of Suriname's future industrial development. This vision should be created with and for the industry stakeholders. The majority of stakeholders also agreed on the positive impact that incentives for attracting foreign direct investment could have in job creation and knowledge transferring processes. The necessity of improving logistical infrastructures was also highlighted as a key structural consideration.

Foresight projects have the capacity of stimulating people, thus encouraging them to transform ideas into innovation. In this sense, this project has provided a sound initial basis for the development of new economic opportunities. Acquiring a foresight culture implies commitment towards the application of processes that support the generation of collective intelligence. With this in mind, every economic or industrial area exposed through the process is, per se, an area of further research and exploration.

The results and insights included in this foresight report constitute a sound and key input for the formulation of the upcoming Suriname industrial policy. Although the next phase for this foresight process has yet to be agreed, further rounds of *sector-specific* and *industrial landscape-shaping* workshops and studies leading to policy and technology roadmaps, capacity building, and investment plans for prioritised areas are recommended. The cooperation between Futures Diamond, representatives from the Ministry of Trade and Industry of Suriname, and key stakeholders is seen as a sensible and strategic way forward to define what Suriname wishes to be, where the country is heading, and how different actors can respond to these aims.

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Annexes

Annexe 1: List of stakeholders mobilised

Participants in the multi-sectoral workshop		
NAME		**ORGANISATION**
1.	Aard Veldhuizen	SIOC
2.	Achmed Neijhorst	i-Frontier Nv
3.	Alex Holvoet	Digicel
4.	Anita Guijt	
5.	Anthony Janssen	Janssen en Partners
6.	Anuskha Sonai	Spang Makandra Studio
7.	Arno van Doorn	Ministry of Trade and Industry
8.	Carlo Tjong A Hung	Quality IT
9.	Carlos Linger	Krosbey Solutions Nv
10.	Carlos Stirling	Alembo
11.	Charissa Berrenstein	Callot IT
12.	Cheryl Pinas	Ministry of Trade and Industry
13.	Cyril Soeri	Tjon A Hung Consulting Nv
14.	Darryl Wolf	
15.	Dennis de Smidt	Telenamic Nv
16.	Djina Bergraaf - Sanchit	Infotrans Caribbean Suriname
17.	Don Lowe	Data world
18.	Eddy Dwarkasing	ED Consultancy
19.	Emanuel Scheek	
20.	Etiënne Poeder	
21.	Fiona Ting A Kee	Ministry of Trade and Industry
22.	George Blufpand	Misabi Testmanagement Nv
23.	Gerard den Dekker	UCC
24.	Gino Bouguenon	ANTS
25.	Giraldo Miranda	Rekemo
26.	Gregory Tai-Apin	BNETS
27.	Henk Ramnandanlal	Nettech
28.	Humphrey Soerohardjo	Info2000
29.	Iden Marshall	DSTN
30.	Ivan Fernald / Jimmy Rosheuvel	RPBG Nv
31.	Iwan Hoogendoorn	IT Nerdz Suriname
32.	Jack Meijdam	ICT Association
33.	Jai Udit	TAS
34.	John Ramdat Tewarie	
35.	John van der Zijden	Stichting Probitas
36.	Jouke Locher	Weblocher
37.	Jules de Rijp	Partners Plus Consultancy

38.	Karuna Soeknandan	CoreStats
39.	Krieshen Ramkhelawan	Lybra
40.	Lloyd Cameron	Clear IT
41.	Megillo B. Pang Atjok	Integrated Computer Services Nv
42.	Mitchell Djastro	HDF Consulting
43.	Moira Rosheuvel	
44.	Nancy B. Tangali	Account & Management Software Nv
45.	Nilesh Bishesar	Qualogy Suriname Nv
46.	Rafi Wazir	RizaW CRC
47.	Rajiv Hieralal	APPTASTIC Nv
48.	Ranny de Vries	Devcomp Nv
49.	Raoul Brahim	Adept
50.	Raoul Oesmanadi	Computer Hardware Services
51.	Rehuel Dompig	RTD Consultancy
52.	Reina Raveles	Ministry of Trade and Industry
53.	Renato Hijlaard	Integrated Professional Services NV
54.	Reno Siswowijoto	BDS
55.	Ricardo Ost	CareerIT
56.	Robert Hahn	Datasur
57.	Rolf Verwey	VSB
58.	Romano Doulat	Telesur
59.	Roy Smits	ICT Association
60.	Satish Gangaram Panday	ITEE NV
61.	Siegfried G. Kenswil	KPMG
62.	Stanley Joemman	Simple IT Systems Nv
63.	Terrence Tjon	Solve-IT
64.	Theo Boomsma	IT Core
65.	Ton Pijpers	IMIT
66.	Vincent Kenswil	Spang Makandra
67.	Vincent Walden	HencomTrai

Participants in the ICT sector workshop

NAME		**ORGANISATION**
68.	Anita Forst	Rapporteur 1 (Ministry of Trade and Industry)
69.	Anita Guijt	Stichting Probitas
70.	Anuskha Sonai	Spang Makandra Studio
71.	Arno van Doorn	AO Consultancy
72.	Charissa Berrenstein	Callot IT
73.	Cyril Soeri	Tjon A Hung Consulting Nv
74.	Darryl Wolf	
75.	Dennis de Smidt	Telenamic Nv
76.	Djina Bergraaf - Sanchit	Infotrans Caribbean Suriname
77.	Emanuel Scheek	
78.	Fiona Ting A Kee	High quality Service Center Nv
79.	George Blufpand	Misabi Testmanagement Nv

80.	Giraldo Miranda	Rekemo
81.	Guylain Arietja	Rapporteur 2 (Ministry of Trade and Industry)
82.	Jack Meijdam	ICT Association
83.	Jai Udit	TAS
84.	John Ramdat Tewarie	CoreStats
85.	Jules de Rijp	Partners Plus Consultancy
86.	Karuna Soeknandan	CoreStats
87.	Krieshen Ramkhelawan	Lybra
88.	Lloyd Cameron	Clear IT
89.	Marian Terinni	Rapporteur 3 (Ministry of Trade and Industry)
90.	Mitchell Djastro	HDF Consulting
91.	Nalini	IT Core
92.	Rajiv Hieralal	APPTASTIC Nv
93.	Ranny de Vries	Devcomp Nv
94.	Reina Raveles	Ministry of Trade and Industry
95.	Robert Hahn	Datasur
96.	Rolf Verwey	VSB
97.	Romano Doulat	Telesur
98.	Roy Smits	ICT Association
99.	Stanley Joemman	Simple IT Systems Nv
100.	Theo Boomsma	IT Core
101.	Ton Pijpers	IMIT
102.	Vincent Kenswil	

Participants supporting the complementary sectoral prioritisation online survey

NAME		ORGANISATION
103.	Aliska Flauwtantie	Ministry of Trade and Industry
104.	Amit Chandansingh	Competitiveness Unit Suriname (CUS)
105.	Arianne De Bye	Prok Vision Nv
106.	Aruna Rampersad	Taxation, Ministry of Finance
107.	Astrik Felter	Telesur
108.	Bhiesnoe Gopal	Gopex International Nv
109.	Carole-Ann Partoredjo	University of Applied Science and Technology
110.	Chavellie Brouwer	Ministry of Trade and Industry
111.	Cornelis A Dilweg	Randoe Meubelen Nv
112.	David Chin Kwie Joe	Ckj Produktie Nv
113.	Dilweg Cees	Randoe Suriname Nv
114.	Eersteling Urville	Ewti Wedding Planner & Decor
115.	Elyssa Wirjosoekarto	Suriname Business Development Center
116.	Ferrier Marjon	Randoe
117.	Fräser Bradley	Ministry of Transport Communication & Tourism
118.	Giraldo Miranda	ICT Association
119.	Halfhide Diana	Suriname Alcoholic Beverages Nv
120.	Henk Ramnandanlal	Nettech
121.	Jai Udit	Telecommunications Authority Suriname

122. Janeczka Danitia	Handel & Industrie
123. John Watkin	Stg Fablab Suriname
124. Jules De Rijp	Partners Plus Consultancy
125. Lam Ensin Chui Soe	KKF
126. Linger Dean	Tohora Group
127. Lloyd Cameron	Clear It Solutions
128. Meijdam Jack	ICT Association Suriname
129. Mike Ebecilio	Ministry Finance
130. Mistral Van Lierop	Ministry of Trade and Industry
131. Ngonidzashe Chiwaridzo	UNDP
132. Ramkhelawan Krieshen	Lybra.Training.Coaching.Consulting Nv
133. Ramkhelawan Jagdiespersad	
134. Ramnandanlall Revinh	Kabinet of the Vicepresident of the Republic of Suriname
135. Ranny De Vries	ICT Association
136. Rashida Mertotaroeno	Ministry of Trade and Industry
137. Reina Raveles	Ministry of Trade and Industry
138. Robby Glenn Holband	Polytechnic College Suriname
139. Robert Hahn	Datasur
140. Roy Smits	Ministry of Trade and Industry
141. Sandora Kartojoso	Ministry of Trade and Industry
142. Sandra Sweeb	La Balustrade
143. Sanne Van Osnabrugge	Conservation International
144. Saskia Nahar	Ministry of Trade and Industry
145. Souverein Ruud	Suriname Candied Fruits Nv
146. Stanley Joemman	Simple It Systems
147. Stuger Marchano	Ministry of Trade and Industry
148. Susan Tjong A Hung	Handelmij L. Willemsberg Nv
149. Susan Bansropansingh	Suriname Business Climate and Innovation Program (SUBCIP) / CUS
150. Susijanie Kartodikromo	Government
151. Sven Aboikoni	Ministry of Trade and Industry
152. Umar Taus	Unifood Suriname Nv
153. Wilfred Balraadjsing	Bedrijf Geneesmiddelen Voorziening Suriname
154. Wilgo Bilkerdijk	Asfa
155. Winston Wieslon	Suriname Business Development Center

NOTE: INDIVIDUAL SURVEY RESPONSES REMAIN CONFIDENTIAL, THUS ONLY AVERAGE RESULTS PRESENTED IN SECTION 5. IN ADDITION, THE SURVEY ALLOWED FOR ANONYMOUS PARTICIPATION SO THE NAMES LISTED ABOVE ARE OF THOSE WHO VOLUNTARILY PROVIDED THEIR CONTACT DETAILS.

Annexe 2: Methodology for industrial areas prioritisation

The methodology of the project included different focus group discussions on agro-food industries, green growth, energy, mining, and information technologies sectors.

Six discussion groups (9-10 participants per group) debated on the opportunities that optimistic, pessimistic and transformative future scenarios could potentially offer by 2025. The sectoral scenarios were presented by keynote speakers invited by the Ministry of Trade and Industry of Suriname. The dynamics of the discussions is described below:

- Each group had 15 minutes to identify 3 priority areas within each perspective in the sector (3 x 3 =9 priorities). Each discussion group shared their 9 priorities with the other groups.
- Each group assessed the importance and feasibility of the priorities generated across the groups and selected the top 5 industrial priorities.
- Among their 5 top priorities each group selected 3 final priorities that were enriched with additional reflections on context, people, process, and impact dimensions.

Some observations can be made in relation with the discussions procedure:

- Each discussion group was represented by industrial/innovation system key actors, i.e. firms, government, academy, civil society.
- Each group nominated a chair responsible for guiding the discussions with the support of a rapporteur.
- The groups were asked to reach consensus on their opinions and insights, which often required rapid-voting or rating activities.
- The industrial priorities proposed by the groups were justified and presented in rapporteur's templates.

The results have been presented in the tables of Section 3. The highest prioritisation was given to those industrial areas that have been more frequently selected by the discussion groups within the top-five priorities ('all-groups' score).

In addition to this prioritisation, the areas have been sorted by a score ('group' score'), which integrates the number of discussions where a priority area has emerged, and its importance and feasibility (as assessed by the participants), i.e. its level of soundness.

Two lists of identified industrial priorities can be found in Annexes 3 and 4. They respectively present the classification by sector and by overall ranking.

Annexe 3: Suriname's industrial priorities by sector

Table 14: Suriname's industrial priorities by sector

SECTOR	PRIORITY AREAS	DISCUSSION GROUPS	SOUNDNESS SCORE	OWNER GROUP SCORE	ALL GROUPS SCORE
Agro-food	**Rice**	**2**	**4.50**	**2.88**	**3**
Agro-food	**Aquaculture**	**2**	**4.00**	**2.70**	**3**
Agro-food	Honey production	2	N/A	1.30	2
Agro-food	Celery	1	5.00	2.40	1
Agro-food	Banana	2	N/A	1.30	1
Agro-food	Cassava	2	N/A	1.30	1
Agro-food	Industrial Hemp	1	N/A	0.65	1
Agro-food	Organic food	1	N/A	0.65	0
Green-growth	**Non-timber forest products**	**4**	**4.50**	**4.18**	**6**
Green-growth	**Eco-tourism**	**3**	**5.00**	**3.70**	**6**
Green-growth	Fresh water	5	4.60	4.86	3
Green-growth	Forest conservation and CO2	2	4.00	2.70	2
Energy	**Solar industry**	**4**	**4.50**	**4.18**	**5**
Energy	**Petrochemical industry**	**4**	**4.70**	**4.25**	**3**
Energy	Wind energy	4	4.00	4.00	3
Energy	Natural gas	1	4.75	2.31	3
Energy	Bio Mass	2	3.50	2.53	2
Energy	Hydro energy	3	4.50	3.53	1
Energy	Waste to Energy	1	4.50	2.23	1
Energy	Mini hydropower	2	N/A	1.30	1
Energy	Rice shaft energy	1	N/A	0.65	1
Energy	Energy from Algae	1	N/A	0.65	1
Energy	Tidal energy	1	N/A	0.65	1
Mining	**Green gold mining**	**4**	**4.90**	**4.32**	**5**
Mining	**Metakaolin**	**3**	**4.30**	**3.46**	**3**
Mining	Crushed stones & chippings	3	N/A	1.95	3
Mining	Other minerals extraction	3	4.00	3.35	2
Mining	Granite	2	3.50	2.53	2
Mining	Gravel production	2	N/A	1.30	2
IT	**IT offshoring**	**4**	**5.00**	**4.35**	**4**
IT	**Geo-ICT**	**1**	**5.00**	**2.40**	**3**
IT	E-waste processing systems	2	4.00	2.70	1
IT	Big Data	2	3.00	2.35	1
IT	Data hosting	1	4.25	2.14	1
IT	Business intelligence & consultancy	1	4.00	2.05	1
IT	ICT for Agro-food sector	1	3.50	1.88	1
IT	3D animation and printing	2	5.00	3.05	1
IT	Software development	2	4.00	2.70	0
IT	International Hub for Latin America	2	3.50	2.53	0
IT	Manufacturing & assembly industry	1	5.00	2.40	0
IT	Internet of things	1	3.50	1.88	0
IT	Computers production	1	N/A	0.65	0

NOTE: THESE LISTED PRIORITIES HAVE BEEN IDENTIFIED WITH THE METHODOLOGY DESCRIBED IN SECTION 2 AND ANNEXE 2.

Annexe 4: Suriname's industrial priorities by ranking

Table 15: Suriname's industrial priorities by ranking

	SECTOR	PRIORITY AREAS	DISCUSSION GROUPS	SOUNDNESS SCORE	OWNER GROUP SCORE	ALL GROUPS SCORE
1	Green-growth	**Non-timber forest products**	4	4.50	4.18	6
2	Green-growth	**Eco-tourism**	3	5.00	3.70	6
3	Mining	**Green gold mining**	4	4.90	4.32	5
4	Energy	**Solar industry**	4	4.50	4.18	5
5	IT	**IT offshoring**	4	5.00	4.35	4
6	Green-growth	Fresh water	5	4.60	4.86	3
7	Energy	**Petrochemical industry**	4	4.70	4.25	3
8	Energy	Wind energy	4	4.00	4.00	3
9	Mining	**Metakaolin**	3	4.30	3.46	3
10	Agro-food	**Rice**	2	4.50	2.88	3
11	Agro-food	**Aquaculture**	2	4.00	2.70	3
12	IT	**Geo-ICT**	1	5.00	2.40	3
13	Energy	Natural gas	1	4.75	2.31	3
14	Mining	Crushed stones & chippings	3	N/A	1.95	3
15	Mining	Other minerals extraction	3	4.00	3.35	2
16	Green-growth	Forest conservation and CO2	2	4.00	2.70	2
17	Energy	Bio Mass	2	3.50	2.53	2
18	Mining	Granite	2	3.50	2.53	2
19	Agro-food	Honey production	2	N/A	1.30	2
20	Mining	Gravel production	2	N/A	1.30	2
21	Energy	Hydro energy	3	4.50	3.53	1
22	IT	3D animation and printing	2	5.00	3.05	1
23	IT	E-waste processing systems	2	4.00	2.70	1
24	Agro-food	Celery	1	5.00	2.40	1
25	IT	Big Data	2	3.00	2.35	1
26	Energy	Waste to Energy	1	4.50	2.23	1
27	IT	Data hosting	1	4.25	2.14	1
28	IT	Business intelligence & consultancy	1	4.00	2.05	1
29	IT	ICT for Agro-food sector	1	3.50	1.88	1
30	Agro-food	Banana	2	N/A	1.30	1
31	Agro-food	Cassava	2	N/A	1.30	1
32	Energy	Mini hydropower	2	N/A	1.30	1
33	Agro-food	Industrial Hemp	1	N/A	0.65	1
34	Energy	Rice shaft energy	1	N/A	0.65	1
35	Energy	Energy from Algae	1	N/A	0.65	1
36	Energy	Tidal energy	1	N/A	0.65	1
37	IT	Software development	2	4.00	2.70	0
38	IT	International Hub for Latin America	2	3.50	2.53	0
39	IT	Manufacturing & assembly industry	1	5.00	2.40	0
40	IT	Internet of things	1	3.50	1.88	0
41	Agro-food	Organic food	1	N/A	0.65	0
42	IT	Computers production	1	N/A	0.65	0

NOTE: THESE LISTED PRIORITIES HAVE BEEN IDENTIFIED WITH THE METHODOLOGY DESCRIBED IN SECTION 2 AND ANNEXE 2.

Annexe 5: Suriname's ISIC sectors prioritised through an online stakeholder survey

Table 16: Suriname's ISIC sectors rated in terms of their positive transformation potential by 2025

ISIC CODE	ISIC ECONOMIC ACTIVITIES	RATING SCORE	OVERALL WEIGHT (%)
A	**Agriculture, forestry and fishing**	**1000**	**20%**
B	**Mining and quarrying**	**462**	**9%**
C	**Manufacturing**	**512**	**10%**
D	Electricity, gas, steam and air conditioning supply	229	5%
E	Water supply; sewerage; waste management and remediation activities	286	6%
F	Construction	142	3%
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	83	2%
H	Transporting and storage	249	5%
I	Accommodation and food service activities	301	6%
J	**Information and communication**	**502**	**10%**
K	Financial and insurance activities	169	3%
L	Real estate activities	39	1%
M	Professional, scientific and technical activities	110	2%
N	Administrative and support service activities	142	3%
O	Public administration and defence; compulsory social security	42	1%
P	**Education**	**422**	**8%**
Q	Human health and social work activities	162	3%
R	Arts, entertainment and recreation	138	3%
S	Other services activities	14	0%
T	Activities of households as employers; undifferentiated goods - and services - producing activities of households for own use	46	1%
U	Activities of extraterritorial organisations and bodies	4	0%

NOTE: TOP 5 SECTORS HIGHLIGHTED IN BOLD.

Annexe 6: Suriname's ISIC sub-sectors prioritised through an online stakeholder survey

Table 17: Suriname's ISIC sub-sectors rated in terms of their positive transformation potential by 2025

ISIC CODE	ISIC SUB-ECONOMIC ACTIVITIES	RATING POSITION	RELATED ISIC SECTOR
3	Fishing and aquaculture	1	Agriculture, forestry and fishing
1	Crop and animal production, hunting and related service activities	2	Agriculture, forestry and fishing
2	Forestry and logging	3	Agriculture, forestry and fishing
62	Computer programming, consultancy and related activities	4	Information and communication
10	Manufacture of food products	5	Manufacturing
63	Information service activities	6	Information and communication
85	Education	7	Education
6	Extraction of crude petroleum and natural gas	8	Mining and quarrying
61	Telecommunications	9	Information and communication
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	10	Manufacturing
9	Mining support service activities	11	Mining and quarrying
7	Mining of metal ores	12	Mining and quarrying
11	Manufacture of beverages	13	Manufacturing
31	Manufacture of furniture	14	Manufacturing
59	Motion picture, video and television programme production, sound recording and music publishing activities	15	Information and communication

NOTE: THIS ANNEXE FEATURES THE TOP 15 SUB-SECTORS ONLY.

Annexe 7: Letter from the Minister of Trade and Industry supporting the stakeholder survey

MINISTRY
OF
TRADE AND INDUSTRY
Nieuwe Haven P.O.Box 9354
Telephone: (597) 402886
Telefax: (597) 402602
E-mail: dhisur@yahoo.com
Paramaribo - Suriname

Invitation letter from the minister of Trade and Industry:

Dear Participant,

I hereby invite you to participate in a survey developed by consulting firm Futures Diamond a specialist in developing Industrial and Innovation Policies. This survey has been designed to gather information on your view on the industrial development of Suriname. It is yet another step in the process which has started one year ago with the technical assistance of UN agencies UNIDO and the UNDP and serves as a follow up to the workshop "Promoting Industry Foresight" in June 2016. This workshop as well as your contribution through this survey will ultimately enable the government of Suriname to develop an Industrialization Strategy. Your knowledge and experience within your specific field of work is essential for achieving our goal.
Your participation in this survey is completely voluntary and will remain confidential. This will only take approximately 20 minutes to complete.

Thank you for taking the time to assist us in our endeavors in developing the Industrial policy of Suriname.

Sincerely yours,

Ms. Sieglien Burleson
Minister of Trade & Industry of Suriname

Promoting Industry Foresight

FUTURES DIAMOND

Futures Thinking Applied

www.futuresdiamond.com

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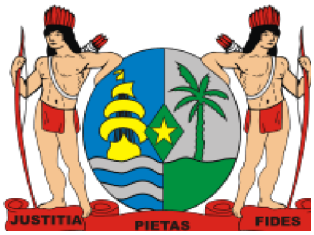
United Nations Development Programme (UNDP),
UN Programme on Reducing Emissions from Deforestation and Forest Degradation (REDD+)
and United Nations Industrial Development Organisation (UNIDO).



50 YEARS

UNIDO

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION