VALUE-BASED INTERMEDIATION FINANCING AND INVESTMENT IMPACT ASSESSMENT FRAMEWORK (VBIAF) SECTORAL GUIDE: RENEWABLE ENERGY

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Acknowledgments

This document is a collaborative effort by the Value-based Intermediation Community of Practitioners, regulators and relevant stakeholders.

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List of acronyms and abbreviations

BNM	Bank Negara Malaysia
CCPT	Climate Change and Principle-based Taxonomy
CCS	Carbon Capture and Sequestration
CITIES	Convention on International Trade in Endangered Species
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
E&S	Environmental and Social
EC	Energy Commission
EE	Energy Efficiency
EIA	Environmental Impact Assessment
EPC	Energy Performance Contract
ESCO	Energy Services Company
ESIA	Environmental and Social Impact Assessment
ESS	Energy Storage Solutions
FIs	Financial Institutions
FiT	Feed-in Tariff
FPIC	Free, Prior and Informed Consent
GHG	Greenhouse Gas
GITA	Green Investment Tax Allowance
GITE	Green Income Tax Exemption
GTFS	Green Technology Financing Scheme
HCS	High Carbon Stock
HCV	High Conservation Value
HNV	High Nature Value
HSAP	Hydropower Sustainability Assessment Protocol
IEA	International Energy Agency
IFC	International Finance Corporation
IRENA	International Renewable Energy Agency
ISCC	International Sustainability and Carbon Certification
IUCN	International Union for Conservation of Nature
JAS	Department of Environment
JKKP	Department of Occupational Safety and Health
JSM	Department of Standards Malaysia
KPKT	Kementerian Perumahan dan Kerajaan Tempatan *(Ministry of Housing and Local Government)*
kWh	Kilowatt Hour
LSS	Large Scale Solar
KeTSA	Kementerian Tenaga dan Sumber Asli *(Ministry of Energy and Natural Resources)*
MGFT	Malaysian Green Financing Taskforce
MGTC	Malaysian Green Technology and Climate Change Centre
MSPO	Malaysian Sustainable Palm Oil
MSW	Municipal Solid Waste
MW	Megawatt
MWh	Megawatt hour
NEM	Net Energy Metering
NGO	Non-Government Agency
OSH	Occupational Safety and Health

P2P	Peer-to-Peer
POME	Palm Oil Mill Effluent
PPA	Power Purchase Agreements
PV	Photovoltaic
RAMSAR	Ramsar Convention on Wetlands of International Importance
RE	Renewable Energy
RE Act 2011	Renewable Energy Act 2011
RECs	Renewable Energy Certificates
RSB	Roundtable on Sustainable Biomaterials
RSPO	Roundtable on Sustainable Palm Oil
SEA	Strategic Environmental Assessment
SEDA	Sustainable Energy Development Authority Malaysia
SEIA	Social and Environmental Impact Assessment
SELCO	Self-Consumption
SESB	Sabah Electricity Sdn Bhd
TCFD	Task Force on Climate-Related Financial Disclosures
TNB	Tenaga Nasional Berhad
TPA	Third Party Access
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VBIAF	Value-based Intermediation Financing and Investment Impact Assessment Framework
WEEE	Waste Electrical and Electronic Equipment (EU)
WTE	Waste to Energy

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Foreword

Chairman of VBIAF Sectoral Guide Working Group

In an increasingly interconnected and sophisticated world, and combined with rising expectations for enhanced corporate governance and transparency, the myriad of environmental and societal issues plaguing the world manifest the profound need for corporations and financial institutions to actively manage risks and opportunities related to emerging environmental and social trends. Amongst others, floods, climate change risks, pollution, waste management, water scarcity, deforestation, loss of biodiversity, wealth disparity, lack of access to finance, occupational safety and health deficiencies, poverty and labour abuse are calling for corporations and financial institutions to serve not only an economic, but an environment and social purpose.

The notion that the fiduciary duty of corporations and financial institutions is limited to the maximisation of shareholder value, gives rise to reluctance to integrate environmental, social and corporate governance ("ESG") considerations in decision-making processes. But the tide has shifted as evidence has grown that ESG issues have financial implications, and could ultimately contribute to more stable economies, which is in the interest of all market players.

To financial institutions, it is abundantly clear that ESG challenges could lead to the customers' inability to meet their financial obligations to the financial institutions or depreciation of the customers' collateral. The success of financial institutions and their ability to remain profitable and relevant is intrinsically dependent on the long-term prosperity of the planet and societies which they serve.

Today, we are facing a global health crisis unlike any, with the COVID-19 attacking societies at their core. This unprecedented situation in recent history presents a new set of challenges with far-reaching ramifications for financial institutions. The current COVID-19 pandemic is a painful reminder that financial institutions are exposed to financial risks stemming from potential disruption to the global supply chain and customers' operations. And unless financial institutions behave responsibly and participate in the efforts to alleviate the devastating impact to societies, financial institutions themselves could perish from this major health and economic crisis.

Islamic financial institutions stand in good stead to contribute towards a vibrant economy, which is underpinned by a healthy civil society and a sustainable planet. The inherent principles of fairness and social responsibility which are intrinsically linked to being Shariah compliant, are poised to support financial stability, sustainable ecosystem, efficient use of resources and innovation to create new market opportunities. Islamic financial institutions are able to better manage environmental and social impacts in a way that contributes to the sustainable development of the global society, which resonates with the increase in society's consciousness and thus presents an enormous opportunity for Islamic finance.

Recognising the need to come to the fore, a number of Islamic banks in Malaysia under the auspices of Bank Negara Malaysia ("BNM") are committed to promote the concept of Value-based Intermediation ("VBI"), which aims to deliver the intended outcomes of Shariah through practices, conduct and offerings that generate positive and sustainable impact to the environment, community, and economy, consistent with the shareholders' sustainable returns and long-term interests. VBI promotes a more holistic observation of Shariah by ensuring that Islamic banking offerings and practices not only comply with Shariah requirements but also *achieve the intended outcomes of Shariah. More business opportunities could be created if the current paradigm could be shifted to extend beyond compliance, towards delivering value propositions not only to consumers, but to the wider stakeholders within the society and the economy at large. Together with BNM, these Islamic banks have formed the VBI Community of Practitioners ("COP") to pool their resources and expertise to codify VBI via inter alia the VBI Strategy Paper, Implementation Guide for VBI, VBI Scorecard and VBI Financing and Investment Impact Assessment Framework ("VBIAF") – Guidance Document.*

To support the implementation of the VBIAF, the COP has established the VBIAF Sectoral Guide Working Group to develop sectoral guides on selected sectors and activities. The sectoral guides would facilitate financial institutions to implement an ESG impact-based risk assessment framework, by recommending key impact-based risk factors of the sector or activity which can typically generate significant risks if not well managed, but could present opportunities if the risks are proactively addressed. They also provide examples of measurement metrics across the entire risk impact-based assessment process.

Renewable energy was selected to be in the first cohort of the VBIAF Sectoral Guides due to its strong links with Malaysia's economic development and its ability to reduce the production and consumption of fossil-based fuels. This first edition of the renewable energy guide covers the direct impact of downstream power producers and will be enhanced at subsequent stages to cover additional parts of the renewable energy value chain.

The VBIAF Sectoral Guides provide the parameters which facilitate a financial institution to overlay its credit or investment decisions with an ESG risk score, so that the financial institution is able to derive final outcomes which incorporate the ESG impact of its financing and investment decisions. In addition, the sectoral guides are intended to provide transparency to customers and investors in relation to financial institutions' ESG assessment considerations in arriving at their final financing and investment decisions.

I wish to take the opportunity to express my gratitude to BNM, the COP, the project manager, industry experts and members of the working group for their tireless dedication and cooperation, without which the VBIAF Sectoral Guide for Renewable Energy would not be a reality.

Thank you.

EQHWAN MOKHZANEE
Chief Executive Officer
AmBank Islamic Berhad

A. INTRODUCTION

Objective

1. This document presents further guidance on implementing impact-based assessments of this sector. This document should be read together with the overarching framework described in the VBIAF.

2. This document also serves as complementary guidance to facilitate the classification of economic activities of financing and/or investments as per the classification system outlined in the CCPT issued by BNM.

Approach

3. The guidance provided is developed in reference to applicable policy documents issued by BNM, Malaysian laws and regulations, standards and guidance issued by international/ multi stakeholder organisations and initiatives and publicly available information on best practices adopted by relevant institutions and practitioners.

Applicability

4. This guidance is intended for FIs. Counterparties of the FIs (e.g. customers, investors) may refer to this guidance to obtain a general perspective on areas/ criteria considered in financing and investment assessments. However, final decision making is subject to the policies and procedures of the respective FIs.

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Sector context

5. The energy sector has strong links with a country's economic development. In Malaysia, the energy sector includes oil and gas, coal and coke, electricity, RE and transportation.

6. Despite the importance of the energy sector's contribution towards economic development, there are negative impacts related to energy production and consumption. As a signatory to the 2015 Paris Agreement, Malaysia has committed to reduce its GHG emissions intensity to Gross Domestic Product (GDP) by 45% by 2030 relative to GHG emissions intensity in 2005, a commitment that provides significant financing and investments opportunities[1].

7. Therefore, the Government of Malaysia highlighted in the 11th Malaysia Plan (2016–2020), the need to achieve economic growth and sustainability through cleaner energy sources. Energy sector activities when sustainably approached and managed can contribute to climate change mitigation. Transitioning to a low carbon economy would necessitate increasing efforts in the following :-
   (i) growing low carbon sector such as RE;
   (ii) applying cross-cutting 'EE' criteria in all sectors;
   (iii) decarbonising all economic activities; and
   (iv) promoting carbon sequestration.

   Scaling up RE is a critical strategy not only for climate change mitigation and environmental protection, but also for energy security[2].

8. In 2020, Malaysia announced that it had set a target to achieve 31% RE capacity mix by 2025[3] (including on and off-grid). [4] Meanwhile, ASEAN has set a target of securing 23% of primary energy from modern, renewable sources (including hydropower of all sizes but excluding traditional biomass) by 2025, which will require an estimated investment of USD27 billion annually, a total of USD290 billion by 2025, in RE capacity[5].

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[1] Globally, in order to deliver the optimal energy efficient scenario, the IEA indicates that EE investment levels globally need to increase to USD580 billion by 2025 and thereafter (between 2026 and 2050) further increasing to USD1.2 trillion.

[2] Rapid economic growth, population increase and urbanisation has led to considerable rise in energy demand.

[3] Report on Peninsular Malaysia Generation Development Plan 2020 (2021 – 2039) https://www.st.gov.my/en/contents/files/download/169/Report_on_Peninsular_Malaysia_Generation_Development_Plan_2020_(2021-2039)-FINAL.pdf

[4] As at the end of 2019, RE capacity stood at 2,486 MW (excluding large hydro i.e. any hydro above 100MW) and this constituted 6% of the national installed capacity mix. Including large hydro, RE constituted 23% of the national installed capacity mix.

[5] IRENA Renewable Energy Market Analysis: Southeast Asia, 2018.

Box 1. RE – Benefits and Potential Negative Impacts of RE growth

The growth in RE has enabled our ability to address climate change. It clearly brings substantial benefits, most significantly in helping to mitigate against the most dangerous climate impacts. However, renewable sources such as wind, solar, geothermal, biomass, and hydropower also have environmental and social impacts, some of which are significant depending on the specific technology used, lifecycle stage and the geographic location. Global PV waste streams for example, are estimated to grow from 250,000 tonnes at the end of 2016 to more than five million tonnes by 2050. Nevertheless, within the PV sector, a circular economy is in the cusp of development. PV modules that are at end of life are spawning recycling industry to reduce waste from PV systems.

Benefits of RE

In addition to the environmental benefits via lower carbon emissions, RE also brings socio-economic benefits which include :-

- Health – reduced air pollution since hydro, solar and wind produce little to no air pollution, while bioenergy and geothermal emit much lower air pollutants relative to conventional fuels. Air pollution is a critical issue in developing countries where many still rely on charcoal, wood and coal for heating and cooking.
- Access to energy[6] – standalone and mini-grid RE solutions are now more viable for 80% of those without access to energy in rural areas or small developing island states. Off-grid solutions are viable because they are decentralised. Development activities are implemented locally, hence job creation is also localised.
- Employment – provides significant and increasing number of jobs globally.
- Resilience – less prone to large-scale failure and relatively more resilient to extreme weather events or complex emergencies (can be deployed without complex and time-consuming infrastructure development).
- Self-sufficiency – Malaysia's electricity demand is mainly contributed by coal-fired resources, in which the resources are fully imported from foreign countries. Utilising the available and indigenous resources enables the country to enhance its security of supply whilst safeguarded from fluctuations of fossil-fuels' market price.

Renewables are increasingly the least-cost option for electricity production, a trend that will accelerate over the coming decade.
Source: IRENA

Potential Negative Impacts of RE

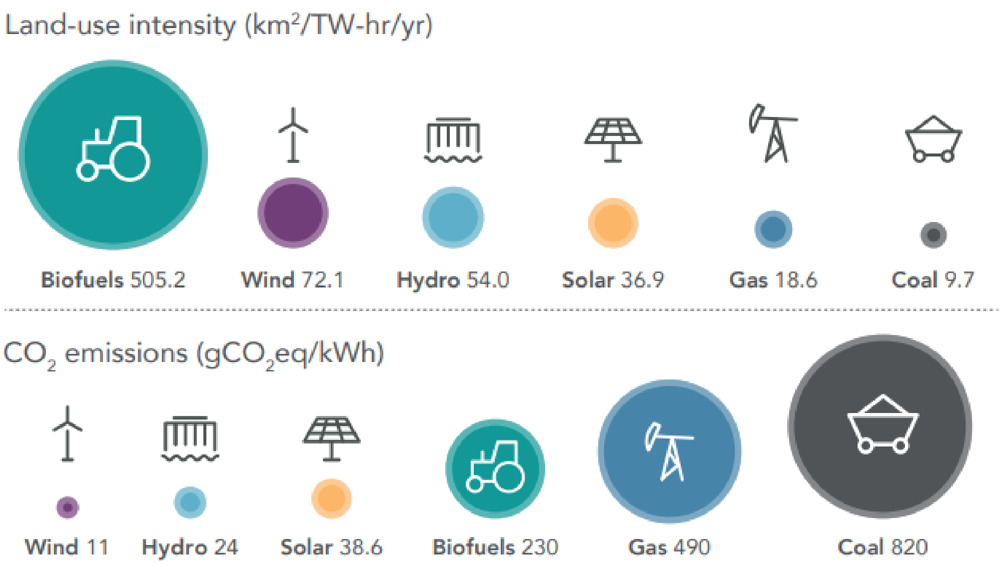
In some cases, RE may have larger land use intensity relative to conventional fuels. Hence, as energy systems move away from carbon, shifting towards renewable sources, demand for land to site renewable power plants will likely increase. If not well sited, sustainably planned and managed, this can exacerbate competition with other land uses such as agriculture and result in further degradation/ fragmentation of forests and biodiversity.

Nonetheless, these can be generally mitigated through the use of already converted land, for example :-

- Wind – compatible with agricultural land use where farmers can lease part of their land for wind turbines.

[6] RE technologies are deployable in a decentralised or modular manner which makes them a particularly suitable energy source for small grids or off-grid solutions.

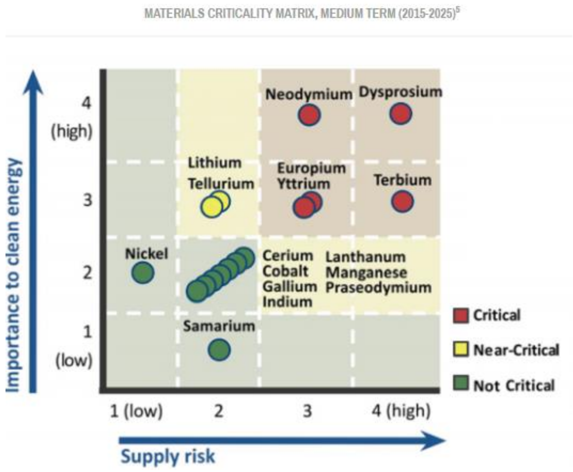
- Solar – can be set up at urban areas such as rooftops, which are largely unused. This has the added benefit of net-metering.
- Other examples of converted lands – pastures, degraded land and reservoirs.



Source: Connected and Flowing: A Renewable Future for Rivers, Climate and People, WWF and The Nature Conservancy

In addition, the increasing use of RE will see increased demand in key minerals and metals. Some mitigating factors include :-

- Reduce critical metal use through substitution and innovative solutions.
- Improve circular design and recycling efforts.
- Improve live span of RE components.



Source: http://css.umich.edu/factsheets/critical-materials-factsheet & working group inputs

B. DEFINITIONS AND SCOPE

Definitions

9. Based on the RE Act 2011, RE means energy generated or produced from indigenous RE resources[7] which include :-
   (i) solar PV;
   (ii) bioenergy – biogas & biomass;
   (iii) small hydro; and
   (iv) geothermal.

Scope

10. The first edition of this guidance will focus on solar PV, bioenergy (biogas and biomass) and hydro (large and small hydro). This edition does not include wind and geothermal.

11. The guidance provided will primarily focus on the direct impact of downstream power producers (e.g. public and private utilities providers), such as :-
    (i) solar PV installations, including both land based and floating developments;
    (ii) processing plants installation for biofuels and biomass; and
    (iii) hydroelectric power plants, including impoundment infrastructure (dam structures), river diversion structures (run-of-river), and pumped storage.

12. Considerations will be given to significant indirect impacts within the RE value chain, that could give rise to both financial and operational risks, such as :-
    (i) responsible sourcing of raw materials and feedstock :-
    - responsible sourcing of cobalt, nickel, lithium and rare earth elements for RE tech components;
    - certified biomass from palm oil, soy and other agricultural sources; and
    - availability and reliability of hydrological resource for hydropower plant and responsible sourcing of materials for dam construction[8].

    (ii) appropriate lifecycle analysis, including waste management processes and decommissioning of the plant, are aligned and/ or certified to recognised international and domestic standards.

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[7] Energy source not depleted by extraction as it is naturally replenished at a rate faster than it is extracted. (ISO/IEC 13273-2, EE and RE sources – Common international terminology – Part 2: RE sources).

[8] Guidance provided by the Hydropower Sustainability Assessment Protocol (HSAP) Topic P-5 under Environmental & Social Impact Assessment and Management. They are specific to primary suppliers in this case, such as quarries supplying construction materials. The HSAP also calls for impact assessment of associated facilities (including road and transmission towers), scoping of cumulative impacts, as well as role and capacity of third parties.

C. COMMERCIAL PROPOSITIONS

Government programmes/ initiatives

13. The Government of Malaysia introduced various initiatives to increase the share of RE in the country's power mix. Table 1 provides an overview of existing RE schemes in Peninsular Malaysia and Sabah, mapping to the schemes applicable for the respective renewable resources. The New Enhanced Dispatching Arrangement (NEDA) is another mechanism available for non-contractual plants, and is open for RE's development.

Table 1. Current RE Schemes in Malaysia

RE Resources	Eligible RE Schemes
Solar PV	NEM
	LSS
	SELCO
Biogas	Feed-in Tariff (FiT)
Biomass	
Small Hydro	
Waste-to-Energy Plant	Bidding exercise under the jurisdiction of KPKT

14. In Sarawak, the state is well endowed with hydropower potential and 70% of the power generation capacity is from large hydropower. Besides large hydropower, other notable technological advanced RE programmes being explored include floating solar PV, green hydrogen, and off-grid rural electrification programme (Sarawak Alternative Rural Electrification Scheme (SARES) that incorporates solar PV and micro hydro systems).

15. The FiT mechanism was introduced in December 2011 to kick start the RE market in Peninsular Malaysia and Sabah under the regulatory framework of RE Act 2011. To finance the FiT mechanism, an RE Fund was introduced through 1.6% additional charges on consumers' electricity bills, whilst the establishment of SEDA was to oversee the implementation and management of the FiT.

16. Currently, FiT allows electricity that is produced from the local biogas, biomass and small hydro to be sold to power utilities at a fixed price and for a specific duration. This mechanism provides a conducive and secured investment environment which allows FIs to provide financing with longer period (16 years and above) by :-
    (i) providing fixed revenue stream for installed system;
    (ii) paying for electricity (kWh) produced – This promotes system owner to install good quality and maintain the system; and
    (iii) encouraging manufacturers and installers to reduce price while enhancing quality with suitable degression rate.

    The prevailing tariff for each of the RE resources under FiT can be referred at SEDA's website or in the abovementioned RE Act 2011.

17. The FiT mechanism is guaranteed via the RE Act 2011 whereby :-
   (i) access to the grid is guaranteed – The distribution licensees (such as TNB and SESB) are legally obliged to accept all electricity generated by RE private producers, subject to safety considerations;
   (ii) clear local approval procedures;
   (iii) competitive FiT fix price to provide attractive ROI and profit;
   (iv) guaranteed payment period of more than 16 years through PPA;
   (v) adequate degression to promote cost reduction to achieve grid parity[9];
   (vi) the FiT projects will be monitored by SEDA for transparency purposes; and
   (vii) RE applicants need to be responsible and ensure that all legal requirements are complied with, including compliance to the requirements set by JKKP and JAS. Failing which, SEDA reserves the absolute rights to revoke their Feed-in Approvals.

18. RE programmes for solar PV are LSS, SELCO and NEM schemes :-
   (i) LSS is a competitive bidding programme to drive down the Levelised Cost of Energy (LCOE) for the development of LSS PV plant. EC is the implementing agency for this scheme.
   (ii) SELCO is implemented by EC, and applies when electricity is being generated for own usage and any excess is not allowed to be exported to the grid. The Government of Malaysia is encouraging individual, commercial and industrial consumers to install solar PV for their own consumption, looking to hedge against the rising cost of electricity.
   (iii) NEM allows excess solar PV generated energy to be exported back to the grid on a "one-on-one" offset basis, which means that every 1kWh exported to the grid will be offset against 1kWh consumed from the grid. NEM is executed by KeTSA, regulated by EC, with SEDA as the implementing agency. The NEM category is divided into 4 categories which are residential, commercial, industrial and agriculture. The NEM scheme is only applicable to Peninsular Malaysia at the moment. Applicants must be registered TNB (Peninsular Malaysia) customers.
   (iv) In January 2021, KeTSA has officially announced the launching of NEM 3.0 in which the mechanisms are categorised into three (3) sectors :-
      a. NEM Rakyat – To encourage participation from the residential sector, and the prevailing "one-on-one" offset is applicable
      b. NEM GoMEn – To encourage participation from government, ministries and agencies' building, and the "one-on-one" offset is applicable
      c. NEM NOVA – Commercial and Industrial sector are subjected under this category. This category will utilise the System Marginal Price (SMP) instead of the "one-on-one" basis. SMP is defined as the energy price of the most expensive thermal generator dispatched to meet demand the half-hour period. Thus, the SMP will differ for every half-

[9] Grid parity occurs when the cost of generating RE is equivalent (or lower) than the cost of generating electricity from conventional fossil fuels (SEDA).

hour period. Pricing based on SMP under this category intends to promote the competitiveness of the industry, and requires more accurate operational planning and strategies by the system owner.

19. There are other incentives available for qualified green companies, announced in the Budget 2020 including :-
    (i) GITA – Investment tax allowance of 100% of qualifying capital expenditure incurred from the date of application received by MIDA until the year 2023 for the purchase of green technology equipment. GITA is applicable for companies that acquire qualifying green technology assets and listed under the MyHIJAU Directory and companies that undertake qualifying green technology projects for business or own consumption. These include RE, EE, Green Building, Green Data Centre and Integrated Waste Management Activity. The allowance can be offset against 70% of statutory income in the year of assessment.
    (ii) GITE for green technology services – Income tax exemption on 100% of statutory income from the year of assessment from date of application received by MIDA until the year 2023 on the use of green technology services which are applicable for qualifying green technology service provider companies (ESCOs) that are listed under the MyHIJAU Directory. Sectors include RE, EE, Green Building, Green Data Centre, Green Township, Certification/Verification Bodies and Electric Vehicles (EV).
    (iii) GITE for solar leasing companies – Companies offering solar leasing services can be eligible for income tax exemption (ITE) of 70% of statutory income from the year of assessment where the application is received by MIDA from 1 January 2020 up to 10 years of assessment.

20. GTFS 3.0 with a fund size of RM2 billion was announced during the tabling of the Budget 2021. The details[10] can be found on the website of MGTC.

21. In Malaysia, typical financing products for RE include term financing, hire purchase and trade facilities to facilitate financing of projects and equipment.

Box 2. Case study for RE financing

Two Malaysian FIs became lead managers/ joint book runners for the RM245m (US$59.5m) Edra Solar Sdn Bhd's Sustainable and Responsible Investment (SRI) sukuk in October 2019.

This is the first sukuk issuance done under the ASEAN Sustainability SRI framework, whereby the issuance proceeds will be used to fund the customer's solar power plant project in Kuala Ketil, Kedah. The Project is deemed as an eligible SRI project falling under the relevant guidelines of the Securities Commission Malaysia, which are projects relating to new or existing RE (such as solar).

[10] The details of GTFS 3.0 was not announced at the time of publication.

As part of Edra Group's corporate social responsibility commitment towards the social and economic development of the communities where the group operates, Edra Solar allocated to the local community 40 acres (more than 15% of the plant) of the buffer zone surrounding the plant for farming of pineapple and other crops. This is the first Malaysian solar power project financing to include a social element.

The agriculture project will be managed by Pertubuhan Peladang Kuala Ketil together with local farmers in terms of capital, risks and rewards. Edra Solar will not be deriving any economic benefit from this agriculture project.

Box 3. RE financing challenge in Malaysia and recommendations to enhance the objectives

Financing is a recurring challenge in the RE sector. RE developers have encountered difficulties in securing financing as FIs consider investments in RE projects risky due to :-

- lack of understanding of RE project lifecycle;
- existing implementation challenges resulting in track record of construction delays and project default for some projects; and
- lack of awareness and understanding of the importance of green economy.

In response, a Malaysian Green Financing Taskforce (MGFT) led by the Securities Commission of Malaysia was set up in 2019 to :-

- resolve operational issues that are hindering the availability of green financing; and
- develop an ecosystem that will support the growth of a viable and sustainable green economy.

The MGFT has proposed a few strategic objectives and recommendations, as shown below, to augment private sector financing of Malaysia's RE sector.

Process change	**Recommendation 1:** Improve Efficiency and Clarity of the Financing Application Process **Recommendation 2:** Enhance Financial Strength of Project Sponsors **Recommendation 3:** Coordinated Government Interface & Targets **Recommendation 4:** Streamlining of Projects to Be Channeled to Private Sector
Products	**Recommendation 5:** Building Supply of Dedicated Green Products **Recommendation 6:** Financial Solutions to Meet Current Financing Gaps
Education, Awareness and Knowledge	**Recommendation 7:** Enhancing Awareness through Branding Programs **Recommendation 8:** Centralized Green Financing Centre of Excellence

Source: MGFT Report (Securities Commission Malaysia)

D. IMPACT-BASED RISK MANAGEMENT

Policy statement

22. FIs should consider setting a clear policy statement/ commitment in support of promoting RE production and/ or consumption. This may include :-
    (i) allocating a specified amount of funds for RE project financing and/ or investment;
    (ii) nurturing counterparties by offering advisory services to identify and adopt RE projects including improvements/ refurbishments[11];
    (iii) agreeing with counterparties on RE targets that are measurable and can be monitored effectively; and/ or
    (iv) incentivising counterparties by offering innovative financial products and services to install/ invest in RE e.g. more competitive terms.

23. FIs need to take a nurturing approach to facilitate compliance with relevant laws, regulations and standards. This requires FIs to obtain commitment from their counterparties, agree on a time-bound action plan and adequately monitor progress as well as agree on rectification/ exit conditions in cases of breaches/ non-compliances.

I. Impact-based risk identification

(a) Key impact assessment

24. FIs should identify and balance trade-offs between the positive[12] (benefits) and negative (risks) impacts related to financing and/ or investing (and any other relevant financial activities) in this sector.

25. Table 2 provides a brief description of the key impact-based risk categories/ themes in RE sector. The impact categories/ themes are classified based on ESG risk aspects and have been adapted from CDC Group plc (The UK's development finance institution) Sector profiles[13]. The identified categories can typically generate significant risks if not well managed but could present significant opportunities to add value if the risk is proactively addressed.

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[11] FIs and counterparties may leverage on free technical assistance provided by Private Finance Advisory Network (PFAN).

[12] As stated in the introduction, some of the positive impact of RE is that it's an important contributor towards reducing carbon emissions and also provide new job opportunities.

[13] CDC Sector profiles draw on internationally recognised standards and guidance, particularly the International Finance Corporation Performance Standards and the World Bank Group Environmental, Health and Safety (EHS) Guidelines. https://toolkit.cdcgroup.com/sector-profiles/power/

Table 2. Key impact-based risk categories/ themes

Categories	Risk transmission
(a) Environment	
Land access, land-use, land-use change and acquisition	• Land use/ land-use change not approved by the respective state government/ country for RE installation deployment. • Delays and additional costs of securing land and access particularly if they involve resettlement of local population and/ or economic displacement of communities. • Acquisition of land without FPIC (perceived "land grabbing"). • Corruption/ bribery in land acquisition process. • Higher operational costs due to inadequate land use planning. • For hydropower, to also consider location of the dam and its reservoir vis-à-vis its surrounding land use. The dam may not be viable in the long term if there are potentials for large inputs of sediments due to the land use e.g. plantations in the area or where there is already water stress.
Biodiversity loss and deforestation	• Adverse EIA. • Biodiversity, habitat and/ or carbon sink (e.g. forests, wetlands, peatlands) loss due to land-use (e.g. clearing for RE installation) and proximity to RE installations. • Deforestation and encroachment into forest reserves. • Adverse interaction with local communities if ecosystem services are damaged or access to use is impaired. • For hydropower, other risk transmission includes connectivity and flow disruptions (including sediment flows) that can cause delta shrinking and sinking, water quality issues from reservoir releases, fisheries ecological disturbance, floods etc.
Climate/ GHG emissions	• Extraction of natural resources such as quartz, silicon carbide, glass, aluminium. • Excessive GHG emissions during manufacturing and material transportation and reservoirs[14]. • Land clearance through open burning and forest fires. • Lower productivity or product loss due to increased weather risks e.g. climate change-induced drought. • Inefficient use of energy throughout the supply chain. • Physical climate risks to RE installation/ operations.
Water	• Destruction of riparian zone. • Inefficient/ excessive use of water in regions with high water source vulnerability.
Pollution prevention and resource use efficiency	• Land degradation from soil compaction, alteration of drainage channels and increased erosion. • Flooding and silt deposits into rivers as a result of soil erosion. • Accidental release of hazardous chemicals, substances, wastewater discharge and/ or acid drainage (from mine

[14] Per the HSAP, projects should be sited in places that avoid exceptional GHG emissions from reservoirs (e.g. arising from decomposition of organic material) and there are also requirements for GHG emission assessments for projects that have a power density below 5W/m^2 of land.

Categories	Risk transmission
	sites) to land or groundwater and leakage to freshwater systems and oceans. • Land clearance (e.g. to prepare for solar PV installation) through open burning resulting in air pollution. • Fines for non-compliance with pollution prevention legal requirements, especially with respect to solid waste and hazardous materials management and disposal. • Inadequate procedures for disposal (disposal/ decommissioning stage) of hazardous materials, leading to land/ water pollution and community health impacts. • River flow and connectivity impacts from dams built in river systems.
(b) Social	
Labour rights and working conditions	• Prosecution or fines for human rights abuses (including forced child and/ or trafficked labour) and poor working/ living conditions (including discriminatory treatment of migrant workers and other indicators of forced labour). • Lower production efficiency arising from deterioration of labour relations and workers' health e.g. labour disputes and exposure to excessive chemical substance. • Higher costs to recruit and train new workers if high turnover and rely on seasonal labour/ part-time employment. • Costs of remediation to address labour issues/ violations.
OSH	• Prosecution or fines for failure to comply with OSH regulations and causing injuries/ fatalities of workers/ contractors. • Loss of production/ business due to increased incidences of injuries/ accidents (e.g. dam safety and dam structural failure). • Additional legal costs and higher payments for protection cover due to higher/ frequent claims.
Human rights and community relations	• Additional costs to address social opposition and criticism over land use conflicts as well as uncertainty in project continuation in the case of hydropower. • Higher compensation claims from surrounding communities exposed to immediate and long-term safety and health risks. • Displacement of communities, involuntary resettlement and violation/ infringement of rights of indigenous/ vulnerable groups without FPIC. • Costs of remediation to address human rights issues.
(c) Governance	
Governance mechanism	• Lack of strategic planning on sustainability including policy statements, clear and tangible action plans and proper reporting and monitoring. • Lack of resources dedicated to sustainability matters. • Lack policy to address corruption and money laundering issue e.g. corruption in land acquisition process

26. FIs need to develop risk assessment framework for each RE sub-sector, which identifies direct project-related risk, including indirect value chain risk and associated mitigation measures.

27. A list of applicable laws and standards regulating this sector is provided in the Appendix.

(b) Customer on-boarding checklist

28. FIs need to develop an appropriate customer on-boarding checklist based on the key impact categories and potential risk transmission channels identified above.

29. The following Table 3 suggests the information required for the initial on-boarding assessment to determine transaction-level risks as described in the in the next section[15] :-

Table 3. Initial on-boarding checklist

Categories	Information required
Land access, land-use, land-use change and acquisition	Land description (e.g. size, type of land, proximity to water source, forest reserve, peat, indigenous people and communities) ◆
	Valid land-use term and planning permission ◆
	EIA and/ or SEIA report ◆
	FPIC* ◆
Biodiversity loss and deforestation	HCV assessment
	HCS assessment
	Land clearance method ◆
	Desktop biodiversity assessment ◆
Climate/ GHG emissions	Climate mitigation and/ or GHG management plan, GHG emissions report
	Efficient energy use
	Climate adaptation strategy
Water	Water management – policy, source of water, usage monitor
	Riparian management[16] – policy, mitigation plan*
Pollution prevention and resource use efficiency	Waste/ effluents management plan (JAS)* ◆
	Permit of purchasing and storage of diesel (KPDNHEP)* ◆
	On-site assessment – waste/ effluent/ chemical storage, handling and disposal
	Air quality measurement and management*
Labour rights and working conditions	Use of migrant and vulnerable workers ◆
	Labour management – policy, formal contracts, training, grievance/ complaints mechanism
	Desktop/ On-site assessment – working condition scanning, living arrangements
	Issues reported and how they were resolved
OSH	OSH management – policy, training, monitoring, audits
	Certification of Fitness for machinery in plant (JKKP) ◆

15 For downstream generation projects especially those that comes under FiT, SEDA will ensure all the requirements are met.

16 https://www.water.gov.my/jps/resources/auto%20download%20images/584651b23652f.pdf

Categories	Information required
	Sufficient protection – coverage, compensation ◆
	On-site assessment – working condition, safety/ protection gears
	Issues reported and how they were resolved
	Emergency response plan
Human rights and community relations	Stakeholder management – policy including FPIC, grievance/complaints mechanism*
	Engagement programmes including awareness, supporting community events etc.*
Governance	Sustainability commitment, strategy and policy including monitoring mechanism, transparency and disclosure.
	Are the RE plants licensed under the Electricity Supply Act 1990?
	Has the company adopted established industry standards and/ or obtained relevant certification? If no, does it have a credible (time-bound) plans to do so and the progress?
	Are there outstanding legal claims relating to the customer's environmental and social performance?
	Desktop research against global tools e.g. WWF Water Risk Filter, RepRisk, Sigwatch, iBAT, TRASE, Carbon Delta tool, SCRIPT, SPOTT, GFW*

** where applicable*

- Initial on-boarding should be conducted at the customer and transaction-levels for new and/ or existing counterparties depending on the FI's implementation approach (refer to scope in VBIAF pp. 3-4).

◆ Indicates the minimum information required for an effective initial on-boarding.

30. FIs should update the above assessment at least annually and/ or when renewing/ reviewing financing facility/ investment (e.g. by requiring the counterparty to provide at least an annual report).

(c) Exclusion list

31. FIs should develop an exclusion list which would serve as a baseline risk appetite. Examples of general activities that should be avoided are provided in Table 6 of VBIAF pp. 30-31. Specific activities that should be avoided in this sector include :-
    (i) plants that convert or degrade HBV/ HCV and HCS forests, primary forests, forest reserves and peatland. Reference check can be done through Malaysia Biodiversity Information System (MyBIS) which lists the protected areas in Malaysia[17];
    (ii) banned and/or harmful practices such as indiscriminate open burning for the purpose of land clearing; and
    (iii) exploitation of people and communities including activities that are against national labour laws and indigenous people's rights.

[17] MyBIS is a one-stop repository database system that provides and facilitates access to information on biodiversity studies and management in Malaysia. The copyright of this system belongs to KeTSA https://www.mybis.gov.my/one/pamaps.php

II. Impact-based risk measurement

(a) Key impact measures/ indicators

32. FIs should develop different impact metrics/ indicators for different counterparties (e.g. corporate/ commercial/ retail customer, based on each RE sub-sector).

33. FIs need to assign appropriate risk score/ level for each of the impact metric/ indicator. As stated in footnote 52 of VBIAF, FIs would need to consider factors such as the likelihood and materiality[18] of the impact-based risks, consideration of stakeholders' interest and national priorities/ targets. The assessment should include, where relevant, an analysis of the severity of the environmental risk, as well as capacity, commitment and track record of the customer in managing such risk. Transactions with higher environmental risk should be subjected to in-depth due diligence, which may include site visits and independent review by environmental risk specialists.

34. Table 4 provides examples of **transaction-level risk metrics and risk score** for each of the categories identified :-

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[18] As suggested in VBIAF, FIs may refer to Bursa Malaysia's "Sustainability Toolkit: Materiality Assessment" and "Sustainability Toolkit: Materiality Matrix" and the Sustainability Accounting Standard Board (SASB)'s Materiality Map.

Table 4. Transaction-level risk metrics and risk score

Categories	Inherent Risk level	Metrics	Mitigation	Risk score/ level[19]
Land access, land-use, land-use change and acquisition				
EIA and/ or ESIA report ◆	High	• Satisfactory report	• Disbursement subject to effective mitigation	Example: Unacceptable/ High – unsatisfactory report Medium – sufficient evidence that effective mitigation measures are in place to address issues identified Low – satisfactory report
FPIC ◆				
Biodiversity loss and deforestation				
HCV and/ or HCS assessment ◆	Unacceptable/High	• Satisfactory report	• Disbursement subject to effective mitigation	Example: Unacceptable/ High – unsatisfactory report Medium – sufficient evidence that effective mitigation measures are in place to address issues identified Low – satisfactory report
Climate/GHG emissions				
GHG emissions	High/Medium	• GHG emissions per tonne reduced (scope 1,2, 3) • % of RE • GHG emissions reduced (compared to conventional energy source, CO_2-eq/MWh)	• Effective GHG management†	Example: Metric for GHG per tonne :- High – Medium – Low –

[19] The risk score/level provided is an example. FIs can use either a numeric score (1-5) or categorisation (High, Medium, Low) according to their respective internal risk methodologies. FIs should determine the appropriate risk score/level based on their respective risk appetites. Examples for some of the risk scores/ levels are intentionally not provided as they will depend on the respective project/ transaction baselines.

Categories	Inherent Risk level	Metrics	Mitigation	Risk score/ level[19]
		• Monetisation of RE certificates, if applicable		(GHG measure differs according to sub-categories)
Efficient energy		• Amount of energy savings per tonne	• Effective energy management†	
Climate adaptation strategy		• (Depends on respective strategy)	• Effective climate adaptation management†	
Water				
Water use ◆	High/Medium	• Amount of water savings per tonne • No. of water source vulnerability assessments implemented • Total water consumed, percentage used from regions with High or Extremely High Baseline Water Stress	• Effective water management†	Example: Metric for water savings per tonne :- High – Medium – Low –
Pollution (water, air, soil etc.)				
Waste/ effluents/ soil degradation ◆	High/Medium	• Improvement in water quality/ soil fertility metrics • Improvement in treatment of waste • Reduction of waste per tonne • Chemical usage • Proportion of waste disposed by the organisation through: 1) reuse 2) recycling, 3) incineration,4) landfill 5) other means	• Effective pollution management†	Example: Metric for chemical usage per ha :- High – Medium – Low –
Labour rights and working conditions				
Use of migrant workers and child labour ◆	High/Medium	• % of migrant workers • % of vulnerable workers • Average salary • Number of legal cases/disputes	• Effective human resource management†	Example: Metric: % of migrant workers :- High – 50-100%
Labour management				

Categories	Inherent Risk level	Metrics	Mitigation	Risk score/ level[19]
				Medium – 31- 49% Low – 0-30%
Occupational safety and health (OSH)				
OSH management ◆	High/Medium	• Number of occupational injuries/ accidents / health issues / fatalities • Number of legal cases/disputes • Satisfactory machinery maintenance reports • Satisfactory training reports	• Effective OSH management†	Example: Metric: % of incident/ worker :- High – high number of incidence and claims (20 per 100 workers) Medium – few number of incidence and claims (10 per 100 workers) Low – rare incidence and claims (1 per 100 workers)
Machinery operation				
Sufficient protection	Medium	• % of employee with protection • Sufficient coverage		Example: Metric: % of employee with SOCSO :- High – 0-50% Medium – 51-99% Low – 100%
Human rights and community relations				
Stakeholder management	High/Medium	• Number of legal cases/disputes • Number of complaints • Number of engagement programmes • Progress reports on complaints handling	• Effective stakeholder management†	Example: Metric: number of legal cases/ disputes :- High – high number of cases and claims (amount in RM) Medium – few number of cases and claims Low – nil cases
Engagement programmes				
Governance				
Corporate governance e.g.	High/Medium	• Number of contract, licenses and permit acquisition	• Strong oversight systems, including	Example:

Categories	Inherent Risk level	Metrics	Mitigation	Risk score/ level[19]
corruption and money laundering		• Process of tariff negotiations • Customer and/ or authorities interfacing	clear and secure whistleblowing procedures • Clear and effective guidance on avoiding	Metric: number of contracts (incl. licenses and permit acquisition) per transaction High – high number of contracts per transaction Medium – few number of contracts per transaction Low – nil number of contract

◆ *Indicates minimum scoring criteria.*

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35. †Effective management is evidenced by amongst others, clear and comprehensive policy and procedures, adequate reporting and monitoring, appropriate grievance/ complaints mechanism and sufficient rectification planning. When making an assessment regarding the effectiveness of such policies/ programmes, FIs should consider independent information obtained either internally or externally such as audit/ surveillance reports, compliance reports, reports/ filings/ checks with regulatory authorities and/or civil societies (if available), and news reports. FIs should, as part of its due diligence process, assess and monitor the counterparty's commitment, capacity and track record in environmental and social risks management.

36. The risk score/ levels provided are for illustrative purposes only. FIs could use either a numeric score (e.g. 1-5) or categorisation (e.g. High, Medium, Low) according to their respective internal risk methodologies. FIs should determine the appropriate risk score/ level based on their respective risk appetites.

37. FIs need to determine a decision making rule based on the aggregate risk score/ level of the impact-based metrics/ indicators above. An example of the description of customer-level risks is provided in Table 8 of VBIAF p.33. The Table 5 below suggests a description of transaction-level risks and decision making rule specific to this sector :-

Table 5. Example of decision making rule.

Unacceptable risk	Transaction involving activities on the exclusion list. This includes existing counterparties that exhibit continuous poor impact performance. No approval should be given.
High risk	Scores "High" for the majority of key impact categories/ themes but has satisfactory mitigation strategy. Approval must be subject to strict compliance conditions/ covenants.
Medium risk	Scores "Medium" or "Low" in the majority and exhibit evidence of effective mitigation strategy. Approval can be subject to additional compliance conditions/ covenants.
Low risk	Scores "Low" for the majority of key impact categories/ themes and exhibit evidence of effective mitigation strategy. Approval can be subject to standard compliance conditions/ covenants.

(b) Certifications

38. As stated in paragraph 56 of VBIAF, FIs may deem a counterparty that is certified with an established certification standard, such as a nationally mandated certification to have sufficiently managed the key impact-categories/ themes. FIs need to ensure that the certifications are current and valid. FIs may assign a Medium/ Low risk score/ level for some or all of the impact-based categories/ themes required to calibrate a minimum scoring criteria (◆).

39. FIs may rely on the risk reports/ assessments provided by the following certifications[20] including :-
   (i) Local operations – JSM
   (ii) Overseas operations – ISCC or RSPO certifications (e.g. ISO/ TC 265 on carbon dioxide capture, transportation, and geological storage formation, ISO/ TC 180 for solar energy and ISO/ TC 238 for solid biofuels).
   (iii) Other relevant schemes – RSB, Rapid Sustainability Assessment Tool[21], Hydropower Sustainability Assessment Protocol, Hydropower Sustainability ESG Gap Analysis tool, Hydropower sustainability guidelines on good international industry practice[22], International Electrotechnical Commission for Solar.

40. However, as further clarified in VBIAF, any reliance on a particular certification standard should only be made if the certification matches FIs' impact-based risk appetite for the particular sector and jurisdiction that the counterparty is operating in. In such instance, FIs may not need to conduct further due diligence on the counterparty's operations, capacity and track record. If the certification standard is inadequate, FIs should review the reports/ assessments including any available audit/ surveillance reports in detail to identify impact-risks that are not adequately addressed by the respective certifications.

41. FIs need to be aware of the differences in the methodology of the various certification schemes and the impact on FIs' impact-risk scoring.

(c) GHG calculator

42. For the purpose of calculating GHG emissions of the activities of the FIs' counterparties, the following methodologies are recommended :-
   (i) GHG methodology by ISCC[23];
   (i) GHG Protocol as recommended by TCFD;
   (ii) IRENA Avoided Emissions Calculator;
   (iii) GHG Accounting for Grid Connected RE Projects by International Financial Institutions[24];
   (iv) Clean Development Mechanism Electricity Baseline for Malaysia by MGTC[25];
   (v) Intergovernmental Panel on Climate Change guidelines 2006; and
   (vi) ISO 14064.

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20 VBIAF Table 11 also provides a list of general certifications e.g. MS ISO 14001: 2015, MS 1722:2011, OHSAS 18001, MS 1900.

21 http://wwf.panda.org/?208671/Rapid-Sustainability-Assessment-Tool-RSAT

22 https://www.hydrosustainability.org/hydropower-sustainability-guidelines

23 https://www.iscc-system.org/wp-content/uploads/2017/02/ISCC_DE_205_GHG-emission-calculation-methodology.pdf

24 https://unfccc.int/sites/default/files/resource/Renewable%20Energy_GHG%20accounting%20approach.pdf

25 https://www.greentechmalaysia.my/wp-content/uploads/2019/12/2017-CDM-Electricity-Baseline-Final-Report-Publication-Version.pdf

43. In addition, the above information may be used by FIs to disclose Scope 3 GHG emissions or financed emissions and the related risks of their counterparties in line with TCFD recommendations.

44. For retail customers, the use of detailed GHG methodology may not be practical. In these cases, FIs should consider a portfolio approach to compute GHG emissions.

(d) Financial risk assessment (TCFD)

45. As stated in paragraph 34 of VBIAF, impact-based risks can also result in financial impact that can impair the FIs' safety and soundness. Hence, FIs need to understand the financial vulnerabilities that may arise in this sector as a result of these impact-based risk factors[26]. Impact-based risks identified above mainly relate to the impact of the counterparties' activities on the environment and society (the effects of which will have impacts on the counterparties). However, TCFD recommendations mainly focus on the impacts of climate-related risks and opportunities on the counterparties (reverse perspective).

46. Table 6 maps examples of physical and transition risks[27] arising from environmental triggers in this activity against established financial risks taxonomy[28] –

Table 6. Example of physical, transition and financial risk

Physical risk	Transition risk	Financial risk
• Acute (event driven) e.g. increased frequency of severe weather events such as cyclones and flooding can result in RE degeneration assets, unplanned closure or asset write off. • Extreme weather events may impact distribution networks. • Chronic long-term climatic conditions (e.g., wind and solar radiation patterns, temperature) can affect renewable and fossil fuel energy production.	• Mandates on, and regulation of, existing products and services. • Substitution of existing products and services with lower emissions options. • Unsuccessful investment in new technologies. • Costs to transition to lower emissions technology. • Insufficient and/ or change in regulatory and policy frameworks to provide certainty for investments and financing.	• Business/ legal risks – increased operational and compliance costs, physical damage to assets disruption in generation capacity, supply chain disruptions etc. • Credit/ market risks – Increasing capital costs due to emergence of new, more efficient technologies, rising insurance costs associated with physical climate risk.

[26] Paragraph 50 of VBIAF states the use of impact-based metrics to improve FI's risk prediction models for stress testing purposes.

[27] Climate-related risks are not limited to physical and transition risks and may include other risks such as liability risk and operational risk. Where applicable, FIs need to also consider the impact of these risks in their assessment.

[28] "Enhancing environmental risk assessment in financial decision-making" (July 2017), G20 Green Finance Study Group.

47. FIs may rely on the assumptions presented in the Malaysia 3rd National Communication and 2nd Biennial Report to the UNFCCC (NC3BUR2) [29] and technical supplement[30] prepared by TCFD in conducting scenario analysis relating to climate-related risks and opportunities. As for other environmental risks, FIs may consider referring to "Exploring Natural Capital Opportunities, Risks and Exposure"[31] as a guide in assessing the financial impacts[32] of natural capital risk on their operations.

III. Impact-based risk management and mitigation

48. FIs need to have appropriate and adequate mitigation measures such as :-
    - (i) Adequate diversifications of different technologies to help reduce weather-related volume risk.
    - (ii) Usage of proven technologies in constructions to ensure reliable recovery plans in case of an outage.
    - (iii) Mandating certain tier of energy suppliers to ensure credibility of power purchase agreements.

49. FIs need to include clear and comprehensive terms and conditions in the contractual agreements with the counterparties (applicable to new or renewal contracts) :-
    - (i) Identify applicable laws/ standards/ certification related to RE and require the counterparties to obtain relevant certifications or comply with relevant regulatory requirements.
    - (ii) Identify, encourage and/ or require specific commitments from counterparties to strive towards adopting local/ international regulatory standards and best practices within a certain timeline in matters such as EE, best management practices relating to sustainable production and supply chain.
    - (iii) Identify event(s) that would constitute impact-based non-compliance/ breach e.g. failure to comply with time bound plan to adopt efficient management of energy, certification withdrawn.
    - (iv) Identify standard representations and warranties to be produced by customers e.g. EIA report.
    - (v) Identify escalation and exit procedures including remedies/ penalties and event of default.
    - (vi) Identify incentives, if applicable e.g. step-down pricing if meet certain impact-based targets.

50. FIs need to ensure that their counterparties have appropriate and adequate protection such as :-

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29 https://unfccc.int/sites/default/files/resource/Malaysia%20NC3%20BUR2_final%20high%20res.pdf
30 "The Use of Scenario Analysis in Disclosure of Climate-Related Risks and Opportunities". TCFD
31 https://www.unepfi.org/wordpress/wp-content/uploads/2018/11/NCFA_Exploring-Natural-Capital-Opportunities-Risks-and-Exposure_Nov-2018.pdf
32 https://impakter.com/nature-risks-are-financial-risks/

(i) Takaful/ Insurance for RE Projects – Provide coverage for companies in the renewable industry to help them in managing risk, defending against lawsuits and protecting assets. These products and services are designed to cover all stages of a project from design to distribution.

(ii) Takaful/ Insurance for RE Property, Equipment and Loss of Use – In order to keep up with the rapid technological change of the RE field, this type of policy provides replacement cost coverage for equipment with more efficient equivalents. Equipment currently in operation, under construction or newly purchased can be added to the policy. Green roofs are examples of what would be covered.

(iii) Property RE Reimbursement – This type of coverage protects those with an alternative-energy system in the case of a power outage.

51. FIs need to establish clear escalation and exit procedures :-

(i) Identify time bound rectification plan(s) in the event of impact-based non-compliance/ breach.

(ii) Identify penalty(ies) e.g. increase/ step-up pricing, temporarily stop availability of revolving/ trade finance facility, no additional facility.

(iii) Identify events of default e.g. continuous breach/ repeated breach, certification withdrawn, and action(s) to be taken such as cancel undisbursed financing amount, recall financing and terminate relationship (negative list).

52. FIs should collaborate with relevant stakeholders to establish appropriate nurturing programmes :-

(i) Customers :-

- Collaborate with relevant government agencies/ local authorities/ NGOs to provide training/ awareness programme and advisory services on RE programme by agencies.
- Conduct regular workshop for FIs' customers to share experience and knowledge with the support of external parties e.g. SEDA.
- Offering green financial products to incentivise customers to improve their sustainability practices e.g. reduced margin based on pre-determined target relating to improvements in RE.

(ii) Community :-

- Collaborate with relevant government agencies/ local authorities/ NGOs to conduct awareness/ education programme on sustainability standards/ conventions.
- General education and promotion of RE to the public through roadshows and social media platforms.

IV. Impact-risk reporting and monitoring

53. FIs should establish appropriate reporting mechanisms to adequately monitor the impact-based performance, based on the impact measures/ indicators of

their counterparties (Table 7). An impact-based risk report may be constructed as follows :-

(i) Objective: Provide comprehensive information on material impact-based risk factors that is critical for effective risk management decision making.

(ii) Minimum components and example(s) :-

- Impact-based target(s)
  - % customer transitioned to RE for energy generation
  - GHG emissions reduction.
- Key impact risk(s) and outlook (positive, stable, negative)
  - Trend of RE production and consumption (improving, unchanged or deteriorating; calculated from baseline period).
- Impact-based metrics at portfolio level
  - % of customers with high, medium, low risk scoring, trend of scoring (improving, unchanged, deteriorating).
- Climate change metrics
  - Internal climate change target(s) – aggregate GHG emissions[33]
  - Climate change classifications[34]
- Compliance
  - Internal audit findings/ site visits/ surveillance audits
  - Exception reporting/breaches e.g. lapsed certification
  - Rectification action plan and progress
  - Penalties/ fines imposed by regulatory bodies e.g. electricity theft
  - Penalties/ cancelled financing.

54. FIs also need to monitor and report on stakeholder feedback (Table 7). A stakeholder feedback report may be constructed as follows :-

(i) Objective: Provide comprehensive information on key capacity building/ engagement initiatives and feedback/ grievances from wider stakeholder that is critical for effective risk management decision making.

(ii) Minimum components :-

- Nature of capacity building for key stakeholders (directly related to sector) e.g. employee, customers, community.
- Nature/ types of feedback/ grievance – positive/ negative, non-compliances/ breaches.
- Summary of action plan e.g. community engagement, additional green-improvement financing.
- Status of action plan e.g. complete, in-progress.
- Impact e.g. improved policies and procedures, improved public sentiment/ branding, reduction in GHG emissions.

[33] FIs should assess its total GHG emissions at portfolio level, and proactively manage those using science-based targets.

[34] Following the classification of economics activities as proposed in the CCPT.

Table 7. Reporting channel and type of report

Stakeholder	Channel	Type of report/ information content	Frequency
Internal			
1. Board/ Risk Management Committee	• Board/ Management meetings	• Impact-based risk • Stakeholder feedback	Quarterly
2. Employees (e.g. customer relationship managers, credit officers)	• Department meetings/ focus groups • Feedback forms/ surveys • Intranet/ Internal communication channels	• Impact-based risk • Stakeholder feedback • Trainings/ up-skilling programmes on relevant sustainability policies, procedures, systems, products and services	Quarterly
External			
3. Regulators	• Meetings • Seminars/ Forums • Annual Report • Others	• Impact-based risk • Stakeholder feedback	Ad-hoc
4. Shareholders/ Investors	• Annual Report • Annual general meeting • Briefings	• Impact-based risk • Stakeholder feedback	Annually
5. Customers	• Distribution channels • Feedback forms/ surveys • Other technologies e.g. social media, call centres • Annual report	• Impact-based risk* • Stakeholder feedback *customer/ transactional level information	Ad-hoc
6. Community/ Local authority	• Community engagement programs • Focus groups • Feedback forms/ surveys • Other technologies e.g. social media, call centres • Annual report	• Impact-based risk • Stakeholder feedback	Ad-hoc

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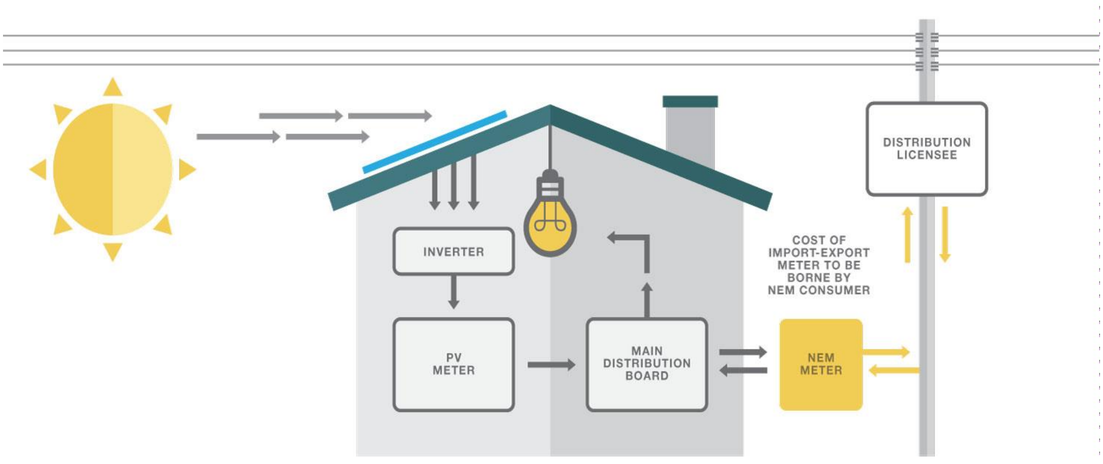
D1. SPECIFIC GUIDANCE FOR SOLAR PV ENERGY

55. Solar energy is harnessed by exploiting the radiation of the sun. PV solar energy converts solar energy into electric energy by using PV cells. This has the highest technical potential in Malaysia for expansion (Diagram 1).

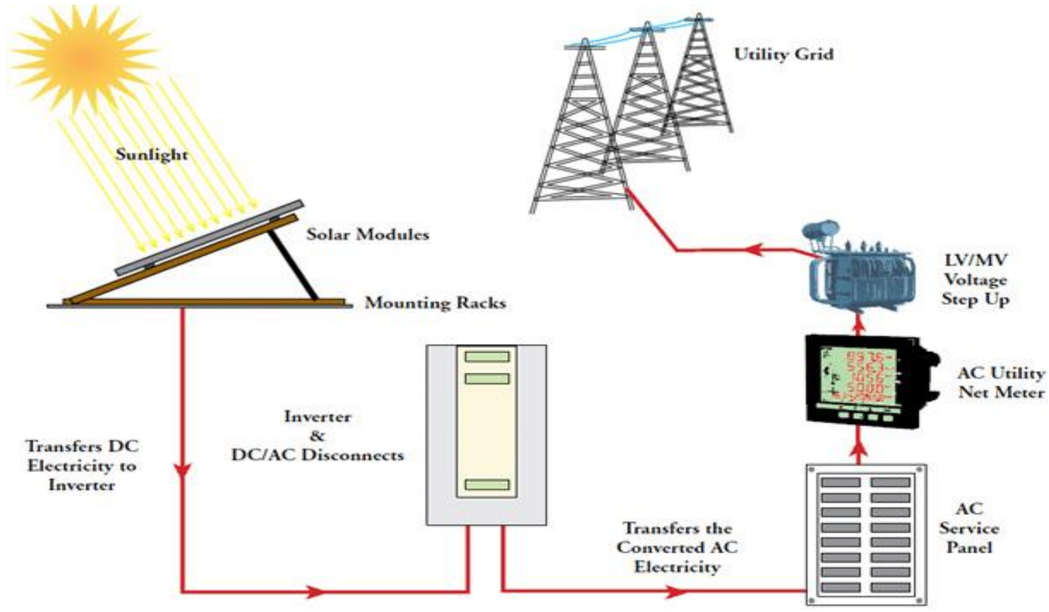
Diagram 1. Solar PV energy generation (grid-connected small distributed scale for self-consumption)



Source: SEDA

56. The types of solar energy applications are large scale (ground mounted and floating/ water bodies as in Diagram 2) and solar rooftops.

Diagram 2. Solar PV energy generation (grid-connected large utility scale for grid export)



Source: Solar Satellite: A Green Energy Infrastructure for Power Challenged Environments, a Case for Solar Cell I-V Behaviour by Okafor, Kennedy & Onwusuru, I & Okoro, I & Onwusuru, C. (2013).

57. The supply chain of solar energy includes :-

(i) Manufacturing and production of the components of solar panels;

(ii) Installation and commissioning of the solar PV modules, inverter, structure and balance of systems by the PV service providers to the consumer;

(iii) Operation of the systems including distribution of the energy to the grid and consumer; and

(iv) Disposal/ decommissioning of the solar panel and plants.

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Impact-based risk management

58. In addition to the impact-based risk management considerations identified in Part D above, FIs should give particular focus on the following aspects specific to solar PV energy by project life cycle :-

Table 8. Impact-risk identification, measurement, risk management and mitigation

Project life cycle	Impact-risk identification	Impact-risk measurement	Impact-risk management and mitigation
Manufacturing and production	• Natural resources – depletion of natural resources used to manufacture solar panels such as quartz, silicon carbide, glass, aluminium. • Climate/ GHG emissions – from mining activities, land-clearing (if applicable), manufacturing, and material transportation. • OSH – worker exposure to hazardous substances such as hydrochloric acid, sulphuric acid, nitric acid, hydrogen fluoride, 1,1,1-trichloroethane, and acetone. • Water – excessive water usage in manufacturing.	**Certification** • FIs can rely on the EIA reports and environmental management plan, where applicable, provided to the JAS. • FIs can also rely on ISO certification for solar energy on climate measurement and data (ISO/TC 180/SC 1 Secretariat) and International Electrotechnical Commission (IEC) [35] for safety and performance of the solar panels.	• FIs should require customers to adopt :- ○ sustainable procurement/ supplier E&S standards (including those relating to mining activities); and ○ standards and regulations for environmentally friendly design such as ISO 14040 series standards, Life Cycle Assessment, address quantitative assessment of the environmental aspects of a product or service in its entire life cycle stages.
Installation and commissioning	• Land access, land-use, land-use change and acquisition – land use conflict. • Biodiversity loss and deforestation – habitat and biodiversity loss from land clearing.		• FIs should ensure customers have the following assessments/ procedures in place :- ○ ESIA regulations. ○ Environmental management plan for construction and operation for solar.

[35] Prepares and publishes international standards for all electrical, electronic and related technologies.

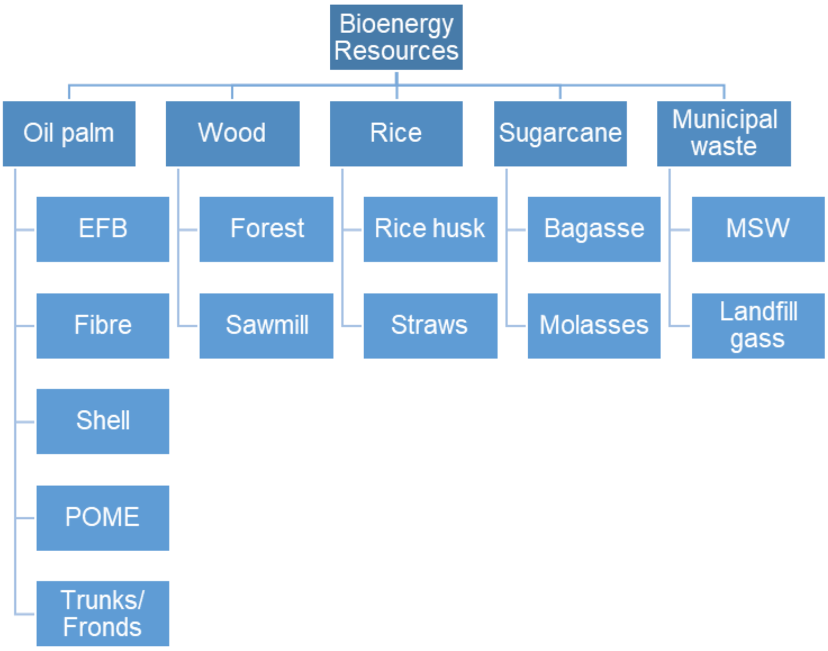
Project life cycle	Impact-risk identification	Impact-risk measurement	Impact-risk management and mitigation
	• Pollution prevention and resource use efficiency – land degradation from soil compaction, alteration of drainage channels and increased erosion, accidental release of hazardous chemicals or substances.		○ Proper siting and design. ○ Avoidance of ecologically and archeologically sensitive areas. ○ FPIC.
Operation	• Climate/ GHG emissions – physical risks to operation due to increased temperature, floods etc.	• Identify areas which are prone to physical risks through assessment[36].	• FIs to recommend customer consider protection required for physical risks exposed.
Disposal/ decommissioning	• Pollution prevention and resource use efficiency – inadequate procedures for disposal of hazardous materials, leading to land/ water pollution and community health impacts.	• Availability of sound waste management process.	• FIs to recommend customer adopt lifecycle management and recycling of PV systems :- ○ Design-for-recycling. ○ Waste management regulations. ○ Implement appropriate lifecycle and waste management processes aligned to recognised international standards, such as the EU Waste Electrical and Electronic Equipment (WEEE) Directive (2012/19), or the EU Batteries and Accumulators Directive (2006/66).

[36] May apply readily available tools or information e.g. NatCatSERVICE by MunichRE or flood-prone areas identified by local authorities.

D2. SPECIFIC GUIDANCE FOR BIOENERGY

59. The RE Act 2011 defines bioenergy into two categories :-
  (i) Biomass – non-fossilised and originating from indigenous plants animals and micro-organisms including but not limited to products biodegradable organic material by-products residues and waste from agriculture industrial and municipal wastes originating from Malaysia (Diagram 3).
  (ii) Biogas – a gas produced by the anaerobic digestion or fermentation of indigenous organic matter under anaerobic conditions including but not limited to manure sewage sludge municipal solid waste and biodegradable waste originating from Malaysia.

Diagram 3. Types of bioenergy resources



EFB = Empty fruit bunch, PKS = Palm kernel shell

Source: Carbon Free Energy: Roadmap for Malaysia, Academy of Science, 2015

60. The following Table 9 provides an overview of the forms of energy sources and their main uses in Malaysia.

Table 9. Forms of energy sources and their main uses in Malaysia[37]

Form	Example	Feedstock	Main uses
Solid fuels	Chips, compressed pellets, briquettes, terrified pellets	PKS, EFB	Heat and power generation
Liquid biofuels	Biodiesel, bioethanol	Lignocellulosic materials (e.g. wood, agricultural or forestry wastes)	Local transportation

[37] Malaysian Biomass Industry Action Plan 2020.

Biogas	Methane, syngas	POME and organic MSW	Palm oil milling operations

61. Essentially, bioenergy involves the transformation of organic matter into a source of energy, whether collected from natural surroundings or specifically grown for the purpose.

62. Some types of bioenergy, for example those produced from agricultural wastes and residues, municipal organic waste, industry residues (e.g. from saw mills and paper mills) and smaller forest harvest residues such as tops and branches can be significantly lower carbon than fossil fuels, provided the feedstock have no significant alternative uses, whether for food, animal feed or bio-based materials. Research also suggests bioenergy can essentially be carbon neutral and even has negative carbon estimates in its lifecycle. The negative estimates is based on assumptions of avoided emissions from residues and wastes in landfill disposals and co-products[38].

63. Although bioenergy has a role to play in decarbonisation, bioenergy from purpose-grown agricultural crops, stem wood (i.e. tree trunks) and coarse forest harvest residues such as stumps is unlikely to be lower carbon than conventional fossil fuels and in many cases will be counterproductive in climate terms. Nevertheless, this should not be construed as an argument in favour of fossil fuels. It is therefore necessary to assess bioenergy throughout its lifecycle to ensure that the bioenergy used is genuinely sustainable from an ecological, social and climate perspective. Furthermore, purpose-grown agricultural crops for bioenergy are not a good use of land as it competes for land for food production and carbon sequestration, thereby exacerbating food security and climate-related issues respectively. Pressure on land resources seems likely to increase significantly given the growing demand for food and fibre by 70-80% by 2050 (predicted by WRI[39]).

64. The main source of bioenergy in Malaysia is biomass wastes from the oil palm industry. However, this is not extensively used as an energy resource for electricity generation due to more competitive alternative uses of palm oil waste. Hence future bioenergy is expected to come from municipal solid waste (MSW) (Diagram 4) and biogas (Diagram 5).

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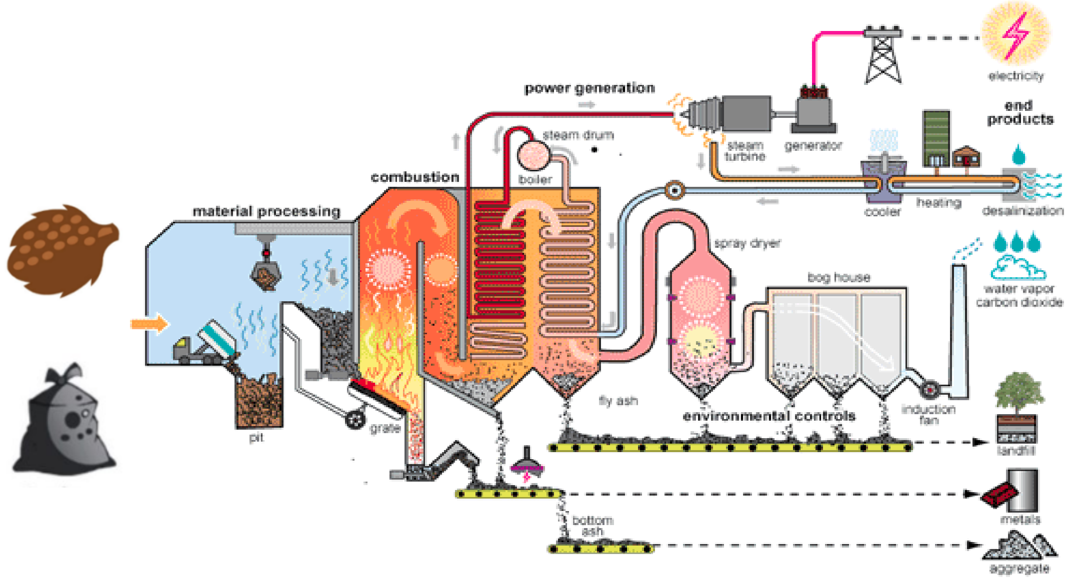
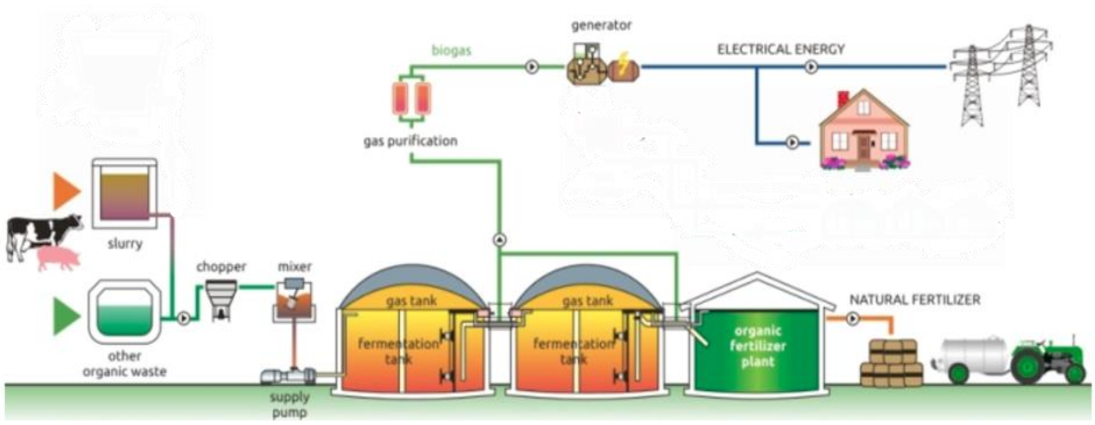
38 https://www.ipcc.ch/site/assets/uploads/2018/03/SRREN_Full_Report-1.pdf
39 http://www.wri.org/publication/avoiding-bioenergy-competition-food-crops-and-land

Diagram 4. Agricultural waste or municipal waste to energy power plants



Source: Adapted from the National Energy Educational Development Programme https://need-media.smugmug.com/Graphics/Waste-to-Energy/i-CHmPL3J

Diagram 5. Biogas from agriculture or animal waste



Source: http://biopowersa.com/

65. Table 10 provides examples on technology use in converting biomass into bioenergy.

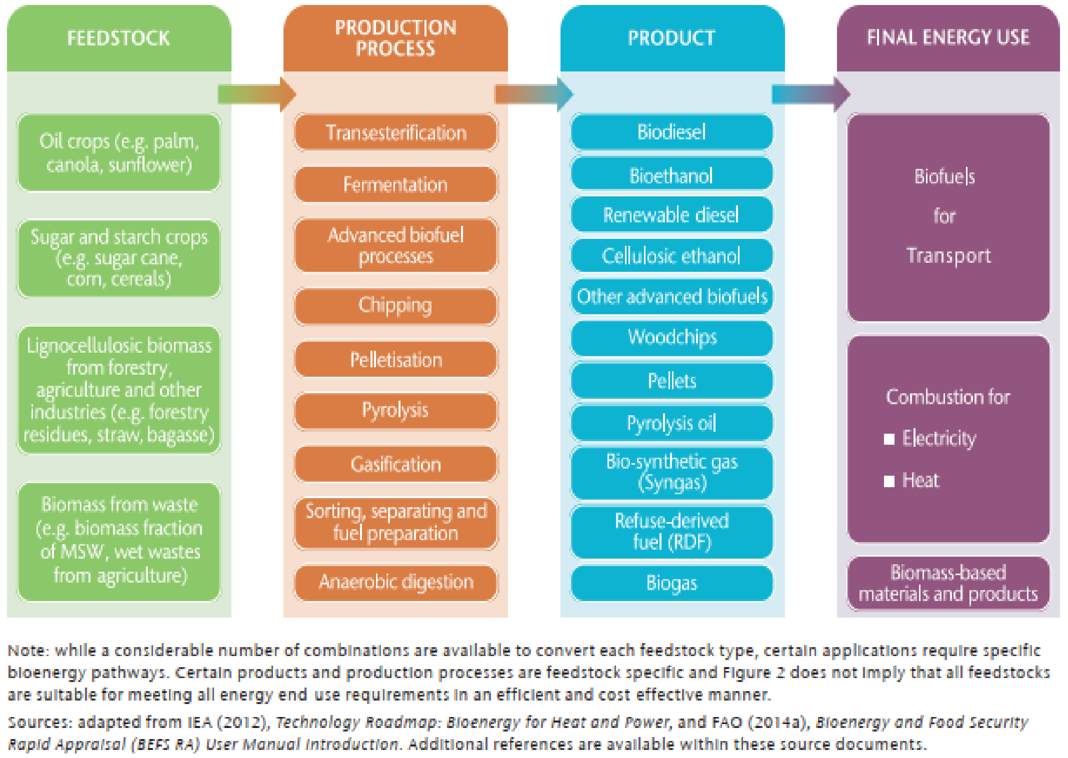
66. The supply chain of bioenergy in general consist of biomass production (mainly from the agriculture waste such as empty food brunches/ rice husks), installation and commissioning of the plant, operations including pre-processing treatment of the fuel supply, energy conversion and the distribution of the energy to the

consumer, and decommissioning of the plant. Possible configurations of bioenergy pathways from biomass to final energy use is provided in Diagram 6.

Table 10. Two main technology conversions of biomass into bioenergy[40]

Thermo-chemical	Bio-chemical
Use of thermal energy to carry out the chemical conversion of biomass to an energy carrier such as producer gas, oils or methanol e.g. liquefaction, combustion, gasification, pyrolysis and/ or carbonisation.	Biological processes commonly through the use of microorganisms or enzymes to mediate the conversion of biomass or organic waste materials to produce ethanol or biogas e.g. anaerobic digestion, ethanol fermentation.

Diagram 6. Possible configurations of bioenergy pathways: from biomass to final energy use



Source: How2Guide for Bioenergy: Roadmap Development and Implementation, IEA and Food and Agriculture Organisation of the United Nations (FAO), 2017.

40 http://www.fao.org/3/T1804E/t1804e06.htm

Impact-based risk management

67. In addition to the impact-based risk management considerations identified in Part D above, FIs should give particular focus on the following aspects specific to bioenergy by project life cycle :-

Table 11. Impact-risk identification, measurement, risk management and mitigation.

Project life cycle	Impact-risk identification	Impact-risk measurement	Impact-risk management and mitigation
Feedstock sourcing (includes collection, transportation and storage)	• Land access, land-use, land-use change and acquisition for the cultivation of biocrops – Land use conflict. • Climate/ GHG emissions* – Feedstock source, cultivation of biocrops or purpose-grown crops for bioenergy [41] will result in higher E&S risks e.g. higher GHG emission and threatens food security[42]. • Biodiversity loss and deforestation – Habitat, biodiversity and carbon sink loss from land use change e.g. land clearing. • Pollution prevention and resource use efficiency – Land degradation from soil compaction, alteration of drainage channels, increased erosion, and leachate from biomass stockpiles.	• Assess traceability of biomass to ensure sustainability and availability of feedstock. FIs need to ensure that wastes and residues from agriculture and forestry used for bioenergy are sustainably produced and managed, and will not have negative impacts on food security nor the feed market. • Assess that the feedstock crop does not displace local food crop land. • Stored biomass should be measured and monitored as a sudden increase could lead to self-ignition (potential risk of fire). • Availability of Social Impact Report. • Availability of a food Impact Assessment if operating in a region of food insecurity.	• FIs should require customers to adopt– ○ Mandatory and/ or voluntary sustainability standards / certification schemes of feedstock / biomass :- - MSPO - RSPO - Roundtable on Sustainable Biofuels - Roundtable on Sustainable Biomaterials - Global Bioenergy Partnerships - Forest Stewardship Council (FSC) - International Sustainability & Carbon Certification (ISCC) - Green Gold Label - Sustainable Biomass Program - ISO 13065:2015 Sustainability criteria for bioenergy ○ sustainable procurement/ supplier E&S standards.

41 In Malaysia, to be eligible for FiT mechanism, the source needs to come from biowaste.
42 Conflicts with land which could be used for food production or carbon sequestering.

Project life cycle	Impact-risk identification	Impact-risk measurement	Impact-risk management and mitigation
	• Water – Degradation of water availability e.g. groundwater depletion.		
Installation and commissioning	• Pollution prevention and resource use efficiency – Release of hazardous chemicals or substances, wastewater discharge and leakage, generation of ash and other hazardous and non-hazardous wastes.		• FIs should ensure customers have the following assessments/ procedures in place :- ○ ESIA ○ Environmental management plan for construction and operation. ○ Proper siting and design. ○ Avoidance of ecologically and archeologically sensitive areas. ○ FPIC.
Operation (include processing feedstock and conversion into bioenergy or energy carrier)	• Climate/ GHG emissions* – Physical risks to operation due to increased temperature, floods etc. • Water. • Pollution prevention and resource use efficiency.	• Identify areas which are prone to physical risks through assessment[43].	• FIs to consider protection required for physical risks exposed.
Disposal/ decommissioning	• Pollution prevention and resource use efficiency – inadequate procedures for disposal of hazardous materials, leading to land/ water pollution and community health impacts (e.g. stress corrosion cracking of ethanol pipelines and storage tanks). • Climate/ GHG emissions*.	• Demonstrate that biomass used complies with certification standard for waste and residues and does not result in GHG emissions.	• FIs to consider protection required for physical risks exposed.

[43] May apply readily available tools or information e.g. NatCatSERVICE by MunichRE or flood-prone areas identified by local authorities.

*For GHG emissions, a life-cycle assessment should be adopted to assess the comparative GHG impacts of bioenergy relative to a reference energy system, e.g. fossil fuels (GHG emission savings in CO_{2e} per kWh).

Box 4. Sustainability criteria for biofuels

Many countries have put in place mandatory sustainability criteria for biofuels. In EU countries for instance, in order to be considered sustainable, biofuels must achieve GHG savings of at least 35% in comparison to fossil fuels (increasing to 50% in 2017 and, for new installations, to 60% in 2018). Furthermore, in order to qualify as sustainable, biofuels cannot be made from raw materials obtained (including through imports) from land with high biodiversity value and high carbon stock, such as wetlands, forests and highly biodiverse grasslands.

Source: How2Guide for Bioenergy: Roadmap Development and Implementation, IEA and Food and Agriculture Organisation of the United Nations (FAO), 2017.

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D3. SPECIFIC GUIDANCE FOR HYDRO ENERGY

68. Hydro energy is harnessed by the conversion of kinetic energy gained from naturally flowing or falling water. In Peninsular Malaysia, hydropower is used as peaking power plants and for reserve margin, whereas Sarawak's large hydropower serves as baseload power. These strategies will continue in future energy mixes.

69. Each hydropower plant is site-specific, but plants can generally be classified according to size or installed capacity, head availability, operation regime, and purpose of plant structures. A widely accepted classification[44] :-
    (i) Micro P[45] < 0.1 MW;
    (ii) Small 0.1 MW < P < 10 MW (some countries go up to 30-35 MW);
    (iii) Medium 10 MW < P < 100 MW; and
    (iv) Large P > 100 MW.

70. The supply chain of hydropower in general consists of pre-installation of the plant including dam construction (for small hydro (Diagram 7), dam is not constructed but rather the weir or barrier to channel the water flow), installation and commissioning of the plant, transmission and operation of the plant including energy generation and the distribution of the energy to the consumer, and decommissioning of the plant.

71. For large hydro (Diagram 8) or the conventional big scale hydropower plants commonly consist of four major components :-
    (i) Dam – Raises the water level of the river to create falling water, controls the flow of water and creates water reservoir that serves as stored energy. For small hydro, weir or low head dam is built instead whereby a barrier across the width of a river that alters the flow characteristics of water and usually results in a change in the height of the river level. There are many designs of weir, but commonly water flows freely over the top of the weir crest before cascading down to a lower level;
    (ii) Turbine – The force of falling water pushing against turbine blades causes the turbine to spin and this yields mechanical energy;
    (iii) Generator – Connected to the turbine by shafts and possibly gears so that when the turbine spins it causes the generator to spin as well. This converts the mechanical energy from the turbine into electrical energy; and
    (iv) Transmission lines – Conducts electricity from the hydropower plant to end-users.

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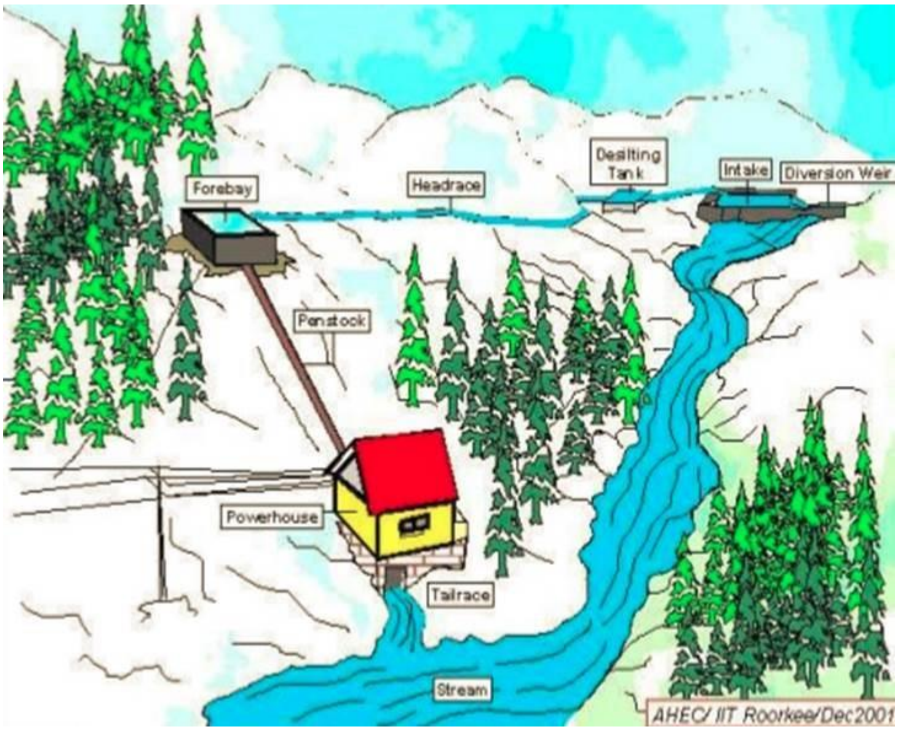
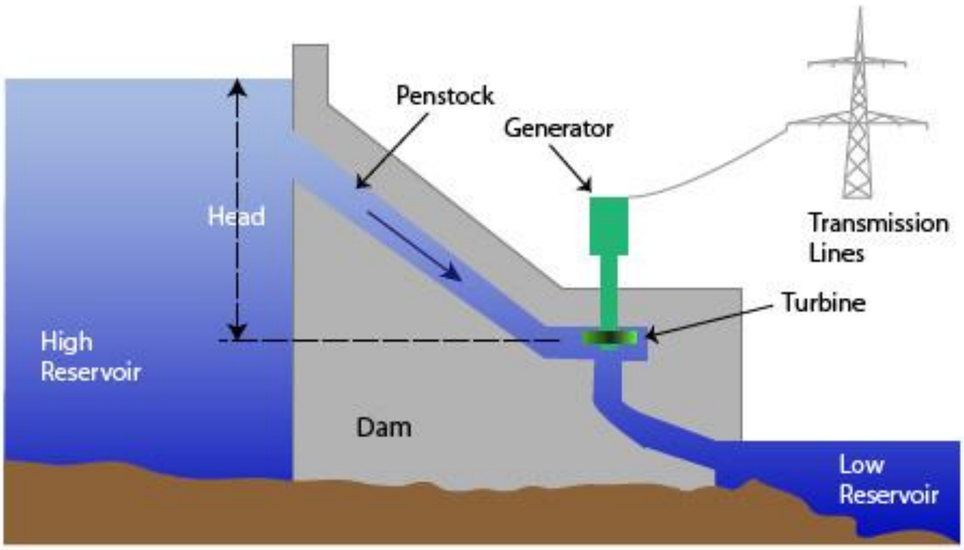
44 Hydroelectric Power: A guide for developers and investors, IFC.
45 Power produced.

Diagram 7. Small hydropower plant



Source: Design of hydro-power plant for energy generation for a mid-size farm with insufficient water distribution networks by Al Khudhiri, Nasr & Dol, Sharul Sham & Khan, Mohammad. (2018).

Diagram 8. Large hydropower plant



Source: [*http://www.greenrhinoenergy.com/renewable/hydro.php*](http://www.greenrhinoenergy.com/renewable/hydro.php)

Box 5. Guiding principles for sustainable hydropower

1. Proposals for new hydropower plants must conform to the strategic priorities and policy principles of the World Commission on Dams (WCD)*.
2. Governments and international agencies must prioritise investment to service the two billion people globally that are without access to electricity. More investment in small-scale, decentralised RE solutions is needed.
3. Clean Development Mechanism (CDM) and Joint Implementation (JI) provision of the Kyoto Protocol hydropower projects should meet Gold Standard criteria.
4. Some of the remaining unregulated rivers in areas of HCV should be designated by governments as "no-go" areas for hydropower schemes.
5. Siting decisions for new hydropower plants need to consider impacts in the whole river basin and opt for sites of minimum E&S impact.
6. Efficient hydropower sites that minimise the area flooded per unit of energy produced should be given preference.
7. The capacity of existing hydropower plants should be upgraded wherever possible, so as to minimise the need for new capacity.
8. Comprehensive environmental mitigation measures (such as environmental flow regimes, habitat restoration and protection and fish ladders) need to be included in all planned and existing hydropower plants[46].
9. Small hydropower plants can play an important role as a RE source, especially for supplying rural areas in developing countries. However, they must include strict environmental mitigation measures and the cumulative impacts of a large number of small hydro plants must be considered.
10. Project developers must include all stakeholders in decision-making and ensure fair and sensitive resettlement procedures in accordance with WCD principles.

Source: Hydropower in a Changing World, WWF's Dams Initiative[47]

Hydropower Sustainability Assessment Protocol (HSAP)
There is increasing preference given for projects that refer/ apply/ use the HSAP[48]. The HSAP is governed by a multi-stakeholder governance process which includes environmental NGOs (WWF, The Nature Conservancy), social NGOs (Oxfam, Transparency International), development banks (The World Bank), governments (China, Zambia, Germany, Iceland, Norway), and the hydropower sector.

Impact-based risk management

72. For all hydropower plant projects, especially large hydropower, FIs need to ensure that the respective counterparties have conducted proper impact assessments and that this information is submitted as part of the financing requirements and includes public consultation inputs. In terms of large hydropower financing, these could be from new and existing infrastructures whereby the risks, measurements and management strategies may differ. The development of large hydropower should apply principles which support :-

[46] The general mitigation hierarchy include avoidance, minimisation, mitigation, compensation and enhancement measures.
[47] http://d2ouvy59p0dg6k.cloudfront.net/downloads/hydropowerfacts.pdf
[48] The HSAP was developed through 30 months of cross-sector engagement between 2007 and 2010, and a review of International Hydropower Association (IHA)'s previous sustainability tools, the World Commission on Dams Recommendations, the Equator Principles, the World Bank Safe Guard Policies and the IFC Performance Standards.

(i) Comprehensive view in development planning.
(ii) Comprehensive impact assessments.
(iii) Transparent and inclusive decision making.
(iv) Fair and equitable processes to address social impacts.
(v) Adherence to international best practices.

73. A proper EIA, SEIA, SEA or cumulative impact assessments should be done to determine all site and project related impacts. It is important to note that hydropower project impacts are site-specific.

74. The following paragraphs details the impact-risk considerations throughout the project life cycle for large hydropower.

Project live cycle – Design and planning

75. Feasibility studies are usually conducted for large hydropower where they assess options selected from a few project sites. This is one of the most critical stage since a large part of what would be implemented following approvals will likely be in accordance to assumptions, risks and mitigations used in the feasibility assessment scope. Some specific risks that should be included are :-
(i) Site selection option that does not include adequate considerations for E&S impacts and its costs for avoiding or mitigating the impacts will potentially result in insufficient financial viability when project is implemented and externalities have to be paid for. Assess whether the costs provided in feasibility studies have included the potential costs of addressing E&S costs in the site and option selected.
(ii) Adequate assessment of energy demand and uptake. Unwarranted excess of energy that cannot be sold will affect the financial viability and ability of project to service loans, not to mention the unnecessary E&S impacts it has caused.
(iii) The project fit into the overall energy direction and policy, demonstrated need and strategic fit.
(iv) Inadequate assessment of GHG emission or fit of project into the RE targets for the country. Large hydropower also emits GHG from its reservoirs, on top of the conversion or loss of forests. The GHG comes from degradation of vegetation in the reservoirs and these include methane, which is 20 to 30 times more potent than carbon dioxide in terms of its global warming potential.

76. During the design stage, it is important to conduct a climate risk assessment since the effects of climate change will affect the performance of hydropower plants (e.g. increased variability of precipitation, extended periods and increased severity of droughts, more intense and frequent heavy rainfall may place tremendous stress on dams).

77. Options that have been considered for siting, design and technology including the need for a new large hydropower plant (vs. upgrading existing ones) as compared to other RE such as solar.

78. Detailed understanding of the environmental conditions within the catchment is required to guide the general project layout and preliminary design, including the identification of appropriate mitigation measures (e.g. downstream flows, connectivity, future changes in climatic patterns).

79. To avoid impacts to areas with high biodiversity values (such as critical habitats, IUCN Protected Area Management Categories, UNESCO Natural World Heritage sites, Key Biodiversity Areas, HCV areas identified using internationally recognised standards, other areas based on systematic conservation techniques carried out by governmental bodies and other organisations), legally protected areas, areas of high social value (such as culturally significant), as well as avoiding or minimising physical or economic displacement of population, displacement of economic activities (such as agricultural lands) and public health and safety risk, among others.

80. FIs should recommend their counterparties to use the Early Stage Assessment Tool under HSAP. The assessment report would provide critical information to guide FIs; decision making with regards to risks and how well these have been addressed.

Project live cycle – Pre-installation: Investigations, planning and designs would take place, including assessment of potential contracts

81. EIA/ ESIA should be comprehensive and account for cumulative impacts, particularly where there are already existing hydropower projects within the same river (the project is a cascade) or within the basin (project could be on a tributary that may affect the main river). A basin perspective should be adopted.

82. Downstream impacts should be included in the impact assessments and provide a clear understanding of the extent of impacts downstream (EIAs usually only focus on a specific radius e.g. 10 km radius of the project site). Large hydropower placed in a river disrupts flows and all the functions and services that are supported by the flows. Dams hold back sediments when it is in operation. Sediments are important to maintain the integrity of downstream delta areas, and to keep the balance of the river energy. Lack of sediments can cause rapid erosion of the delta which can increase the risks of flood or the severity of floods. It also creates ‘sediment hungry’ waters immediately downstream of the dam, which result in more erosion to the river banks and river beds to balance back the equilibrium. This means structural integrity of rivers could be compromised along with all the associated assets already present there.

83. ESIA reports that are done should be encouraged to have been made publicly available or have gone through a public consultation and the inputs provided by the public consultation included in the report. There are hidden risks of potential public opposition that the FIs unfamiliar with the area may be exposed to and the public consultation process will provide some mitigation to this risk.

84. The mitigation provided for in the impact assessments should demonstrate clear compliance to the mitigation hierarchy of avoidance, minimisation, mitigation, compensation and enhancement measures. Design of the dam proposed should also account for the mitigation needs especially in providing for downstream environmental flows. This cannot be built in post project if structures necessary for release of downstream flows to sustain environmental and other needs are not factored into the design.

Project live cycle – Installation and commissioning: Site preparation, construction, wildlife rescues, turbine installations, impoundment, resettlement (if applicable) implementation of mitigation measures

85. Project should adopt a lifecycle management approach – including sourcing of materials to construct dam.

86. This stage typically involves the excavation of large quantities of soil and rock, and sometimes the drilling and blasting of tunnels and channels (causing pollution to air, water and soil wastes and wastewater discharge, construction debris).

87. It also involves river flow diversion upstream from dams to enable construction to take place (the river to be impounded will be closed off with a coffer dam upstream of the construction site and the flows diverted back downstream of the construction site). This is where water related issues usually starts and would affect downstream users.

88. Where impoundment is needed, it involves maximising flows into the reservoir and minimising flows that are directed away from the reservoir. The river diversion established to enable construction in the earlier phase will be closed off. This will result in a period of potential water stress in the downstream parts of rivers especially if measures and quantity requirements are not put in place to ensure sufficient water for downstream users, including the ecosystem's health.

89. It also involves wildlife and plant rescues where there will be inundation of natural habitats.

90. It sometimes involves a large migrant work force when local expertise is not available.

91. FPIC should be implemented where there are affected communities, especially where resettlement is involved. The roles of respective parties should be clear at this point – who is responsible for which part of the process (sometimes the roles are shared between the project proponent and the government) as this will create risks to planned financial resources and project delays if the process is not well defined and implemented.

Project live cycle – Operation and transmission: Operation of the dam to meet energy demands, emergency response plans

92. Turbines would likely be already installed and tested and the dam would have filled up to its operating level. Ancillary infrastructures such as access roads and transmission towers are also in place.

93. The dam would operate according to an operating curve with regards to projected inflows and energy demand. The dam should have sufficient storage and projections to contain/release flood flows during intensive rain fall season and plans for meeting environmental flow requirements to sustain the river health downstream, including during low flow periods/ dry season.

94. There are risks of no energy uptake and the dam not operating to its optimum designed capacity if power purchasers are not ready or there are no buyers. There are also external risks from the dam catchment if land use is not properly managed to minimise the input of sediments into the reservoirs. The life span of the reservoir, the turbines and the dam itself could be significantly reduced from this risk, resulting in the hydropower either having to increasingly dredge their reservoir or in their ability to generate the required energy.

95. Periodic monitoring of compliance, mitigation and management of environmental and social impacts are important at this stage.

96. Table 12 provides the key E&S risks and tools for hydro energy.

Table 12. Key E&S risks and tools

E&S risks	Tools
• Biodiversity, natural resources, ecosystem services, aquatic ecology - Altering the natural flows of river has implications for downstream riparian and aquatic species and impair/block connectivity and habitat for wildlife. • Hydrology, water flows, geomorphology, erosion and sedimentation - Impoundment causing accumulation and trapping of sediments at dam, temperature and oxygen level changes in the water, stranding of aquatic life and micro-organisms.	• HSAP by International Hydropower Association (2018) • Hydropower Sustainability Guidelines for Good Industry Practice (2018). (https://www.hydropower.org/publications/hydropower-sustainability-guidelines) • IFC's Good Practice Note: Environmental, Health and Safety Approaches for Hydropower Projects (2018) • Hydropower Sustainability ESG Gap Analysis Tool (HESG)

E&S risks	Tools
• Climate change/ GHG emissions - Construction of dam, decomposition of live vegetation at dams that have flooded areas, decomposition of organic material in reservoirs. • Water stress - Downstream discharges impairing water quality, reservoir affecting water temperature and oxygen levels. • OSH - Dam safety for large dams is a major concern and design has to account for site risks e.g. stability of grounds, seismic risks, other social issues due to the presence of migrant workers in interior areas. • Human rights and community relations - Land and water conflicts, resettlement, community safety.	(https://www.hydrosustainability.org/esg-tool) • The HESG checklist document is available here for reference: (https://static1.squarespace.com/static/5c1978d3ee1759dc44fbd8ba/t/5dbc33f692746d54e966cd2e/1572615168151/HESG+Document.pdf)

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97. In addition to the impact-based risk considerations identified above, further aspects specific to hydro energy by project life cycle are provided as following :-

Table 13. Impact-risk identification, measurement, risk management and mitigation

Project life cycle	Impact-risk identification	Impact-risk measurement	Impact-risk management and mitigation
Design and planning, pre-installation	• Biodiversity loss and deforestation – Extent of land clearing or new access roads that will alter habitat, forestation or biodiversity. • Human rights and community relations – Public acceptance. • Governance – Clear and stability of regulatory policy development regarding water source (including river diversions), adequacy of field-site, geology, hydrology and/ or feasibility study.	• FIs to ensure study or certifications are done based on data that is authentic, official, reliable and reasonably verifiable source(s) and undertaken by competent and reliable technical experts. • FIs may rely on EIA report submitted to JAS. JAS requires EIAs for dams and hydro-electric power schemes with either or both of the following– ○ Dams over 15 metres high and ancillary structures covering a total area in excess of 40 hectares. ○ Reservoirs with a surface area in excess of 400 hectares. • Availability of EIA/ SEIA/ SEA.	• Regular and timely stakeholders' interactions. • Support for effective implementation of one-window policy which could reduce administrative delays.
Installation and commissioning	• Land access, land-use, land-use change and acquisition – cumulative impact of land access to the surrounding habitat including impact from proximity of grid connection. • OSH from farther in-land logistics such as river upstream.	• Impact on critical path time (project management). • Review of terms under PPA and procurement contracts.	• Provisions of PPA and procurement contracts to ensure costs and time overruns are recoverable if not mitigated. • Regular review system to monitor project timeline and costing. • Comprehensive equipment supply contract with extended and extensive warranty beyond commissioning.

Project life cycle	Impact-risk identification	Impact-risk measurement	Impact-risk management and mitigation
	• Governance – Project management from planning, implementation and (periodical) reviews, time and cost-overruns may have prolonged environmental impact.		
Operation and transmission.	• Operating environment due to silt at bottom of dam leading to turbine damage and aquatic habitat alteration. • Climate/ GHG emissions - impact assessment on natural calamity or geological surprises like floods, earthquakes or landslides. • Governance – Maintenance and operations of plant, transformers and substations.	• Effective operational and maintenance contract.	• Investment in administrative resources to tackle non-technical issues (e.g. closed circuit monitors). • Annual or periodical preventative maintenance. • Indemnity against possible losses via insurance under natural calamity risk insurance policy. • Terms of the PPA adequately protected or reasonable force majeure clause. • Develop disaster management plan. • Absent or minimal punitive costs for events impacted by force majeure clauses.
Disposal and decommissioning	• Pollution prevention and resource use efficiency – Sediments and silts removal plan with minimal environmental disruptions, decommissioning may also be for reasons of aquatic environment disruptions (e.g. restoring salmon habitat) or endangered aquatic ecosystems.	• Decommissioning planning with recreational and/ or environmental considerations (e.g. fish ladders). • Methods of removal e.g. notch and release (time factor) or rapid release approach with minimal hazardous impact.	• Smaller dams or plants more easy to be decommissioned. • Cost of dam/ power plant decommissioning is shared by multiple stakeholders including owners, federal and state governments. • Sectional removal of dam/ power plant and restoration of rivers. • Environmental rehabilitation programme. • Natural resources and gradual decommissioning to manage sediments and the downstream effects.

E. APPENDICES

1. Technical glossary

Term	Definition
Bioenergy pathway	The process that starts with the selection of a particular biomass source and, through the application of a conversion process, culminates in the generation of bioenergy in a form suitable to satisfy the energy demand profile of the end-use sector (industry, transport, buildings, and others).
Biofuels	Liquid fuels derived from biomass including ethanol (a liquid produced from fermenting any biomass type high in carbohydrates) and biodiesel (a diesel-equivalent processed fuel made from both vegetable oil and animal fats).
Biogas	A mixture of methane and carbon dioxide used as fuel and produced by bacterial degradation of organic matter or through gasification of biomass.
Carbon Capture and Storage (CCS)	A process consisting of separation of CO_2 from industrial and energy-related sources, transport to a storage location, and long-term isolation from the atmosphere.
Carbon sequestration	A process by which carbon is removed or absorbed (by living organisms, including trees, soil micro-organisms, and crops) from the atmosphere, and stored in a carbon sink. Natural carbon sinks include forests, peat, plants, and soil. Because of the amounts of carbon that are stored in soils, small changes in soil carbon content can have major impacts on carbon dioxide levels in the atmosphere.
Prosumager	A “prosumer” who has made additional investments in distributed storage, usually in the form of batteries.
Prosumer	A producer and consumer of energy.
Small hydro	ICOLD (International Commission on Large Dams) or according to electricity generation capacity (note: by other definitions, small hydro is typically 1-10 MW)

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2. List of applicable laws and regulations

(i) Renewable energy (http://www.seda.gov.my/policies/rules-and-regulations/)

- Renewable Energy Act 2011
- Renewable Energy (Feed-in Approval and Feed-in Tariff Rate) Rules 2011
- Renewable Energy (Feed-in Approval and Feed-in Tariff Rate) (Amendment) Rules 2013
- Renewable Energy (Feed-in Approval and Feed-in Tariff Rate) (Amendment) (No.2) Rules 2013
- Renewable Energy (Feed-in Approval and Feed-in Tariff Rate) (Amendment) Rules 2020
- Renewable Energy (Technical and Operational Requirements) Rules 2011
- Renewable Energy (Technical and Operational Requirements) Rules 2014
- Renewable Energy (Technical and Operational Requirements) Rules 2011 – Incorporating Latest Amendment
- Renewable Energy (REPPA) Rules 2011
- Renewable Energy (Criteria for Renewable Resources) Regulations 2011
- Renewable Energy (Criteria for Renewable Resources) (Amendment) Regulations 2013
- Renewable Energy (Allocation from Electricity Tariffs) Order 2011
- Renewable Energy (Allocation from Electricity Tariffs) Order 2013
- Renewable Energy (Recovery of Moneys by Distribution Licensee) Rules 2011
- Renewable Energy (Recovery of Moneys by Distribution Licensee) (Amendment) Rules 2014
- Renewable Energy (Administrative Fees) Rules 2011
- Appointment of Date of Coming into Operation Rules 2011
- Guidelines for Solar Photovoltaic Installation on Net Energy Metering (NEM) Scheme & Schedule 1 (Second Amendment 2019)
- Guidelines on Large Scale Solar Photovoltaic Plant for Connection to Electricity Networks [Electricity Supply Act (Amendment) 2015 (Act A1501)]
- Guidelines On Large Scale Solar Power Plants For Connection to the Transmission and Distribution Electricity Networks
- Malaysian Biofuel Industry Act 2007

(ii) Environmental matters

- Environmental Quality Act 1974

F. ESSENTIAL READINGS

1. Energy Malaysia, Volume 18 (2019), www.st.gov.my/web/download/listing/112
2. Energy Malaysia, Volume 12 (2017), www.st.gov.my/web/download/listing/112
3. Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution, International Finance Corporation Environmental, Health and Safety Guidelines, www.ifc.org/ehsguidelines
4. GRI 302: Energy 2016, Global Reporting Initiative, www.globalreporting.org
5. Hands-on Energy Adaptation Toolkit (HEAT), Energy Sector Management Assistance Program (2010), www.esmap.org
6. How2Guide for Bioenergy: Roadmap Development and Implementation, IEA and Food and Agriculture Organisation of the United Nations (FAO), 2017. http://www.fao.org/3/a-i6683e.pdf
7. Hydropower related updates, https://www.hydropower.org/resources/status-report
8. Hydropower Sustainability Assessment Protocol, https://www.hydropower.org/goodpractice
9. International Rivers, http://www.internationalrivers.org
10. National Survey Report of PV Applications in Malaysia (2018), http://www.iea-pvps.org/index.php?id=93&eID=dam_frontend_push&docID=4874
11. Malaysian Biomass Industry Action Plan 2020
12. Renewable Energy Market Analysis, SouthEast Asia, IRENA 2018
13. SEDA's Annual Report 2018, http://www.seda.gov.my/download/seda-annual-report/

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