

# Framework of systematic sustainability assessment strategy (FSSAS) for hydroelectric power industry in Malaysia

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**Abstract.** Hydroelectric power is an alternative power resource in Malaysia and always associated with negative impact on environmental, social and economy of the surrounding site. The dispute over environmental, societal and economic issues can be minimised if compliance to sustainability development requirement is included in the project as part of the project premises during planning phase. This paper suggests a framework targeted for decision-makers in charge of implementing the projects to produce hydropower the sustainable way in Malaysian context which can mitigate the risks in social, environment and economy. The framework is strategic in nature and based on project management methodology with objective to provide a 'common language' by having a project value as measureable for stakeholders to state their mutual agreement of what a sustainable hydropower project in the context of Malaysia and in line with the United Nations (UN) 17 Sustainable Development Goals (SDGs). The paper discusses how the proposed systematic sustainability assessment strategy (FSSAS) framework support the call for Malaysia to promote meaningful public participation in ensuring land and natural resource decisions and to address citizens' interests which is the core idea of Environmental Democracy Index established in 2014. The paper argues that, even though it is at present impossible to define precision status of sustainability development with respect to the nature of the multi stakeholders and the lack of systematic assessment the proposed FSSAS framework can be a valuable tool because it tracks the project value as a quantitative deliverable to determine the status of the journey in sustainable development towards accomplishing the SDG under a consensus in hydropower industry of any scale over time.

## 1. Introduction

"Then I say the Earth belongs to each generation during its course, fully and in its right no generation can contract debts greater than may be paid during the course of its existence"

*Thomas Jefferson, 1789*

Based on the report from World Commissions on Dams in 2000 (WCD) on this blue planet, less than 2.5% of our water is fresh, less than 33% of fresh water is fluid, less than 1.7% of fluid water runs in streams and even with the scarcity the streams are being stopped in damming projects. Half our world's rivers are damned at unprecedented rates of one per hour and at unprecedented scales of over 45000 dams more than four story high [1]. The construction of



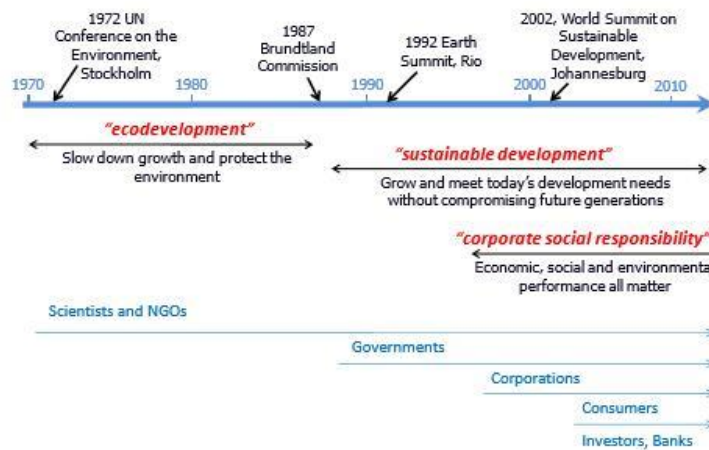
large dams is one of the most hotly contested issues in Sustainable Development (SD) as it has frequently disrupted the lives of affected populations : people lose their homes and their livelihoods deteriorate significantly [2]. Building hydropower and dams never failed to be the center of the debate of a blueprint for a sustainable future hence provoking challenging reactions around the practitioners of the sustainability principles. Of the US\$1.1 trillion the world is predicted to spend on energy infrastructure between 2005 and 2030, US1.9 trillion may be expected to go to hydropower [3]. Supporters talk up the social and economic benefits of irrigation, electricity, flood control and water supply; while opponents highlight their negative impacts, such as cost overruns and debt burden, the displacement and impoverishment of human settlement patterns, the destruction of important ecosystems and fishery resources, and the inequitable distribution of costs and benefits [4].

Despite of the controversial issues on SD over a hydropower project , it is still beyond other potential sources of electricity and has significant potential to support progress towards the SDGs. It is reported hydropower is the largest source of renewable energy in the electricity sector, contributing 16% of worldwide electricity supply as of the end of 2008 [5]. It is the only renewable energy technology that is commercially viable on a large scale in Malaysia [ong,masjuki,2010]. Malaysia as a country that depend on oil and gas for half of the century has realized the importance of adapting renewable energy in the energy mix and has continuously reviewed its energy policy to ensure sustainable energy supply and security. Its share in the generation mix is expected to increase from 5% in 2008 to 35% in 2030 for Peninsular Malaysia [6]. The implementation of the hydropower projects is line with the Government's plan to reduce dependency on fossil fuel sources by exploiting the indigenous or domestic hydropower and renewable energy [7]. Futhermore the implementation of the hydropower projects will reduce the impact of tariff hike as it is not dependent on the fluctuation global market price of fossil fuel and depletion fossil fuel resources. Its capability in peaking demand is another good point of hydropower making it a good choice as a source in renewable energy [7]

Sustainability is a major challenge facing the world . The term “sustainable development” came from the 1987 Brundtland Commission, which define it as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" [8]. Government, businesses and civil society together with the United Nations have started to mobilize efforts to achieve the Sustainable Development Agenda by 2030. The agenda calls for universal and inclusive action by all countries to improve the lives of people everywhere [9]. In 2015, countries adopted the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs). On 1 January 2016, the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development officially came into force. These goals universally apply to all and demand countries to mobilize efforts to end all forms of poverty fight inequalities and tackle climate change and ensuring no one is left behind in the process.

The SDGs, also known as Global Goals are built on the success of the Millennium Development Goals (MDGs) and aim to end all forms of poverty. The Global Goals are unique in the sense that they call for actions by all countries to promote prosperity while protecting the planet without any legal binding. However governments are expected to take ownership and establish national frameworks for the achievement of the 17 Goals. Implementations and success rely fully on countries' own sustainable development policies, plans and programs and will be led by countries. Thus, contributions are expected from all stakeholders: governments, civil society, the private sector, and others, to realize the new agenda. The 2030 Agenda for sustainable development also recognised a global partnership to revitalise efforts and to support national efforts. Most importantly, multi-stake partnerships have been recognized as a significant component of strategies that seek to mobilize all stakeholders around the new agenda and this is the prime motivation for this study: to create a framework for SD-directed strategy in the context of Malaysia hydropower industry [10]

The 2030 Agenda has 17 goals and 169 targets. It is a plan of action for people, planet and prosperity which is also known as the Triple Bottom Line (TBL) principles [11]. The MDGs which is the predecessor of SDGs, captured some valuable lesson learned mainly focusing on the ‘missing global targets’ and the issue of ignorance on how community-led development actually functions. These remarks are the basis for some critics to predict the coming collapse of the SDGs [12]. The other aspects that may be complicating the efforts to achieve the goals is the understanding of sustainability and sustainable development itself which is evolutionary as illustrated in Figure 1 [13]



**Figure 1.** Evolution of understanding sustainability and sustainable development (based on “Sustainable Hydropower – Issues and Approaches

In Malaysia, the shift in the Corporate Social Responsibility (CSR)-oriented thinking in sustainability is reflected in the launching of new Sustainability Framework in 2015 by Bursa Malaysia Securities Berhad (Bursa Malaysia) [14]. The framework aims at enhancing sustainability practices and moving focus from reporting on CSR activities to incorporating sustainability i.e. how listed issuers manage material economic, environmental and social risks and opportunities into the corporate strategies. In the context of Bursa Malaysia, companies in Malaysia are required to look at sustainability from an investment perspective and it shall be reported in a comprehensive manner to the stakeholders. The fact that the global sustainable investment market grew to US\$21.4 trillion (RM93 trillion) from US\$13.3 trillion (61 per cent increase) outpacing the growth of total professionally managed assets shows that the sustainability culture in a company carries innovative and strategic values to the investment strategies [15]. Such statistics highlight the need for companies to adapt to the SDGs as part of the strategic tool in their business processes.

In 2015 the World Resources Institute (WRI) and partners launched the Environmental Democracy Index (EDI) a publicly available online platform to track countries’ progress in enacting national laws to promote transparency, accountability and citizen engagement in environmental decision making [16]. The index evaluates environmental democracy in 70 countries, including 75 legal and 24 practice indicators based on recognized international standards. It is a powerful lever for the world to establish a common index in understanding the state of environmental democracy for countries around the world which is essential to strengthen laws and public participation around environmental issues. In essence it promotes government to make environmental information available to public thus becoming more transparent and allowing ordinary citizens to be a meaningful part of the environmental decision-making process and advocate more rights [17]. In 2015 based on the legal index scores i.e. scores based on strength of laws enacted to protect environmental democracy, Malaysia

scored the 69<sup>th</sup> placement out of 70 countries [18]. In the context of hydropower industry in Malaysia this signify the urgent need of an operational system for stakeholders to be engaged in and informed of with regards to environmental-related decisions made in critical projects like hydropower.

In the power sector the main challenge is to ensure the security and reliability of energy supply and the diversification of the various energy sources. From the perspective of Sustainable Development (SD) like other power generation projects, hydropower has its challenges to keep the three pillars of sustainability ‘in harmony’ with regards to the Triple Bottom Line principles . Identification of the three pillars with regards to the challenges in Malaysian hydropower context is shown below in Table 1.

**Table 1.** Challenges in hydropower projects with regards to the three sustainability pillars (based on “overview of hydropower in Malaysia as renewable energy: a review of water-energy security challenges” , Tenaga Nasional Berhad, 2016)

Pillars of sustainability	Challenges
Society	Continuous pressure from other stakeholders to share the natural water resource for water supply and irrigation as results of climate change
Environment	Operational conditions for hydropower generation is potentially required to be reviewed as an impact from climate change Hydropower dam and reservoirs will play an important role in managing extreme flood and draughts
Economy	Advanced engineering and international safety standards particularly for dam construction are continuously being implemented creating further engineering challenges; Continuously loss of storage due to sedimentation especially during extreme events creates operational and sustainability challenges

Major global conferences, think-tanks and processes have been in train for decades around this theme of sustainability, and countries and states are increasingly creating departments and legislation which have sustainability as part of their mandate . For decision makers especially municipalities , it is important for them to be able to participate in hydropower development process and to be able to communicate effectively the impacts to the local communities, NGOs and energy companies [19]. This team of stakeholders is presumably multidisciplinary in nature and shall be involved in sustainability assessment in certain degree and at a certain point of the project phase and often needed to give a consensus over the results given from various assessment tools. They face countless choice of environment and sustainability tools and topped with the fact that some results are open textured and subjected to interpretation based on context making it difficult to decide ‘wisely’ as far as sustainability principles is concerned [20].

For this study, a ‘sustainable hydropower’ is considered to have three critical components as shown in Table 2 . This study aims to answer the following questions:

- How can there be a ‘common language’ of what is a sustainable hydropower among the decision makers
- What is the mechanism for increasing the public participation and stakeholder engagement in a hydropower project
- How can the decision makers or the stakeholders of a hydropower project work collaboratively in assessing sustainability performance to allow it to be meaningful and operationalized

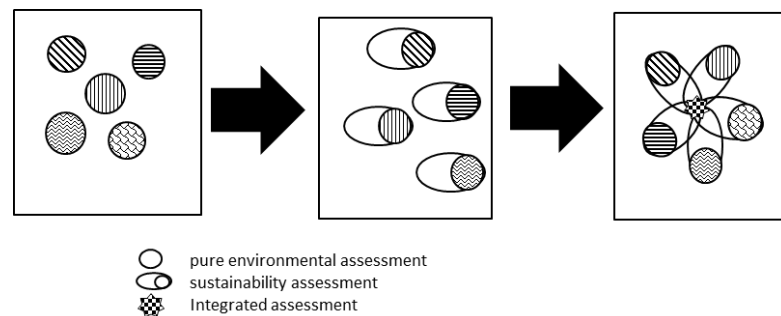
The objective of this study is to propose a framework of systematic sustainability assessment (FSSA) based on the ‘triple bottom line’ (TBL) concept and green project management (GPM) methodology. For the purpose of the discussion in this paper, the TBL can be considered as an

interpretation of sustainability that places equal importance on environmental, social and economic considerations in decision-making [21]. The three elements of the suggested framework identified within the attribute of a sustainable hydropower is also shown in Table 2

**Table 2.** Critical components of a ‘sustainable hydropower’ (based on “Sustainable Hydropower – Issues and Approaches”)

FSSA element	Critical components
Control Plan	The long-term <i>viability</i> of a hydropower project;
Project value	The contribution of the <i>project</i> to sustainable development
Sustainability assessment	The <i>integrated</i> consideration of the different sustainability dimensions (social, environmental, financial/economic, technical, governance)

An important concept of sustainability assessment is that it is a decision making tool. It is also important to note that sustainability is a difficult concept to define in a way that is meaningful and sufficiently practical to allow it to be operationalized. Therefore for the discussion in this study, the evolution of the sustainability thinking is illustrated in Figure 2. The ‘integrated assessment’ is the essence of the project value suggested in this study.

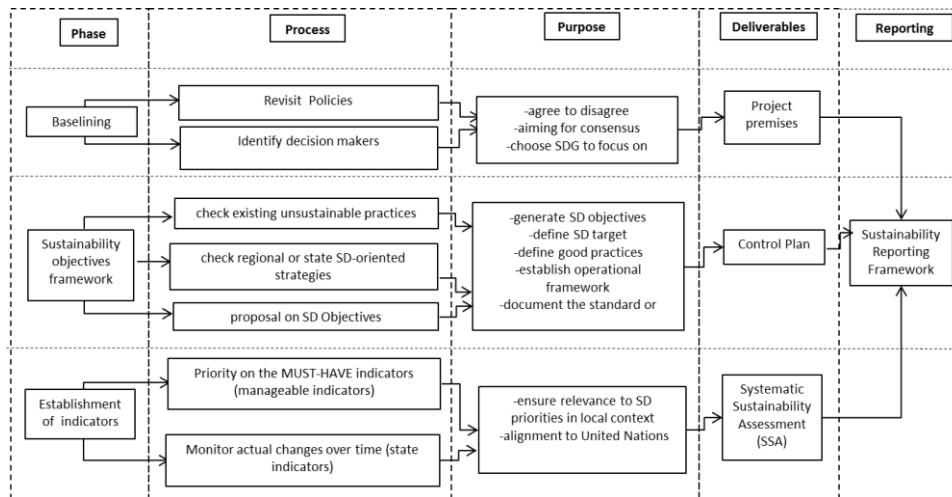


**Figure2.** Evolution of sustainability thinking in FSSA

From a general perspective sustainability can be described as a concept of ‘love’, ‘hope’ and ‘freedom’ and as such tend to remain ‘fuzzy’ until applied in a specific context. Therefore in order for the sustainability assessment (SA) processes to be effective and act as an instrument for change, it must be applied within a structured framework [22]. In this framework, SA follow the generic definition from Hacking and Guthrie (2008) which is simply “a process that directs decision-making towards sustainability” [23]. Thus, the value obtained from the integrated assessment is regarded as the project value which act as a bridge for the stakeholders to communicate between each other in a ‘common language’ of sustainability in achieving a consensus. This approach is hoped to serve as a platform for driving initiatives towards strategies in balancing the negative impacts to social, economy and environment in Malaysian hydropower projects and support the holistic water-food-energy security nexus [24].

## 2. Methodology

The development framework of proposed approach is as depicted in Figure 3.



**Figure 3.** General framework for systematic sustainability assessment strategy (FSSAS)

### 2.1. Base-lining phase

This is the initial phase which is the foundation of the entire framework. Since the spirit of the framework is to enable a consensus to be given to the established indicators therefore members of the stakeholder's team or the decision makers must be identified at the commencement of the project. Policies and guidelines from all chosen agencies are to be revisited and understood well in order to define the scope of the project and the objectives [25]. At this phase it is very important for the team to choose which SDGs to be 'the-must-haves' so that they are given high priority with respect to the business objectives of the company and the policies of the municipalities. The outcome of this phase is a document with premises of the SDGs that will be worked on, the relevant policies that apply and the selected members on board. It is also recommended for the document to be made as a strategic tool in the business process of the company involved in the perspective of sustainability reporting

### 2.2. Sustainability objectives framework

This is the phase of which the team derives the SD objectives based on the chosen SDGs. Any existing unsustainable practice may be eliminated or improved to a better one in this phase. SD-oriented strategies from municipalities or the company should be wisely checked across the newly formulated SD objectives to ensure realistic SD targets.

The key point of this phase is to produce an operational framework for the targets to be realised and achieved. The operations will involve various organisations, government agencies and municipalities hopefully with participation from sustainability practitioners, NGOs and the local community. The outcome will be documented as a 'control plan' consists of a flow, defined tasks in various operations and defined owners. The document can be made available to public and act as 'controlled document' within the framework.

### 2.3. Establishment of indicators

This framework will embrace the spirit of project deliverables and integrated assessment will be carried out in integrated manner and mathematically modelled from the classic environmental tool results (Figure 2). The idea is to use the integrated assessment as an element of record to inform the policy and decision and at the same time the results from the individual environmental tool will remain and regarded as the intrinsic value of the disciplinary research.

In fulfilling this purpose, integrated assessment supplements the disciplinary research but does not replace it [26]. In this manner, the main objective of the framework which is to provide a measurable value that can be monitored over the progress in the journey towards accomplishing the SDG goals under a consensus i.e. project value is exclusively introduced. A special assessment method tool called Systematic Sustainability Assessment (SSA) will be proposed to obtain this value and presumably the value will enable quantitative reporting to be published in active participation mode by the public and the stakeholders from the project level up to municipalities with transparency to the global audience i.e. United Nations [27].

## Conclusion

This new framework has the objective to answer the call for sustainability development journey for hydropower companies in the context of Malaysia. The three phases of FSSA are not only to address the numerous guidelines and concepts which can be referred to but somehow pretty confusing in this era of sustainability in accomplishing the journey but also to determine the status of the journey towards accomplishing them which is the topmost essential lesson learnt in SDGs. The need to have established indicators are inevitable in order to provide a starting point or initial state for measuring the progress in the SDG journey and to enable action items to be executed for continuous improvement in reaching the goals.[28] Of course, with no doubt, a systematic calculating tool must be established primarily to provide an assessment value for it to be relevant for measuring the progress and act as a control hence it must be reliable as indicators throughout the entire SDG policy cycle. This is due to the fact that indicators will help proving the key in sustainable development reports and assessments of progress for being accountable at local, national and global levels. Indicators at these different levels, moreover, must be commonly understood and reported if the results are to be aligned in useful and informative ways [29]

The framework suggested is strategic in nature and embrace the sustainability pillars in SDGs functioning within the means of project management methodology and adopting the quality management system originated in manufacturing sector [30]. The major constraint in this study is foreseen to occur in the first phase which is getting the consensus from the multi stakeholders who naturally come from different jurisdiction and authorities. Therefore, a further study is recommended to investigate the level of knowledge in sustainability development (SD) among the sustainability actors or in this context the stakeholders involved in Malaysia hydropower project. Educating the knowledge in SD hence promoting awareness in sustainability-oriented thinking among the public and the industries is essentially required to support the decisive manner in the base-lining phase of the proposed FSSAS framework [31]

The existence of the different types of assessment tools from multi-disciplinary research background i.e. pure environmental tools resulting from the three sustainability pillars seriously demand the SD-directedness thinking from the stakeholders in holding on to the idea that integrated assessment results or the project value in this study is as important as the intrinsic research results from the respective environment assessment towards reaching the mantra of SDG i.e. “to count the same things, in the same ways, to accurately measure the progress in the journey towards accomplishing the SDG goals under a consensus”. Even though it is at present impossible to define precision status of sustainability development with respect to the nature of the multi stakeholders and the lack of systematic assessment in Malaysia hydropower industry, the FSSAS framework can be a valuable tool because it tracks the project value as a quantitative deliverable to determine the status of the journey in SD towards accomplishing the SDG under a consensus of any scale over time. It is hoped in this era of sustainability the FSSAS may support the call for Malaysia to promote meaningful public participation in ensuring land and natural resource decisions and to address citizens’ interests which is the core idea of Environmental Democracy Index established in 2014 [32].

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