Professional Practice:

Integrated assessment on flood risks and building Indigenous community resilience

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Organisation: B.E.A.CC.H. (Biodiversity •Environment •Agroecology •Climate Change •Habitats) is the environment cluster of the CSO Platform for Reform, a coalition of about 60 civil society organizations focusing on institutional reforms for a better Malaysia. B.E.A.CC.H**.** advocates for a human rights-based, sustainable and an ecologically sound environment in Malaysia.

INTRODUCTION

It is undeniable that flooding is the most frequent, severe climate change threat and the costliest natural disaster that affects human lives and the environment globally. An estimated 1.81 billion people are already facing flood risks (World Bank, 2022), accounting for almost 25% of the world population. 89% of those affected live in low and middle-income countries. In addition, 780 million flood-exposed people live on less than $5.50 a day while 170 million affected live in extreme poverty of less than $1.90 a day (World Bank, 2022). This means 4 out of 10 people susceptible to flood risk live in poverty. Due to their socio-economic conditions, these communities are less resilient to the exacerbating impacts of climate change, further aggravating existing vulnerabilities and inequalities (IPCC 2022). Inextricably, undermining state development initiatives intended for poverty reduction and sustainable development in these regions (Djalante, 2019). Hence, the deployment of integrated impact assessment in tackling a complex scenario seems compelling.

BACKGROUND OF STUDY

Baram River, is the second longest river in Sarawak, East Malaysia in Borneo. As part of the state's socio-economic growth plans for rural development, the Baram Growth Area was demarcated as part of its RM1.5 billion highland development projects covering an area of 18,463 square km. In 2022, the Highland Development Agency (HDA) announced investments in 50 infrastructure projects which include three completed road projects, 17 projects under construction, nine projects under detailed design stage and a total of 21 projects, including 19 water supply projects that are expected to be tendered out soon (New Sarawak Tribune, 05 Sept 2022). The five-year (2022 to 2026) socio-economic development plan is intended to expedite the economic growth potentials of Upper Baram and highland region. The main communities residing in remote highlands, Upper Baram and Lower Baram River are the *Orang Ulu* (Upriver People), who collectively represent the Kayan, Kenyah, Kelabit, Kiput, Penan, Punan and Saban indigenous communities; with a population of about 180,000.

Motivation of study

The motivation of this study is rooted in two realities. To begin with, flood-related calamities in Malaysia have escalated by 134% over the past two decades. Despite the predictions and flooding patterns, heightened eco-system vulnerabilities due to parallel land clearance for multi-development projects, is expected to magnify flooding impacts. To date, there is limited integrated impact assessment research insights on flooding on Baram riverine. Secondly, as a collaborative response to an invocation on the escalating flooding phenomenon by affected indigenous communities to B.E.A.CC.H, an environmental cluster of civil society organizations platform focused on climate governance and institutional reform. Thus, further asserting the shifting role of civil societies and NGOs (Pandey 2015) in the provision of expertise, information, and negotiation for implementation of climate change policies.

Purpose of Study

The insights from the pilot study are aimed as a case for reference for riverine conservation and for onward (i) design of an integrated impact assessment framework for adoption into socio-economic development projects around riverine region and (ii) the development and advocacy of sustainable flood mitigation and adaption strategies for indigenous communities inhabiting in these regions.

Significance of study

The study delineates the significance of integrated assessment (IA) in a real-world context in face of intensifying impact from climate change challenges; and explores aspects of IA in a multi-disciplinary manner instead of a more discipline-specific impact assessment; to draw a comprehensive understanding of flood risks with community participation, ultimately facilitate mitigation strategies for vulnerable communities and ecology for policy consideration.

LITERATURE REVIEW

Sustainable development & significance of Integrated impact assessment

Sustainable Development Goals (SDG) requires the adoption of multi-disciplinary approaches to impact assessment of socio-economic development plans. This has led to the rising interest and inquiry in the integration of various methods of evaluation into impact assessment. Integrated Assessment (IA) can be broadly defined as (1) the process for guiding anthropogenic activities towards sustainable development; and (2) comprehensively examining potential implications viz. intended or unintended; with the application of qualitative and quantitative tools to generate valuable insights into observed impacts as well as the interrelationships among socio-economic conditions and ecological vulnerabilities (IPCC 2022). This approach is widely recommended and used in developed and developing countries.

Meanwhile, scenario tools and methods which provide helpful guiding analyses of enhancing future adaptation, risk reduction as well as adaptation policy and planning (Berkhout et al, 2014), include: *multi discipline analyses and assessment* which aim to assimilate the experience, knowledge and analyses to consolidate social, economic and the environment in a single study and synthesize information that cannot be deduced holistically from a single disciplinary analysis (Baines *et al*, 2006; Lee, 2006); *wider context examination* that takes into account other concurrent projects in the area of impact assessment study; emphasis on *public and grassroot stakeholder participation* in a meaningful and participatory manner (Scrase and Sheate, 2002); adoption of *complementary appraisal methods* to reconcile insights and consistency of assumptions (Orenstein et al, 2010)

METHODOLOGY

The study deployed an integrated assessment mixed methods approach (Figure 1) for data collection and analyses.

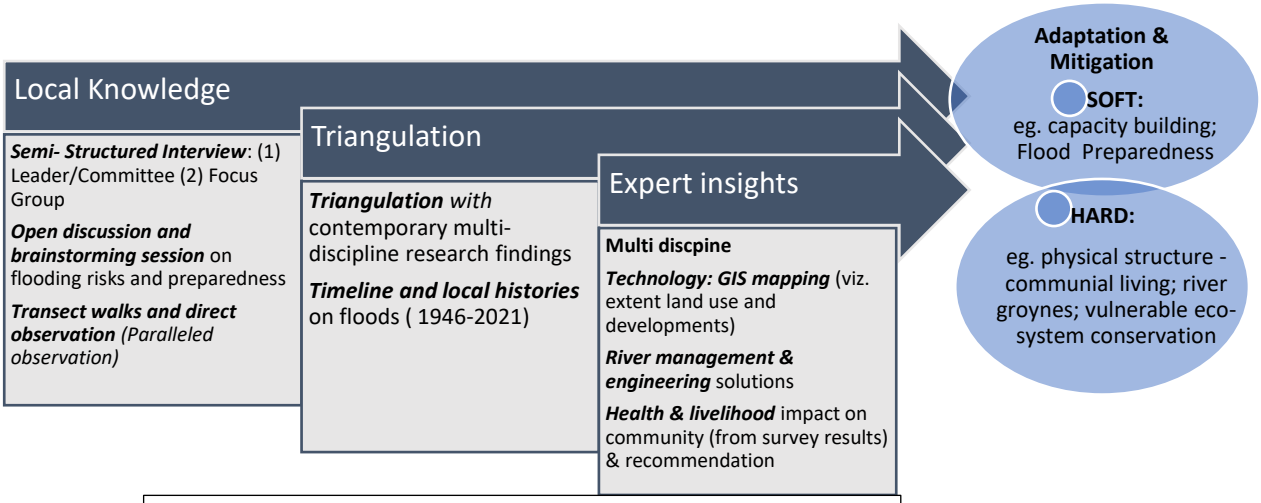

Figure 1: Integrated Assessment design Framework (Author, 2023)

In addition, as the study involved Indigenous Peoples (IP), the research design was guided by Participatory Rural Appraisal (PRA) approaches and strictly adhered to ethical consideration and administered Prior Informed Consent (PIC) practice prior to data collection. The overarching intention is to extrapolate insights from personal and collective accounts, as well as recollections on (i) flooding impact on lives and livelihood; ii) historical data on flooding events and (iii) circumstances contributing to the surge in flood disasters. PRA approach aims to actively involve IP communities to identify problems relevant to them; empowerment through open discussion and identify options for tackling the issues.

Research Instrument

To ensure rigor of the PRA research instrument, the semi-structured interview questions were developed and peer-reviewed by experts involved in international SDG-related projects from B.E.A.CC.H. from various disciplines viz. agroecology, biodiversity conservation and natural resources planning, stakeholder collaboration, and IP engagement.

Population and Sampling

For this pilot study, longhouses in Lower Baram were selected based on the severity of flooding viz. structural loss and damages, with possible displacement due severe riverbank erosion and safety risks. Purposive sampling was adopted primarily to gain a better understanding of common experiences and perceptions on flooding; with a focus on three segments of community, namely, mothers, elderly and youth, to develop insights on flooding encounters and level of preparedness.

FINDINGS & DISCUSSION

The section briefly highlights result findings from *local knowledge* and extends the deliberation by way of *triangulation with contemporary multi discipline literature* insights and *expert inputs* as a frame of reference to establish substantiated and meaningful insights on (1) vulnerabilities and preparedness; (2) contributory factors.

(1) Vulnerability of communities & lack of flood preparedness

Based on the socio-economic background, the average earnings of the communities under study are between RM200 to RM600, approximately US$46 to US$136 per month, indicating they fall below the poverty line in terms of global standards. This means with continued damage from floods to farms and built environment, loss of livestock, disruption to essential services such as water, education and healthcare, their ability for any rapid and effective recovery would be undermined. To comprehend the perceived severity and future risks, an examination of the historical flood timeline in Sarawak from 1946 to 2021 by the Department of Irrigation and Drainage Sarawak delineate the worst floods in Baram began late 1980s and flooding incidences have increased steadily with compounded frequency and extremity annually since 2008. Apart from that, the insights from the open discussion and brainstorming sessions delineate absence or lack of flood preparedness attitude among longhouse(s) residents. Despite the obvious lack of flood readiness attitude, the session was welcomed by the participants and village committee as it was their first time discussing openly together on flood issues and participants expressed a heightened sense on flood realities and actions needed.

(2) Contributory factors to increased flood frequencies

Based on local community knowledge, the incessant floodings in Baram are mainly attributed to anthropogenic activities. Table 1 delineates contributory factors juxtaposed with contemporary literature, GIS mapping and expert inputs to determine presence of corroborating evidence or insights:

Flood Contributing Factors: Community observation and perception	**Discipline-related findings** in the fields of biology; sustainability science; ecology; hydrology, innovative technology and engineering
Poor drainage system in adjacent monoculture plantation areas	Impacts are exacerbated by large-scale expansion of monoculture plantations, due to lengthened periods of inundation (Sumarga et al. 2016)
Heavy rainfall upriver	Statistics on Sarawak flooding records 1946 to 2021 by the Department of Irrigation and Drainage Sarawak affirm 50% of floodings were attributed to heavy rainfall upstream '*Kawasan hulu/ulu sungai'.*
Overlogging and deforestation Upper Baram/Highland	• Academy of Sciences Malaysia noted *"…the uncontrolled development in Selangor and the mass logging in Sarawak were the reasons these states are experiencing frequent floods"* (The Star 2022). • Studies on deforestation in highland areas affirmed: (1) interruption to the important services of forest ecosystems linked to hydrological cycle, which depended on the landscape's capacity to regulate the quantity of freshwater flows and mitigate damages from flooding and erosion (Razali et al, 2018); and (2) connection to exacerbated landslides and soil erosion (Wells et al 2016). • GIS Mapping conducted post-study affirm extended land clearance occurring along upper and lower Baram River.
Over 40 years of quarry sand & gravel mining	Numerous studies on sand and gravel mining around riverine affirm threat to riverbank erosion and soil stability, riverbed degradation, river buffer zone encroachment, causing siltation, altering natural flow of the river and the deterioration of river water quality (Teo et al 2017; Devi & Rongmei 2017)
Severe siltation and sedimentation	• Annammala et al (2021); Razali et al (2018) - large-scale land clearance and conversion accelerate sedimentation in riverbeds and reservoirs eventually resulting in floods especially during the monsoon periods. • Nainar et al (2017) - substantial disturbances on soil surface can accelerate erosion rates by 10 to 100-fold and inadvertently, contribute to higher suspended sediment concentrations compared with natural, undisturbed catchments.
Severe climate change impact	Historical time series of hydrological and meteorological data (Nasser & Nurainin 2018) affirmed rainfall trend in Baram has decreased over a 10-year period (2005 to 2014) due to change in climate regime. Conversely, analyses on rainfall predictions for the next 30 years (2015 to 2044) indicate a decrease with direct impact on water resources in Baram in terms of its quantity and quality. To surmise, the report added to mitigate climate change impact, healthy ecosystems are critical.
Construction of ineffective river bunding that was washed away	Based on GIS Mapping and local knowledge inputs, river management consultant form B.E.A.CC.H proposed the use of river Groynes constructed that are far more economical and sturdy than existing bunding strategies

Table 1: Triangulation of contributing factors to floodings with multi discipline contemporary research insights

Policy consideration on Cumulative effects assessment

As climate-influenced risks and future vulnerabilities get more complex and systemic (UNDRR, 2019), the state needs to consider the accumulative effects impact (IPCC 2022) of its multiple socio-economic development projects viz. sequenced or parallel implementation on socio-ecology from past, present and future development projects in demarcated growth areas. In addition, the current non-mandatory EIA reporting for clearing virgin forests under 500 hectares should be amended considering climate change risks. Furthermore, Sarawak Biodiversity Blueprint which emphasizes on sustainable development should include Baram as a case for reference for riverine conservation and design a framework for support, remedial and mitigation action for riverine communities and ecology.

CONCLUSION

The severity of anthropogenic impact should not be underestimated as sporadic losses due to climate change can lead to perennial losses and impoverishment resulting in social tipping points among indigenous communities living along riverine. The study highlights the incorporation of local knowledge and perspective not only facilitates better understanding of contributory factors in the respective area(s); in fact, it enables authorities to gain grounded insights for effective soft and hard mitigation strategies. Finally, considering climate-induced risks and vulnerabilities, an integrated impact assessment which considers accumulative effects impact should be explored further in developing regions with multiple socio-economic development plans. The lack of robust policy consideration could ultimately reverse rural poverty alleviation initiatives by the state.

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