PLANNING SUSTAINABLE INVESTMENTS IN THE GREATER MEKONG SUBREGION

Lessons from a Spatial Multicriteria Assessment of the GMS Regional Investment Framework

The Asian Development Bank (ADB) has prepared a Regional Investment Framework (RIF) to operationalize the Greater Mekong Subregion (GMS) Strategic Framework 2012–2022. With an initial portfolio of 130 investments identified, totaling more than US$50 billion, the RIF is expected to contribute significantly to economic growth and poverty reduction in the subregion.

To maximize contribution, it is essential that the environmental, social, and economic risks and opportunities of the RIF portfolio are analyzed, understood, and ultimately addressed by decision makers. If not, cumulative negative impacts could undermine investment performance, erode the natural resource base, and threaten long-term development of the subregion.

The GMS Core Environment Program recently conducted a rapid Multicriteria Assessment (MCA) and Spatial Multicriteria Assessment (SMCA) of the RIF portfolio. The results of the assessments include:

i) MCA and SMCA demonstrated to be complementary and valuable tools for assessing economic, environmental, and social risks associated with regional investments.

ii) Such assessments enable decision makers to prioritize RIF investments and identify mitigation actions based on environmental and social risks.

iii) The assessments also enable decision makers to better understand the geographic suitability of RIF investments based on mapping the environmental risks and economic opportunities.

This brief summarizes the methodology, outputs, and lessons learned from the assessments. The full report, *Environmental Analysis of the GMS Regional Investment Framework*, can be downloaded from the GMS Core Environment Program website: www.gms-eoc.org

BACKGROUND

GMS leaders endorsed the GMS Strategic Framework 2012–2022 at the 4th GMS Summit in December 2011, and requested ADB to lead a regional planning exercise to identify the next generation of multisector investments. This planning exercise resulted in the GMS Regional Investment Framework 2013–2017, which will be presented for endorsement at the 19th GMS Ministers Meeting in December 2013.

The RIF investment portfolio was prepared through a *bottom-up* approach, based on extensive country inputs and consultations, that began in early 2012. In addition to country assessments, sector assessments informed the RIF portfolio, namely: agriculture, energy, environment, human resource development, labor migration, tourism, transport and related services, and urban development.

In late 2012, the GMS Core Environment Program was requested to assess the environmental, climatic, and social risks of the portfolio, focusing on GMS economic corridors and landscapes.

To achieve its aims, the program conducted an MCA and SMCA of the RIF in mid 2013. The results were translated into scores and maps for investment selection, geographic prioritization, and mitigation planning. The outputs were designed to provide RIF stakeholders and decision makers with information to:

i) Assess and compare the risks of *individual investments*, (e.g., trade-offs), and identify potential synergies with environmental support services (i.e., opportunities).

ii) Assess and compare the suitability of *geographic locations* (e.g., economic corridors) against the risk profile of investments. Then, decide on location-specific mitigation measures.

METHOD

Multicriteria Assessment (MCA) is a decision-support tool that allows options (e.g., in this case, RIF investments) to be compared and assessed using economic, environmental, and social criteria and scores. For the RIF assessment, the MCA generated a risk score for each investment, assisting decision makers with an improved understanding of risk and a comparison of investments.

Although customizable, an MCA includes four basic steps:

i) Identify risk variables (e.g. protected area).

ii) Value risk variables, turning variables into criteria (e.g., not within a protected area).

iii) Translate criteria into a common (risk) scale (e.g., not within protected area = 1, within protected area = 0).

iv) Weigh criteria against each other to reflect stakeholder and country priorities (i.e., protected area = 30% of total risk score).

A Spatial Multicriteria Assessment (SMCA) is an MCA that uses geographic information to map risk scores. These maps create a visual geographic overview of high to low risk areas, in this case for RIF investments. An SMCA usually complements, rather than replaces, an MCA as not all risk types have detailed spatial data available (e.g., climate change variables), or are difficult to map (e.g., groundwater impacts).

MCA and SMCA use simple formulas, are easy to design, have flexible data needs, and produce logical results that nontechnical experts can easily understand.

For the RIF analysis, the MCA was applied to investments to determine their level of environmental, climatic, and social risk, while the SMCA analyzed the geographic suitability of economic corridors and landscapes for types of investments.

OUTPUTS

Multicriteria Assessment of the RIF Portfolio

To assess the magnitude of risk, the MCA process involved screening each RIF investment against three risk groups: environmental, climate change, and social. Between the three risk groups, 10 equally weighted risk variables were identified:

Environmental risk variables: biodiversity assets, forests resources, land use, national protected areas, watersheds, wetlands and water courses, terrain type.

Climate change risk variables: adaptation, mitigation.

Social risk variables: vulnerability.

Each risk variable was further subdivided into risk types, totaling 45. Risk types for each variable were then weighted based on their relative importance.

For each risk type, a severity rating was assigned for all RIF investments, ranging from 1 (very high), 2 (high), 3 (medium), 4 (low) to 5 (negligible). The severity ratings were assigned using expert judgment supported by maps and other materials as guidance. Finally, severity ratings were aggregated into risk scores for each of the three risk groups, using the same 1 to 5 scale. This analysis was conducted for every investment in the RIF portfolio, yielding a comprehensive list of risk scores (see Table 1 for a sample of how risk scores were aggregated).

RIF investments were then compiled by country and based on the risk scores, further analysis was undertaken to identify the following (see Figure 1).

i) Investments with high environmental, climatic, and social risk.

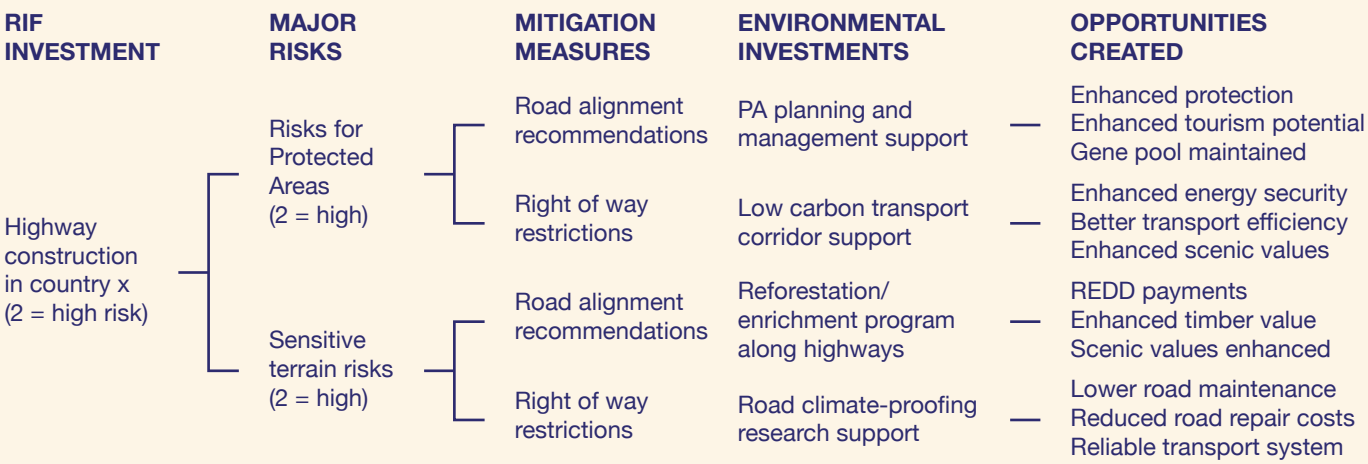
ii) Appropriate mitigation measures and interventions to reduce negative risk.

iii) Recommendations for additional environmental investments to sustain RIF investments.

Table 1: Sample Subset Showing How Multicriteria Assessment Scores Were Aggregated

Risk type	Severity rating	Weighting	Weighted severity rating	Risk variable	Sum of weighted severity rating	Risk group	Risk score (mean of B)
Land-take	3	0.21	0.63	Land use	4.08	Environmental	3.59
Change of land use	4	0.21	0.84				
Change of intensity of use	5	0.29	1.45				
Use of pollutants	4	0.29	1.16				
Loss of diversity	3	0.29	0.87	Biodiversity Assets	3.10		
Resource degradation	4	0.36	1.44				
Fragmentation	2	0.29	0.58				
Visual impacts	3	0.07	0.21				

Figure 1: Example Mitigation Measures and Economic Opportunities Identified by the Multicriteria Assessment



Spatial Multicriteria Assessment of Economic Corridors and Landscapes

SMCA was used to measure the suitability of landscapes and economic corridors for different sector investments, enabling risk scores to be mapped.

While SMCA design follows the same principles as MCA, more extensive data are required to establish maps for each risk type. Thus, fewer risk types are usually included in SMCA due to data constraints.

To demonstrate SMCA as a multisector assessment tool, economic opportunities were considered alongside environmental risks with equal weighting.

Fourteen risk and opportunity types were defined:

Environmental risk types: protected areas, key biodiversity areas, forest value, forest accessibility, terrain sensitivity, and upstream water courses.

Economic opportunity types: urban centers, population density, access to special economic zones, economic corridor roads, railways, seaports, international airports, and domestic airports.

Each risk type was matched with a map from which severity ratings were generated and summarized into risk scores ranging from 0 = very high risk to 1 = low risk (see Table 2).

Table 2: Risk/Opportunity Types Evaluated by the Spatial Multicriteria Assessment

Risk/ Opportunity Group	Risk type	Weighting	Severity rating
Restriction	Protected areas (PA)	–	No development within protected area boundaries
Environmental Risk (50%)	Distance to PA	0.35	Decreasing risk with increasing distance from PA (up to 10 km)
	Distance to key biodiversity areas	0.20	Decreasing risk with increasing distance from key biodiversity areas (up to 10 km)
	Forest value	0.15	Dense forest = high risk, Open forest = medium risk, No forest = low risk
	Distance to forest	0.05	Decreasing risk with increasing distance from forest (up to 10 km)
	Terrain sensitivity	0.20	Increasing risk with increasing slope (up to 15 degree slope)
	Distance to upstream water courses	0.05	Decreasing risk with increasing distance to water course (up to 1 km)
Economic Opportunity (50%)	Distance urban center	0.20	Decreasing opportunity with increasing distance (up to 50 km)
	Population density	0.15	Decreasing opportunity with decreasing density (up to 100/km^2)
	Distance to Special Economic Zone	0.15	Decreasing opportunity with increasing distance (up to 50 km)
	Distance to economic corridor road	0.15	Decreasing opportunity with increasing distance (up to 50 km)
	Distance to railway	0.10	Decreasing opportunity with increasing distance (up to 50 km)
	Distance to seaport	0.10	Decreasing opportunity with increasing distance (up to 300 km)
	Distance to international airport	0.10	Decreasing opportunity with increasing distance (up to 150 km)
	Distance to domestic airport	0.05	Decreasing opportunity with increasing distance (up to 25 km)

Km = kilometer

The risk scores were then aggregated and mapped at two geographic levels: economic corridors and landscapes.

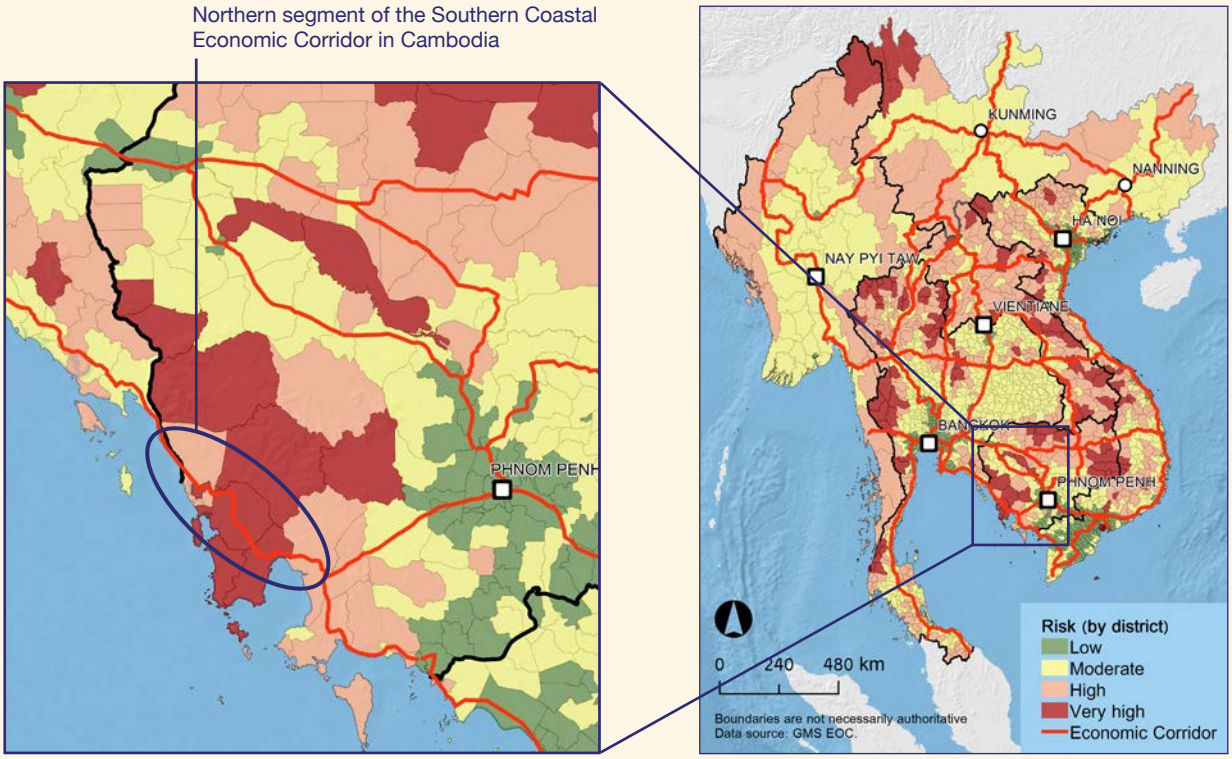
Economic corridors: Risk scores were summarized for economic corridor segments, with management guidelines identified as well as an overview of environmental sensitivities. As shown in Figure 2, the SMCA map used risk scores aggregated to the district level. These values were the basis for analyzing risks for different economic corridor segments.

Landscapes: Based on the risk scores described above (0 = very high risk, 1 = low risk), the GMS landscape was grouped into three categories to determine the suitability of the land area for investment (see Figure 3).

Low risk landscapes: Land areas that have low risk scores (0.51-1.0) are generally suitable for a wide range of investments in agriculture, industry and manufacturing, urban development, and infrastructure development.

Medium risk landscapes: Land areas that have medium risk scores (0.26-0.5) are suitable for investments that do not have a high impact on ecosystem services, but can benefit from sustainable use of these services. For example: sustainable forestry, tourism, and organic or niche agriculture. Using these land areas for investments that have a high impact on the environment could result in significant and possibly irreversible losses of ecosystem functions.

Figure 2: Sample Spatial Multicriteria Assessment Map of Economic Corridor Risks



ENVIRONMENTAL SENSITIVITIES

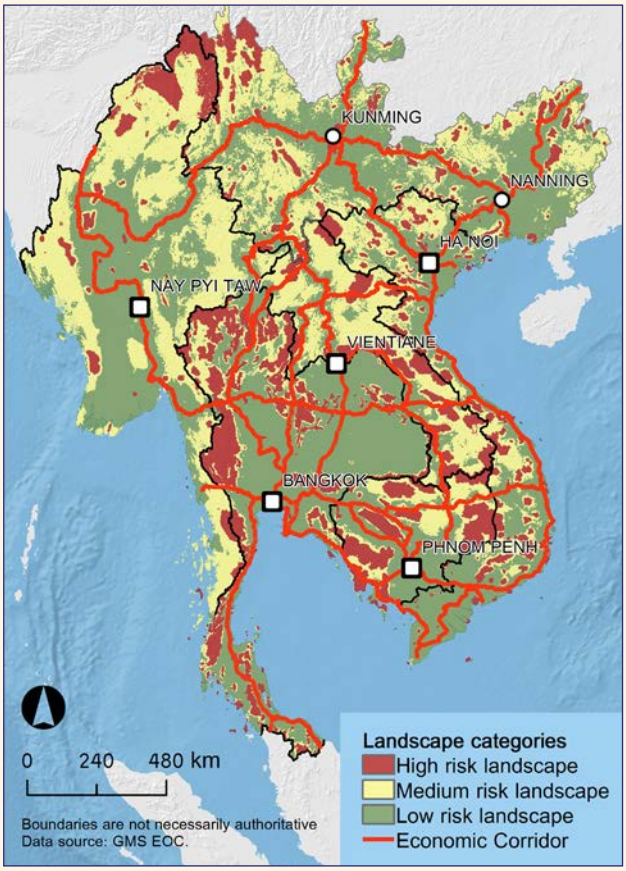
- Very high biodiversity values
- High value forest areas
- Steeply sloping, sensitive terrain
- Critical upper-watershed area
- Contains proposed hydropower dams
- Environmental suitability 0.15 (very high risk)

MANAGEMENT GUIDELINES

- Restricted investments with a high level of protection for natural capital assets
- Investments could include forestry and watershed protection with associated benefits from payment for ecosystem services (e.g., Reducing Emissions from Deforestation and Forest Degradation – REDD+), ecotourism, low impact or organic agriculture, etc.

High risk landscapes: Land areas with high risk scores (0-0.25) are environmentally sensitive to development. The ecosystem services they provide, e.g., carbon sequestration, climate regulation, hydrological cycling for clean water, gene pool maintenance, and pollination, not only support these areas, but also maintain the productivity of the low risk and medium risk landscapes. High risk landscapes should only be targeted for investments that have a minimal or positive ecosystem impact. Examples might be conservation or protection forestry with associated nonextractive use of resources, e.g., ecotourism. These investments would be suitable for generating payments for ecosystem services such as from REDD+.

Figure 3: Spatial Multicriteria Assessment Map Identifying Three Investment Landscape Categories



LESSONS LEARNED AND NEXT STEPS

The assessment team began its work after the RIF sector and country assessments were finalized and priority investments were identified. As a result, the assessment had a distinct ex-post character, constraining the influence of the assessment on the selection and prioritization of investments in the draft RIF. Due to time constraints, the assessment team was unable to involve a wider range of experts to refine the criteria framework used for scoring and mapping, and allocating risk scores.

Despite these challenges, the methodology developed for the RIF provided a rapid and useful means of screening investments. To enable MCA and SMCA to become a more powerful tool for GMS national and regional planners, the following improvements are recommended:

i) **Timeliness of inputs:** The analysis should run ahead of (ex-ante), or in parallel with, RIF sector assessments and its results should be firmly integrated into the investment identification and prioritization processes at the sector level.

ii) **Participation and feedback:** The design of the MCA and SMCA criteria framework should involve stakeholders of various disciplines to generate consensus and objectivity, particularly during criteria development and weighting processes.

iii) **Database development:** The accuracy of the MCA scores and SMCA maps is closely tied to data quality. More resources need to be allocated to produce data at sufficient detail and keep them up to date.

Concluding Points

i) If the above recommendations are adopted, MCA and SMCA can become more useful and widely accepted tools to assist decision makers to prioritize investments, determine appropriate land allocation, and plan mitigation measures to reduce risks.

ii) There is significant scope for improving the process of screening investments, such as those in the RIF portfolio, by applying MCA and SMCA early in the planning process.

iii) MCA and SMCA can be effectively applied to sector- and area-based plans, for example, power development plans, transport sector strategies, and land use plans.

The Core Environment Program (CEP) supports the Greater Mekong Subregion (GMS) in delivering environmentally friendly economic growth. Anchored on the Asian Development Bank's (ADB) GMS Economic Cooperation Program, CEP promotes regional cooperation to improve development planning, safeguards, biodiversity conservation, and resilience to climate change, all of which are underpinned by building capacity.

CEP is overseen by the environment ministries of the six GMS countries and implemented by the ADB-administered Environment Operations Center. The Governments of Finland and Sweden, and the Nordic Development Fund, cofinance the program.

Find out more: www.gms-eoc.org

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GREATER MEKONG SUBREGION
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