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Agenda Item 11

A METHODOLOGICAL APPROACH FOR POST-COMPLETION VERIFICATION NOVEMBER 2019

(Prepared by the Independent Evaluation Office of the GEF)

Recommended Council Decision

Regarding the Semi-Annual Evaluation Report of the Independent Evaluation Office.

The Council, having reviewed the "A Methodological Approach for Post-Completion Verification: November 2019," endorses the approach and supports the application of the post-completion verification methodology.

Abbreviations

DROK	Democratic People's Republic of Korea
ET	evapotranspiration
ICM	integrated coastal management
IEG	Independent Evaluation Group, World Bank
IEO	Independent Evaluation Office, Global Environment Facility
IWEM	integrated water and environmental management
PEMSEA	Building Partnerships for the Environmental Protection and Management of the East Asian Seas
PMO	Project Management Office
PPAR	Project Performance Assessment Reports
PPP	public-private partnership
ROK	Republic of Korea
SAP	Yellow Sea LME Strategic Action Programme
SDS-SEA	Sustainable Development Strategy for the Seas of East Asia
TE	terminal evaluation
YSLME	Yellow Sea Large Marine Ecosystem

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EXECUTIVE SUMMARY

1. At the request of the Council, the IEO has developed a framework for post completion evaluation assessments. The IEO and other evaluation units of agencies such as the World Bank, have carried out post completion assessments of projects in performance, country and thematic evaluations, but the approaches have varied across the evaluations and across agencies. This report presents a methodology that could be applied for consistent post completion evaluation assessments building upon existing frameworks used by the IEO, the World Bank and JICA.

2. Given the ease of access to environmental data on outcomes through satellite imagery, it is now possible to demonstrate the potential of geospatial analyses to generate long-term data trends in environmental outcomes as well as to regenerate relevant key baseline data. This report presents the application of such geospatial analyses in the case study of the Yellow Sea and includes a discussion of the advantages and shortcomings of using such geospatial data at the project post-completion stage. It demonstrates that geospatial analysis enables an efficient data collection for post completion verification. It allows for a pattern of observed time series data, but it also enables evaluators to understand the cumulative impact of GEF interventions, combined with other interventions, within a system or region to establish whether ecosystems are improving—a goal of which is at the center of GEF environmental funding. This type of coarse-scale analysis is not feasible through field visits nor from interviews that provide a limited focus of environmental progress. However, this method is useful only for those projects with environmental indicators that can be detected remotely. Indicators, such as those relating to policy reform or gender inclusion may not be able to be remotely detected.

I. INTRODUCTION

1. The Global Environment Facility (GEF) has invested over US$18.1 billion in environmental grants globally over the last 27 years, making it one of the largest multilateral financing mechanisms for environmental intervention in the international development space. GEF projects have been shown to have high performance in terms of achieving their outcomes during project implementation. According to *GEF Annual Performance Report 2017*[1] of the Independent Evaluation Office (IEO), 80 percent of completed projects have been rated in the satisfactory range and have contributed to improving environmental conditions and reducing environmental stress in areas that include biodiversity, climate change, land degradation, chemicals and waste, and international waters.

2. Achieving expected outcomes at the end of project implementation is only the first step toward obtaining long-term environmental results. GEF-supported interventions typically aim to achieve impacts that require long-term processes that extend well beyond a single project cycle. It is therefore essential to look beyond project completion to comprehend whether and how longer-term project outcomes are being reached and sustained over time, as well as the extent to which GEF-supported interventions have led to broader adoption—or even transformational change—across markets and systems.

3. The GEF Council has requested IEO to conduct post-completion evaluations of its projects, including an assessment of their sustainability. In response—and building upon existing tools and approaches—IEO has developed an approach to do so, including those projects that may have linked interventions. This methodology and the relevant process are presented in Section 1 of this report. Given the ease of access to environmental data on outcomes through satellite imagery, it is now possible to demonstrate the potential of geospatial analyses—in this case, a study of the Yellow Sea—to generate long-term data trends in environmental outcomes as well as to regenerate relevant key baseline data. This process enables an efficient data collection for post completion verification. The case study of the Yellow Sea is presented in Section 2 of this report and includes a discussion of the advantages and shortcomings of using such geospatial data at the project post-completion stage.

4. A post-completion evaluation, undertaken approximately three to five years later, should reveal the extent to which a project's outcomes have been sustained and expanded. It will determine changes in expected outcomes and reveal unanticipated outcomes if any; evidence the extent of sustainability; and expose any risk to future progress.

[1] Independent Evaluation Office of the GEF. 2019. *GEF Annual Performance Report 2017.* Washington, DC: IEO.

II. POST COMPLETION VERIFICATION TOOLS AND APPROACHES

5. Post-completion verification is not a new process within the GEF partnership, since there have been several verifications of GEF-supported projects years following completion. These evaluations were either conducted by the independent evaluation offices of GEF agencies, particularly the Independent Evaluation Group (IEG) of the World Bank, and GEF's Independent Evaluation Office (IEO). Several of these assessments have been carried out within the context of thematic evaluations, such as Country Portfolio Evaluations, Scaling up and Impact Evaluations, albeit at the exception of consistency. Assessments typically have proved helpful in the verification of the terminal evaluation (TE) reports prepared at project completion, and they have been used to examine the achievement of specific long-term impacts. Sustainability of a project, however, has not been a central focus and, as a result, often has not been adequately assessed; similarly, the learning component has not emphasized. Only in the cases of the World Bank's Project Performance Assessment Reports (PPAR) and reports of the Japan International Cooperation Agency, has a systematic approach been applied to post-completion evaluation. The PPAR focuses on the learning factor with regards to what works, what does not work, and why it does not work, particularly in terms of the direct links between interventions and outcomes. This information is generally drawn from an assessment carried out close to project completion (between 18 and 24 months) on the achievement of intervention objectives, rather than on the context and stakeholders. Ex-post evaluations carried out by the Japan International Cooperation Agency focus more on effectiveness and sustainability, based on the same methodology as that applied to GEF's TEs, which emphasizes quantitative indicators. An ex-post evaluation is conducted at a maximum of three years following project completion, placing less emphasis on the identification of factors or the role of stakeholders.

Box 1: Sustainability Review Presented in the GEF Annual Performance Report 2017

The *GEF Annual Performance Report 2017* by GEF's Independent Evaluation Office includes a desk review of sustainability outcomes during the project post-completion period.[1] The review was based on field verification reports that were conducted three years following project closure, and it was carried out with the help of an instrument to document outcomes, elements of sustainability, and necessary mechanisms for broader adoption. It was found that 62 percent of project reports were incomplete, reducing the final number of verification reports to only 61. Of these, 50 had been carried out by GEF's Independent Evaluation Office with regards to its impact and country portfolio evaluation work, and 11 had been prepared by the World Bank's Independent Evaluation Group. While most of the verification reports focus on project objectives, they lack adequate content relating to outcomes and sustainability issues. The time and cost to carry out the desk review were relatively low.

[1] Independent Evaluation Office of the GEF. 2019. GEF Annual Performance Report 2017. Washington, DC: IEO.

Box 2: Evaluation of GEF Support to Scaling Up Impact

As part of the Evaluation of GEF Support to Scaling Up Impact,[1] six case studies in three countries were conducted to specifically assess the extent to which GEF-supported scale-up activities had been sustained following project completion. The six cases, for which there were field visits, consisted of various focal areas and project modalities. The post-completion period ranged from three months to 10 years, although in most instances, projects had completed five years prior to team evaluation. The team explored the progression of outcomes following project completion as well as the factors that may have affected progress. Information from discussions was drawn by applying a standard tool to allow for case comparison. From these assessments, it was discovered that those stakeholders key to institutional knowledge were no longer available and could not be contacted, thus exacerbating the effort to establish the link between post-completion outcomes and GEF-supported interventions.

[1] Independent Evaluation Office of the Global Environment Facility. 2019. *Evaluation of GEF Support to Scaling up Impact 2019* (unedited). Washington, DC: IEO.

Box 3: Project Performance Assessment Report of the Energy Efficiency Project in Armenia

The World Bank's Independent Evaluation Group (IEG) conducts ex-post project evaluations that are based on project objectives. Projects include those that are financed by the Global Environment Facility and implemented by the World Bank. IEG conducts an in-depth, field-based evaluation (referred to as a Project Performance Assessment Report (PPAR)) of approximately 20 percent of its portfolio, representing only a sample of projects. Evaluation is conducted at any point following the project completion report.

Given that IEG has restructured its PPAR to place less emphasis on ratings and to focus more on the learning factor, a narrative approach was applied to draw out a message, exemplified by the PPAR of Armenia's Energy Efficiency Project. Financed by the Global Environment Facility, this joint effort applied a mixed-methods approach to the evaluation, including a review of the literature, portfolio analysis, site visits, focus group discussions and semi-structured interviews. PPAR ratings replaced those from the self-evaluated project outcomes and performance, and they took into consideration not only events since project completion but also those during project implementation. In line with the recent PPAR restructure, the ex-post project evaluation presents the findings and conclusions as well as what worked and what did not.

1. A Systematic Approach for GEF Post-Completion Assessments

6. Approaches described in Box 1, Box 2, and Box 3 typically involve a combination of desk reviews and field visits to gather information, although data may vary from study to study based on evaluation objectives. Furthermore, the timing of post completion verification has not been consistent, with some assessments having been carried out too soon after project closure and others long after a project has ended. These limitations point to the need for a tool that can be applied for consistency in information, comparative analyses, and identification of lessons learned. As such, IEO has developed a template that builds on the strengths of previous

tools, with an additional focus on the measurement of sustainability and the broader adoption of outcomes. While this tool is not designed to replace the TE of implementing agencies, it aims to assess the extent to which project outcomes have been sustained over the five years following project completion, the extent to which outcomes have contributed to or have the potential to contribute to transformational change, and whether or not they have been adopted more broadly by stakeholders. The data will be publicly accessible and verifiable.

7. The objective of the post-completion evaluation is to determine the extent to which (i) the outcomes achieved by a GEF-supported intervention continue to progress beyond the implementation period, and/or (ii) the conditions that contributed to the outcomes, and (iii) the potential for longer-term outcomes. The evaluation is not intended to assess all areas (e.g., relevance, efficiency) that a TE usually does, other than how some areas may have influenced key outcomes. The selection of projects for post-completion verification is based, inter alia, on those that have a minimum of four to five years following closure, the amount of GEF investment involved, the lessons of value, and the potential to contribute to more in-depth thematic evaluation.

8. **The post-completion evaluation should include an assessment of the changes and/or trends of the project from the time it was implemented to the time it is evaluated, as well as the following (Annex 1B):**

Outcomes:

(a) **Environmental impacts**: Key environmental changes and/or trends that the intervention aimed to achieve in the short and long terms, as well as any unintended changes (e.g., forest cover, water quality, vegetation cover, carbon sequestration).

(b) **Social impacts**: Key human well-being changes and/or trends that the intervention aimed to achieve in the short and long terms, as well as any unintended social changes (e.g., income, health, education, gender equality).

(c) **Synergies and trade-offs:** Interactions between impacts that either reinforce or reduce any of the identified environmental and social changes or trends.

(d) **Broader adoption and/or transformational change**: The extent to which the intervention, specific activities, and/or key outcomes have been sustained, replicated, mainstreamed, scaled up, or contributed to transformational change.

Influencing factors

(a) **Enabling conditions**: Conditions that relate to implementation activities through GEF-supported interventions, as well as from those actors that provide the technical and institutional environment to enable impact and broader adoption, and from whose absence these may not occur (e.g. institutional and individual capacities, governance frameworks, financing mechanisms).

(b) GEF-supported intervention, as well as from those actors who may assist or may hinder impact and broader adoption (e.g., champions, stakeholders, political priorities).

(c) **Barriers**: Challenges that prevent impact and broader adoption.

(d) **De-risking**: Immediate and potential risks to further impacts, broader adoption and transformational change that may be internal or external to the intervention.

(e) **GEF additionality**: The extent to which innovation, enabling conditions (especially legal, institutional, and financial), and environmental and social impacts may not have occurred without the support of GEF.

9. **The following steps will be applied to the assessment.**

(a) Develop a theory of change for the path to sustainability of outcomes.

(b) Identify three or four key intended and unintended outcomes that can be evidenced four to five years from project completion. Select outcomes that will represent essential measures of an intervention's medium-term success. These will vary depending on focal area, type of intervention, and objectives, among others.

(c) Identify factors that are key to influencing the sustainability and further progress of these selected outcomes.

(d) Identify appropriate methods and tools to assess outcomes and factors alike, using quantitative and qualitative data to the extent possible.

(e) Evaluate the changes and trends in outcomes and the factors in the period between project completion and the evaluation.

(f) Assess the extent to which the intervention has contributed to post-completion changes and trends in outcomes and factors. Specify GEF additionality in these changes and trends.

(g) Assess the extent to which outcomes are likely to continue and progress beyond the post-completion evaluation.

(h) Identify lessons for current and future interventions.

(i) Prepare a report (outline presented in Annex 1 C)

10. **Methods for the post-completion verification process will include the following:**

(a) A review of project documents, publications, peer-reviewed literature, and databases (especially of environmental monitoring data) relating to the intervention, trends in impacts and factors, and context. These will include similar non-GEF interventions that occur within the same geographic area.

(b) Geospatial data analyses where feasible, to assess environmental and social changes and factors.

(c) Interviews with key stakeholders (e.g., implementers, beneficiaries, actors implementing related interventions, and any those who may be affected) at the corporate, regional, national, and local and community levels.

(d) Field visits to verify environmental and social changes and to gain a deeper understanding of factors that have influenced these changes

2. Annex 1. A Definition of Terms

Intervention	Any programmatic approach, be it a full-sized project, medium-sized project, or enabling activity that is financed from a Trust Fund administered by the Global Environment Facility (GEF), as well as regional and national outreach activities. In the context of post-completion evaluation, an intervention may consist of a single project or multiple projects (i.e., phased or in parallel) with explicitly linked objectives that contribute to the same specific impacts within the same specific geographic area and sector. Independent Evaluation Office of the GEF. 2019. *The GEF Evaluation Policy 2019* (unedited). Washington, DC: IEO. www.gefieo.org/evaluations/gef-evaluation-policy-2019.
Activity (of an intervention)	An action that is undertaken over the duration of an intervention that contributes to the achievement of the intervention's objectives; that is. an intervention that is implemented through a set of activities (e.g., training, (support to) policy development, (implementation of) management approach).
Outcome	An intended or achieved short- or medium-term effect of a project or program's outputs. Independent Evaluation Office of the GEF. 2019. *The GEF Evaluation Policy 2019* (unedited). Washington, DC: IEO. www.gefieo.org/evaluations/gef-evaluation-policy-2019.
Impact	The positive and negative, primary and secondary long-term effects produced by a project or program, directly or indirectly, intended or unintended. Independent Evaluation Office of the GEF. 2019. *The GEF Evaluation Policy 2019* (unedited). Washington, DC: IEO. www.gefieo.org/evaluations/gef-evaluation-policy-2019.
Environmental impact	Changes in biophysical parameters that could take the following forms: • Stress reduction: Biophysical changes that reflect reduction of threats emanating from human actions (e.g., local communities, societies, economies) • Environmental status: Changes in the status of the environment. Independent Evaluation Office of the GEF. 2014. *Final Report: At The Crossroads For Higher Impact* (2014), Overall Performance Study 5. Washington, DC: IEO. www.Gefieo.Org/Sites/Default/Files/Ieo/Evaluations/Ops5-Final-Report-Eng.Pdf.
Social impact	Changes in parameters that affect human well-being at the individual and community levels, (e.g., income or access to capital, food security, health, safety, education, cooperation/conflict resolution, and equity in distribution/access to benefits, especially among marginalized groups).
Synergies	Multiple benefits achieved in more than one focal area as a result of a single intervention, or benefits achieved from the interaction of outcomes from at least two separate interventions in addition to those achieved had the interventions been done independently. • Independent Evaluation Office of the GEF. 2018. *Evaluation of the Multiple Benefits of GEF Support through Its Multifocal Area Portfolio*. Volume 1. Washington, DC: IEO. www.gefieo.org/evaluations/evaluation-multiple-benefits-gef-support-through-its-multifocal-area-portfolio-map-2016. • Independent Evaluation Office of the GEF. 2018. *Evaluation of the Multiple Benefits of GEF Support through Its Multifocal Area Portfolio*. Volume 2. Washington, DC: IEO. www.gefieo.org/sites/default/files/ieo/evaluations/files/multiple-benefits-2016-v1_0.pdf.
Trade-offs	A reduction in one benefit in the process of maximizing or increasing another benefit. • Independent Evaluation Office of the GEF. 2018. *Evaluation of the Multiple Benefits of GEF Support through Its Multifocal Area Portfolio*. Volume 1. Washington, DC: IEO. www.gefieo.org/evaluations/evaluation-multiple-benefits-gef-support-through-its-multifocal-area-portfolio-map-2016.

	• Independent Evaluation Office of the GEF. 2018. *Evaluation of the Multiple Benefits of GEF Support through Its Multifocal Area Portfolio*. Volume 2. Washington, DC: IEO. www.gefieo.org/sites/default/files/ieo/evaluations/files/multiple-benefits-2016-v1_0.pdf.
Enabling Conditions	Conditions that are key to a broader adoption of impacts (e.g., institutional and individual capacities, governance frameworks, financing mechanisms, knowledge and information dissemination, participatory processes). Independent Evaluation Office of the GEF. 2019. *Evaluation of GEF Support to Scaling up Impact*. Washington, DC: IEO. www.gefieo.org/evaluations/evaluation-gef-support-scaling-impact-2019.
Broader adoption	The adoption of GEF-supported interventions by governments and other stakeholders beyond the original scope and funding of a GEF-supported pilot. This may take place by sustaining, replicating, mainstreaming, and scaling up (see definitions below). Independent Evaluation Office of the GEF. 2014. *Final Report: At The Crossroads For Higher Impact* (2014), Overall Performance Study 5. Washington, DC: IEO. www.gefieo.org/sites/default/files/ieo/evaluations/ops5-final-report-eng.pdf.
Sustaining	The continuation/likely continuation of positive effects from the intervention after it has come to an end, and its potential for scale up and/or replication. Interventions need to be environmentally as well as institutionally, financially, politically, culturally and socially sustainable. Independent Evaluation Office of the GEF. 2019 *The GEF Evaluation Policy 2019* (unedited). Washington, DC: IEO. www.gefieo.org/evaluations/gef-evaluation-policy-2019.
Replication	When a GEF intervention is reproduced at a comparable administrative or ecological scale, often in different geographic areas or regions. Independent Evaluation Office of the GEF. 2014. *Final Report: At The Crossroads For Higher Impact* (2014), Overall Performance Study 5. Washington, DC: IEO. www.Gefieo.Org/Sites/Default/Files/Ieo/Evaluations/Ops5-Final-Report-Eng.Pdf.
Mainstreaming	When information, lessons, or specific aspects of a GEF initiative are incorporated into a broader stakeholder initiative. This may occur not only through governments but also through development organizations and other sectors. Independent Evaluation Office of the GEF. 2014. *Final Report: At The Crossroads For Higher Impact* (2014), Overall Performance Study 5. Washington, DC: IEO. www.Gefieo.Org/Sites/Default/Files/Ieo/Evaluations/Ops5-Final-Report-Eng.Pdf.
Scaling-up	Increasing the magnitude of global environmental benefits and/or expanding the geographic and sectoral areas where they are generated to cover a defined ecological, economic, or governance unit. May occur through replication, mainstreaming, and linking. Independent Evaluation Office of the GEF. 2019. *Evaluation of GEF Support to Scaling up Impact*. Washington, DC: IEO. www.gefieo.org/evaluations/evaluation-gef-support-scaling-impact-2019.
Transformational change	Deep, systemic, and sustainable change with large-scale impact in an area of major environmental concern. Defined by four criteria: relevance, depth of change, scale of change, and sustainability. Independent Evaluation Office of the GEF. 2018. *Evaluation of GEF Support for Transformational Change.* Washington, DC: IEO. www.gefieo.org/evaluations/evaluation-gef-support-transformational-change-2017.
Additionality	▪ Changes in the attainment of direct project outcomes at project completion that can be attributed to GEF's interventions. These can be reflected in an acceleration of the

	adoption of reforms, enhancement of outcomes, or reduction of risks and greater viability of project interventions. ▪ Spill-over effects beyond project outcomes that may result from systemic reforms, capacity development, and socio-economic changes. ▪ Clearly articulated pathways to achieve broadening of the impact beyond project completion that can be associated with GEF interventions. Independent Evaluation Office of the GEF. 2018. *An Evaluative Approach to Assessing GEF's Additionality.* GEF/ME/C.55/inf. 01, November 26, 2018. 55th GEF Council Meeting held in Washington, DC December18–20. Washington, DC: IEO. www.gefieo.org/sites/default/files/ieo/council-documents/files/c-55-me-inf-01.pdf.

3. Annex 1.B Template for Post-Completion Data

This template is used to organize information collected from various sources into a standard format to enable the extraction of data for further analyses and comparison across a set of post-completion evaluations. The template includes the **intervention** as a unit of analysis so that multiple GEF-supported projects and programs that promote the **same technologies/approaches with explicitly linked objectives** can be analyzed together as a coherent package through which the GEF aims **to achieve a specific impact in a specific sector within a specific geographic area**, such as a city, country, or ecosystem (e.g., sustainable forest management in the southern dryland regions of Ethiopia, DDT elimination in small-scale farms in Gansu Province). The post-completion evaluation uses the implementation end-date of the most recent project as the starting point for assessing post-completion outcomes.

The template is meant to capture information comprehensively, such that it can be used as a reference document for various analyses of current and future objectives alike, without duplicating the data collection effort from many of the documents. Context-specific interview questions will need to be developed for each post-completion evaluation to allow the template to be filled in accurately and reliably. The format of the report also will depend on the relative importance of findings to be communicated following the analysis of this template but would generally follow the outline in Annex 1C.

B.1. Intervention Information

1.1.a.	**What is the GEF-supported intervention that is being assessed post-completion?**	
1.1.b.	**Which geographic area(s) did it aim to cover?**	

1.2	Project Information	GEF ID _____	Add or delete columns according to number of projects included in analysis
	Project Title		
	Country/countries		
	GEF Agency		
	GEF grant amount (actual)		
	Co-financing total (actual)		
	Project Objectives		
	Key Activities Implemented		

	(e.g., related to innovations, enabling conditions, broader adoption)		
	Implementation Start Date		
	Implementation End Date		
	Data sources used		

1.3 List the intervention's key activities and the corresponding intended outcomes that need to be assessed post-completion.

Key Activity	**Intended Environmental Impacts**	**Intended Social Impacts**	**Other Key Intended Outcomes** (e.g., enabling conditions, broader adoption)

1.4	**Based on the latest theory of change, are there any unintended (positive and negative) outcomes that need to be assessed? If yes, please specify.**	

B.2. Outcomes

2.1 Key Environmental Impacts

What are the intervention's key environmental impacts (intended and unintended), and what have been the results? Specify years when data was collected or, if not available, the time period between baseline and end-line data. Include quantitative/qualitative data, scale of change in relation to targeted area/unit, and scale of environmental concern being addressed. Include web links, document titles with page number, name of interviewee, among others for each piece of data to allow verification of information. In the last column, specify the direction of change between completion and the current period.

Environmental Change/Trend Reported [a]	At Completion	Latest Information [b]	Direction of Change
			Improved No Change Worsened Unable to assess

[a] Match to outcomes identified in Question 1.3 and Question 1.4.

[b] Indicate year of data, not data source

2.2 Key Social Impacts

What are the intervention's key social impacts (intended and unintended), and what have been the results? Specify years when data was collected or, if not available, the time period between baseline and end-line data. Include quantitative/qualitative data, scale of change in relation to targeted area/unit, and scale of environmental concern being addressed. Include web links, document titles with page number, name of interviewee, among others for each piece of data to allow verification of information. In the last column, specify the direction of change between completion and the current period.

Social Change/Trend Reported [a]	At Completion	Latest Information [b]	Direction of Change
Level of income/ opportunities for income			Improved No Change Worsened Unable to assess
Community relationships			

[a] Match to outcomes identified in Question 1.3 and Question 1.4.

[b] Indicate year of data, not data source

2.3 Synergies and Trade-offs

Were any of the key impacts identified above generated as synergies? Were any of the changes/trends affected by trade-offs? YES / NO

CHANGE/TREND REPORTED	At Completion	Latest Information
Synergies From the impacts above, note any that were generated as a "win-win", including any unintended, and how these came about.		
Trade-offs From the impacts above, note any that resulted in a decrease in another outcome, including any unintended, and any measures taken to mitigate the trade-off.		

2.4 Broader Adoption

Which of the intervention's key activities have been broadly adopted? A key activity may be an innovation (technology or approach), an enabling condition, or a process that fosters broader adoption. Specify details of the broader adoption of each key activity, including the type of mechanism and the quantitative and geographic extent. Specify years when data was collected or, if not, the time between baseline and endline data. In the last column, specify which mechanisms of broader adoption took place between time of completion and the current period.

Key Activity	At Completion	Latest Information	Sustaining	Replication	Mainstreaming	Scaling-up
			Yes In process No Unable to assess NA	Increase Decrease No change In process Unable to assess NA	Increase Decrease No change In process Unable to assess NA	Increase Decrease No change In process Unable to assess NA

2.5 Transformational Change

Has the intervention contributed to any of the following criteria of transformational change?

Criteria		Supporting Evidence
Relevance. The intervention design and intended results were consistent with local and national environmental priorities and policies and to the GEF's strategic priorities and objectives, and they remained suited to the conditions of the context over time.	Yes In process No Unable to assess	
Depth of change. The intervention causes or supports a fundamental change in a system or market.	Yes In process No Unable to assess	
Scale of change. The intervention causes or supports a full-scale impact at the local, national, or regional level.	Yes In process No Unable to assess	
Sustainability. The impact is financially, economically, environmentally, socially, and politically sustainable in the long term, post-intervention ends.	Yes In process No Unable to assess	

	Based on the criteria above, have any transformational changes occurred at completion and/or post-completion?	Yes In process No Unable to assess
	If so, describe the change that occurred, including how it occurred. If not, describe how the GEF intervention is contributing to a potential transformational change at present, if applicable.	

B.3. Influencing Factors

Should a pre-population be carried out with a list of factors to select from to facilitate analysis?

3.1 Contributing Factors

Which factors contributed to a POSITIVE change or trend, post-completion? Specify the role of other actors such as government, other donors, beneficiaries, academia, and private sector, among others.

a.	Which key enabling and catalytic conditions resulted in each made each positive outcome happen?
b.	Which key activities and actors contributed to creating or strengthening these conditions?
c.	Did GEF support contribute to creating or strengthening these conditions? If so, how and for which conditions? Please specify the areas and extent to which GEF support was additional.

3.2 Challenges

Which factors caused NEGATIVE or NO further change, post-completion, or which prevented a positive outcome from occurring or increasing? Specify the role of other actors such as government, other donors, beneficiaries, academia, and private sector, among others.

a.	Which enabling and catalytic conditions were missing that led to each negative outcome? Which challenges prevented positive outcomes?
b.	Which key activities and actors contributed to removing or weakening these conditions, or prevented them from being present?
c.	Did GEF support fail to address any of these conditions during implementation when it could have? If so, how and for which conditions?

3.3 Summary Table for the Role of GEF

How did GEF support contribute to positive and negative outcomes? Specify for the intervention in general and/or for each key activity where relevant.

Key Activity	Environmental Impacts	Social Impacts	Synergies	Mitigation of Trade-Offs	Broader Adoption	Transformational Change	Enabling Conditions	Catalytic Conditions	Additional?
Intervention in general	Positive Negative No influence Unable to assess NA	Positive Negative No influence Unable to assess NA	Positive Negative No influence Unable to assess NA	Positive Negative No influence Unable to assess NA	Positive Negative No influence Unable to assess NA	Positive Negative No influence Unable to assess NA	Positive Negative No influence Unable to assess NA	Positive Negative No influence Unable to assess NA	Yes No Unable to assess NA

B.4. Likelihood of Sustained Progress

4.1 Remaining Barriers

	Are there any remaining barriers that may prevent further impact, broader adoption, and transformational change in the near future? If so, describe the barriers and how they will affect progress.	
	How are the current barriers relative to those at the time of completion?	Greater Same Lesser Unable to assess

4.2 Existing and Potential Risks

	Are there any existing or potential risks that may prevent further impact, broader adoption, and transformational change in the near future? If so, describe the internal and/or external risks and how they will prevent progress.	
	How are current and potential risks relative to those at the time of completion?	Greater Same Lesser Unable to assess

4.3 Overall Sustainability Ratings

	Given the over-all direction of changes and trends in outcomes, how sustainable, since this assessment, has the intervention been?	Highly sustained Sustained Somewhat sustained Not sustained
	Risks to sustainability. Given the contributing and hindering factors at present, as well as existing barriers and risks, what is the overall likelihood of positive outcomes and broader adoption NOT CONTINUING to happen, or NOT HAPPENING in the near future?	Likely to not continue/happen Moderately Likely to not continue/happen Moderately Unlikely to not continue/happen Unlikely to not continue/happen

4. Annex 1.C. Outline for Post-Completion Evaluation Report

1. Summary of Intervention

- Objectives, financing, and implementation period, among others. [Question 1]
- Sectoral and institutional context
  - Issues that needed resolving. Resources and capacities at the time, as well as the gaps. Reason for the intervention requirement at that point in time. [Project documents/terminal evaluations + Question 3]
- Theory of change
  - Key outcomes required to resolve the issue, and length of time for outcomes to be achieved. How the outcomes are supposed to be sustained and expanded beyond this intervention.

2. Summary of Outcomes and Influencing Factors

- Summary table of direction of change for key environmental impacts, key social impacts, broader adoption and transformational change. [Question 2]
- What was sustained/expanded and the reasons why. [Question 2 and Question 3.1]
- What was not sustained/expanded and the reasons why not. [Question 2 and Question 3.2]
- Unanticipated positive/negative trends and influencing factors, if any, found during the evaluation. [Question 2 and Question 3]
- Summary of the role/additionality of the Global Environment Facility (GEF) versus other actors in the sustainability of outcomes and broader adoption. [Question 3]
  - What GEF support did best in which contexts, what did not work as well, and the reason(s) why.

3. Lessons for the GEF
   - What should be continued. [Question 3]
   - What should be improved or changed. [Question 3 and Question 4]
   - External risks to address and how they might be addressed. [Question 4]

4. Annexes
   - Post-completion template
   - Key actors in the context and their relevant interventions
   - List of data sources, including interviewees
   - Methods used + technical documents of full data analyses.

III. Geospatial Analysis for Post-Completion Assessment: GEF Yellow Sea Portfolio

11. Post-completion evaluation is made more difficult by the fact that a project's impact may vary over time. For example, the outcomes of an intervention that have been sustained for two years following project closure may be found to have declined five years later due to a decrease in funding and political priority. The same positive outcomes and trends, however, may begin to show 10 years following project completion based on the ultimate establishment of institutional capacities to enable positive change.

12. Ideally, each GEF intervention will be evaluated several times post-completion to track trends in outcome sustainability. However, given budget restrictions, this is not feasible. Some methods, such as field visits that provide evaluators an in-depth and first-hand understanding of outcome sustainability, are time consuming and expensive. In practice, only one post-completion assessment occurs for any given intervention.

13. Quantitative analyses of environmental indicators that are automatically or periodically monitored can help fill the gaps between in-depth field visits. Such analyses could harness a variety of monitoring tools give insight into the impact of GEF interventions, including stream discharge gauges, water quality testing, carbon flux towers, and satellite imagery. Satellite images are particularly attractive for evaluators, given that many are provided and processed free of charge via the internet by several governments, and they have reliable temporal and spatial resolution—generally, an image of the same location on Earth can be obtained at known time intervals.

14. This low-cost alternative (given in-house capacity, software, and hardware to perform the geospatial analysis necessary for the specific evaluation) can provide observations that complement in-depth field visits to show not only how indicators have changed at multiple points in time since project closure, but also to give a baseline of a given indicator before and during project implementation. Geospatial analysis of satellite images can also provide a first-cut analysis for an evaluation; that is, should the analysis reveal sharp changes in the trend of an indicator that might prompt the need for further in-depth methods such as field visits to be deployed. In contrast, should the trends remain stable throughout time, field visits may not be necessary. In this way, geospatial analyses of remote sensing images may provide a low-cost, initial, or continuous analysis for any post-completion evaluation.

1. A Post-Completion Assessment Pilot for the Yellow Sea Region

15. Within this context, the case study of the Yellow Sea region presented here constitutes a post-completion assessment, piloting a geospatial analysis of a remotely-sensed marine water quality indicator. The study demonstrates how geospatial analysis can add to such an assessment, while also going beyond just quantitative analysis to include desk studies of project documents, ongoing interventions considered continuations or follow-ons to GEF projects, interventions unrelated to GEF projects, and interviews of stakeholders within the Yellow Sea region. This study does not, however, pretend to constitute an entire post-completion evaluation, given that there was no field visit. It is acknowledged that without a field visit to the region, the study lacks information that may have been gleaned through visits to key project

implementation sites. The study's main purpose is to show the usefulness of geospatial analysis within the framework of a post-completion evaluation of GEF-supported interventions.

2. Background

16. The Yellow Sea Large Marine Ecosystem (YSLME) is a semi-enclosed sea located between China to the west and the Korean peninsula to the east, with an area of approximately 380,000 square kilometers (Figure 2). Generally, the YSLME is considered to include the Bohai Sea, which is the most northern portion of the YSLME and is even more enclosed than the rest of the Yellow Sea by two Chinese peninsulas, Liaodong and Shandong. One of the most defining features of the Yellow Sea, and especially the Bohai Sea are their shallow depth at a mean of 44 meters.[2] This characteristic means the YSLME has higher primary productivity than deeper oceanic areas as well as a large amount of aquatic animal and plant life, including economically-important fish species. Paired with this unique ecosystem richness is its susceptibility to pollution; the semi-enclosed and shallow nature of the YSLME means that its water does not mix as often with water from the wider Pacific Ocean and, as such, pollution remains trapped within.[3]

17. The pollution issue is exacerbated by a large coastal human population that surrounds the YSLME, with major cities including the Beijing-Tianjin metropolitan area in China; Seoul, Republic of Korea (ROK); and Pyongyang, Democratic People's Republic of Korea (DPRK). All are on the coast or along rivers that empty into the YSLME. Populations and economies in the region have grown exponentially over the last half century, as has the amount of waste being emptied into the YSLME. In recent years, the Bohai Sea has received approximately 40 percent of direct discharged sewage from all of China while only having 2.6 percent of its sea area.[4] This effluent creates an excess of nutrients at certain times of the year, leading to eutrophication, damaging red tides, and hypoxic zones that are so low in oxygen concentration that animals (including economically important fish species) cannot survive.[5] In addition to the issue of land-based pollution from point and nonpoint sources (almost 10,000 nonpoint sources), the damming of many of the more than 40 rivers that enter the YSLME have caused decreasing discharge, leading to more concentrated nutrient-rich waters.[6]

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[2] Zhang, Z., F. Qu., and S. Wang. 2019. "Sustainable Development of the Yellow Sea Large Marine Ecosystem." *Deep-Sea Research Part II,* 163: 102–107.

[3] Meng, J., S. Hong, T. Wang, Q. Li, S. J. Yoon, Y. Lu, J. Giesy, and S. J. Khim. 2017. "Traditional and New POPs in Environments along the Bohai and Yellow Seas: An Overview of China and South Korea." *Chemosphere,* 169: 503–515.

[4] Shang, S., Z. Lee, L. Shi, G. Lin, G. Wei, and X. Li. 2016. "Changes in Water Clarity of the Bohai Sea: Observations from MODIS." *Remote Sensing of Environment*, 186: 22–31.

[5] Xin, M., B. Wang, L. Xie, X. Sun, Q. Wei, L. Liang, and K. Chen. 2019. "Long-Term Changes in Nutrient Regimes and Their Ecological Effects in the Bohai Sea, China." *Marine Pollution Bulletin,* 146: 562–573.

[6] Wang, J., Z. Yu, Q. Wei, and Q. Yao. 2019. "Long-Term Nutrient Variations in the Bohai Sea over the Past 40 Years. *Journal of Geophysical Research,* 124: 703–722.

3. GEF Projects in the Yellow Sea Large Marine Ecosystem

18. To combat the pollution issues facing the YSLME, GEF has, since the fund began in the early 1990s, invested in projects that approach ecosystem improvement in a variety of ways (see Annex 2A for a complete list of Yellow Sea interventions). The most common method is the establishment of mechanisms and initiatives to influence policy and improve stakeholder planning and improvement of waste treatment facilities.

19. The earliest GEF project designed to combat pollution in the YSLME was the Ship Waste Disposal project (GEF ID 587), which aimed to reduce pollution from ship waste through improved incentives and regulatory and policy frameworks along with the establishing ship waste treatment and disposal facilities and improving monitoring. Other projects, such as the Building Partnerships for the Environmental Protection and Management of the East Asian Seas project (PEMSEA) (GEF ID 597) and the Reducing Environmental Stress in the YSLME project (GEF ID 790), established multi-stakeholder groups to improve decision-making around ecosystem health. A set of projects, beginning with Project 597, formed the PEMSEA partnership that facilitates sustainable use and management of the East Asian Seas' coast and marine resources (including the YSLME) via interagency, intergovernmental, and intersectoral partnerships. The Yellow Sea Partnership, created during Project 790, focused on building the YSLME Strategic Action Programme (SAP) for the Yellow Sea ecosystem, which identifies legal, policy, and institutional actions that improve ecosystem health. The Hai River Basin Integrated Water Resources Management project (GEF ID 1323) focused on catalyzing integrated water resource management and pollution control in the Hai River basin through improved planning and management, including institutional support at various levels.

20. Other projects had major waste treatment improvement components in addition to policy actions. The Development and Implementation of Public Private Partnerships in Environmental Investments project (GEF ID 2188), relating to the East Asian Seas region, supported priority infrastructure improvement projects and established a pipeline of waste treatment projects for public-private partnership (PPP) investment. The Second Liaoning Medium Cities Infrastructure project (GEF ID 2972) focused on wastewater treatment by constructing or improving four wastewater treatment plants in the YSLME in Yingkou, Panjin, Fushun, and Gaizhou. The Second Shandong Environment project (GEF ID 2979) established a septic tank system in Yantai to improve solid and wastewater management.

21. Later projects built on the progress of earlier projects, including the Implementation of Sustainable Development Strategy for the Seas of East Asia (SDS-SEA) (GEF ID 2700) which strengthened PEMSEA, scaled up integrated coastal management (ICM) programs and developed national policies and action plans for sustainable coastal development. The Implementation of the Yellow Sea LME Strategic Action Programme for Adaptive Ecosystem-Based Management (GEF ID 4343) also built on project 790 to create the YSLME Commission to facilitate effective ecosystem-based management via policy, financial, and institutional arrangements.

22. This study is a pilot for a post-completion evaluation assessment using geospatial analyses. It focuses only on Yellow Sea area projects that have been completed. In addition,

given the focus on geospatial analyses of environmental indicators, the study assesses completed projects that included outcomes relating to reducing waste flowing into the Bohai Sea and Yellow Sea, especially those that aimed to reduce nutrient loads.

4. Yellow Sea Project Outcomes and Terminal Evaluation Ratings

23. The projects in this portfolio target specific and detailed outcomes but are also relevant to the broader issues and overall goals of GEF's International Waters portfolio as a whole. Termination evaluation (TE) ratings for completed projects in the YSLME area are generally favorable. Among those that rate project relevance, the result is favorable—all five Yellow Sea projects rated for relevance had a Satisfactory or Highly Satisfactory rating (Annex 2B, Table 1). Project 597 was praised for relevance due to the inclusion of ICM in national directives, legal systems, and governance. Project 1323 was relevant to the global intergovernmental mechanism, Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities, and complemented YSLME Commission and PEMSEA projects. Other projects were noted for relating to China's Five-Year Plans and the expressed needs and priorities of governments and organizations, among other factors. Project 790 was praised for a being a unique, cooperative, and community-driven project in the YSLME, while being relevant to the larger GEF International Waters strategy and its Waterbody-Based Operational Program.

24. As with relevance, only some project TEs presented ratings for efficiency (Annex 2B Table 2), whereby six of seven rated projects had either Highly Satisfactory or Satisfactory ratings. Among the projects that rated efficiency, views were generally favorable, and evaluators tended to focus on the benefits to the economy or beneficiaries and methods of achieving efficiency. Project 2188 was extended due to implementation delays, although it still received a Satisfactory efficiency rating.

25. Among completed projects, evaluations positively rated project effectiveness (Annex 2B, Table 3), whereby all four rated projects had Highly Satisfactory or Satisfactory ratings. While projects achieved effective results in various ways, commonly used methods include strong government commitment, collaboration among sectors and organizations, and the need for reliable funding.

26. Sustainability, to varying degrees, was incorporated into the design of all projects according to evaluations (Annex 2B, Table 4), whereby four out of five rated projects received a Likely or Moderately Likely rating. Most approaches fit into the broad themes of financial, institutional, social, and political, or policy-oriented sustainability. Projects also acknowledged the importance of strong commitment from countries and other partners, along with the dependence on reliable funding to ensure project sustainability. Only three projects have TE and IEO annual performance report ratings (Annex 2A.2, Table 2A.2.4 and Table 2A.2.5) that relate to sustainability. For two of these, (790 and 2700), ratings correspond to each other, having overall sustainability ratings of Likely and Moderately Likely, respectively. For Project 2188, the sustainability rating was Likely in the TE, but downgraded to Moderately Unlikely in the annual performance report.

5. Post-Completion Assessment of Environmental Indicators: Methods

27. A method used to measure the post-completion impact of GEF projects is to step back from specific project outcomes and actions and examine environmental indicators more broadly. Such indicators allow evaluators to establish whether or not projects have a cumulative effect on improving an area's environment. Since many GEF projects in the Yellow Sea region focused on one of the most serious environmental issues, that of water pollution, it is useful to use indicators to establish how pollution levels and water quality have changed over time; that is, to understand whether or not there have been any changes since project completion compared to before and during project implementation.

28. In order to understand how completed GEF projects have impacted water quality within the YSLME, a geospatial analysis was undertaken. Several satellite products, including the Moderate Resolution Imaging Spectroradiometer (MODIS) Aqua and the Sea-Viewing Wide Field-of-View Sensor (SeaWiFS), are able to detect several ocean water characteristics. Both sensors take an image of each point on earth every one to two days, although there are many missing data days due to a variety of reasons such as cloud cover. The SeaWiFS dataset runs from 1997 to 2010 and the MODIS Aqua dataset from 2002 to the present. These time periods make it possible to track ocean water characteristics in the Yellow Sea from the early stage of the first GEF project intervention (and prior to project inception in the case of many) through to project implementation—even until the present, several years after most of the projects have reached completion. Based on this, the remote sensing tools are able to show whether the project time periods correlate to any changes in water characteristics.

29. One of the ocean water characteristics mapped by MODIS Aqua and SeaWiFS is that relating to chlorophyll-a, a useful indicator for the biomass of phytoplankton in large bodies of water, although there are some known issues with the MODIS global algorithms.[7,8,9] When there is abundant phytoplankton in a water body, it indicates that nutrients abound and thus the nutrient pollution is high (although phytoplankton levels also vary naturally over the course of a year due to changes in wind and temperature patterns).[10] Studies indicate that remotely-sensed chlorophyll concentrations tend to correlate to changes in climate, increases in aquaculture (e.g., the aquaculture boom in the YSLME in the late 2000s), and river discharge rates, showing sensitivity to major anthropogenic and natural influences on marine nutrient

[7] Gohin, F., B. Saulquin, H. Oger-Jeanneret, L. Lozac'h, L. Lampert, A. Lefebvre, P. Riou, and F. Bruchon. 2008. "Towards a Better Assessment of the Ecological Status of Coastal Waters Using Satellite-Derived Chlorophyll-A Concentrations." *Remote Sensing of the Environment,* 112: 3329–3340.

[8] Son, S. H., M. Wang, and J. K. Shon. 2011. "Satellite Observations of Optical and Biological Properties in the Korean Dump Site of the Yellow Sea." *Remote Sensing of the Environment,* 115: 562–572.

[9] Wang, Y., D. Liu, Y. Wang, Z. Gao, and J. K. Keesing. 2019. "Evaluation of Standard and Regional Satellite Chlorophyll-A Algorithms for Moderate-Resolution Imaging Spectroradiometer (MODIS) in the Bohai and Yellow Seas, China: A Comparison of Chlorophyll-A Magnitude and Seasonality." *International Journal of Remote Sensing*, 40(13).

[10] Zheng, X., and H. Wei. 2010. "Analysis of Chlorophyll Concentration during the Phytoplankton Spring Bloom in the Yellow Sea Based on MODIS Data." In *Life System Modelling and Intelligent Computing—Part III*, edited by K. Li et al. Proceedings of the International Conference on Life System Modelling and Simulation and International Conference on Intelligent Computing for Sustainable Energy and Environment. Wuxi, China.

levels.[11] Different algorithms for MODIS and SeaWiFS are used to convert spectral signatures derived from the chlorophyll concentration sensors. Since the sensors and their associated algorithms may vary, two measurements at the same point in time from the two sensors are unlikely to record the same chlorophyll concentration value. Because of this, it is best to compare the change in values over time rather than focus on the absolute values of concentration at specific points in time.

30. This study uses chlorophyll concentrations sensed by MODIS Aqua and SeaWiFS throughout each sensor's respective period of activity to better understand the change in nutrient pollution over the course of GEF's projects in the YSLME region. The Google Earth Engine platform[12] was used to access Level 3 MODIS Aqua and SeaWiFS data.[13, 14] Given the high cloud cover common in the YSLME area, a majority of the YSLME often had no detected chlorophyll data for a particular day. Even when pixel values were averaged across entire months, large sections of the YSLME had no cloud-free days for many monthly composites. Since obtaining average chlorophyll values from images missing large sections of the YSLME could give skewed results (given that certain areas of the region have consistently higher chlorophyll concentrations than others), each pixel in the daily images were averaged over four quarters of each year of data to provide one image of the entire YSLME for each quarter of each year in the dataset. Quarter 1 (Q1) corresponded to January 1–March 31; Q2 to April 1–June 30; Q3 to July 1–September 30; and Q4 to October 1–December 31.

31. The quarterly images were produced within the Google Earth Engine platform and then exported to desktop ArcGIS software. There, the images were averaged spatially across the entire YSLME to give one average chlorophyll value per image. Another set of averages was calculated for the Bohai Sea area to see how it differed from the entire YSLME.

6. Geospatial Analysis of Water Quality

32. There is high inter-annual variation and a general increasing trend of chlorophyll concentration from the 1990s to the 2010s, followed by a decreasing trend after 2015 (Figure 1). These trends occurred in the entire Yellow Sea and the Bohai Sea. It was noted that the SeaWiFS data generally had lower chlorophyll values than did the MODIS Aqua data for the period in which their datasets overlapped. Their trends, however, were more or less comparable, with a steady chlorophyll concentration between 2002 and 2009 for the greater YSLME and a mini-peak around 2007 in the Bohai Sea.

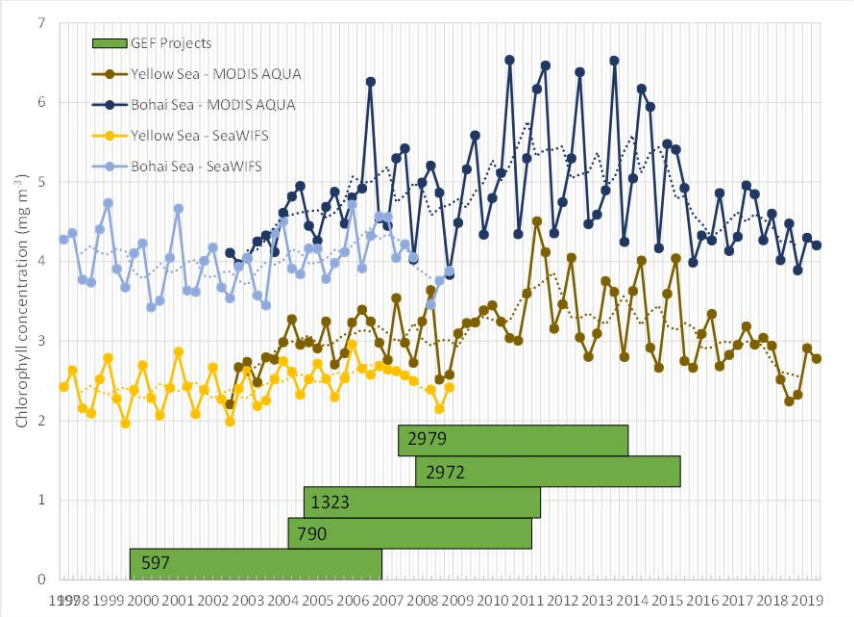
33. Spatial data showed that chlorophyll concentrations were generally higher near coastal areas (Figure 2), but high concentrations tended to spread across the deeper mid-section of the

[11] Fu, Y., S. Xu, and J. Liu. 2016. Temporal-Spatial Variations and Developing Trends of Chlorophyll-a in the Bohai Sea, China." *Estuarine, Coastal and Shelf Science,* 173: 49–56.
[12] For more information, see https://earthengine.google.com.
[13] NASA Goddard Space Flight Center, Ocean Ecology Laboratory, Ocean Biology Processing Group. Moderate-resolution Imaging Spectroradiometer (MODIS) Aqua Ocean Color Data, NASA OB.DAAC, Greenbelt, MD, USA.
[14] NASA Goddard Space Flight Center, Ocean Ecology Laboratory, Ocean Biology Processing Group. Sea-viewing Wide Field-of-view Sensor (SeaWiFS) Data, NASA OB.DAAC, Greenbelt, MD, USA.

Yellow Sea during peak periods (Figure 3). The shallower Bohai Sea had higher concentrations than the southern Yellow Sea in most cases, while the Jiangsu coast—an area of high turbidity—had no data available for much of the period. This may be due to high turbidity causing errors in the chlorophyll algorithms.

34. The trend in the chlorophyll data does not neatly line up with historical project implementation periods, likely for a variety of reasons. First, GEF projects do not exist in a vacuum; they were not and are not the only interventions or actions being taken in the YSLME region that reduce (or increase) nutrient levels. The region is impacted by political, social, economic, and climatic forces outside of GEF project influence that undoubtedly have large impacts on chlorophyll levels. Second, GEF projects have been implemented during the entire period of SeaWiFS and MODIS Aqua sensor periods, meaning that it is not easy to distinguish the effects of particular GEF projects on chlorophyll trends. Third, no GEF project has had the specific goal of reducing chlorophyll—although many aimed to reduce nutrient levels at least in certain areas of the YSLME. Many of the activities carried out under GEF projects had the intention to eventually reduce water pollution; however, it was often by addressing underlying policy and capacity building challenges rather than aiming directly to facilitate wastewater treatment or reduction. It is unlikely that all projects, therefore, would have had immediate impact on chlorophyll levels, although the impact may have been delayed. **The remote sensing data shows that chlorophyll levels began to decline after 2015, which could be at least partially caused by a sustained effort, beginning in the 1990s, by GEF and other actors to manage waste and pollution in the YSLME. This points to a possible delayed success that only materialized after over 20 years of implementation**. The high concentrations seen in the early 2010s may represent the increase in population, wastewater discharge, and effects of upstream dams peaking before clean water policies and actions were put in place.

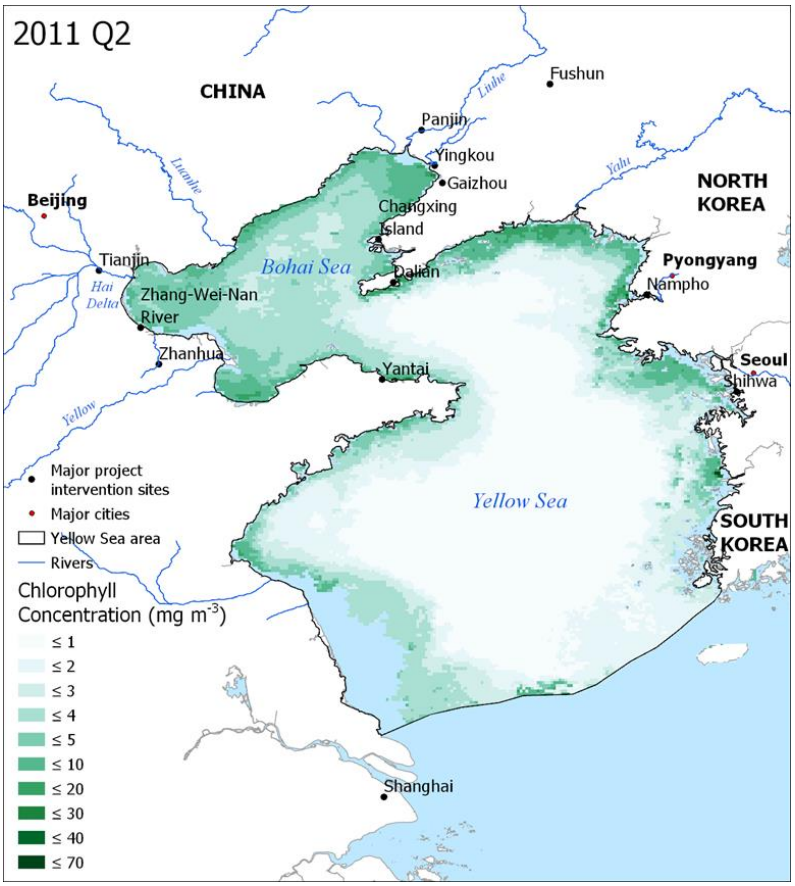
Figure 1: Time Series of Chlorophyll Concentration from Mid-1997 to Mid-2019 for the Wider Yellow Sea Large Marine Ecosystem and the Bohai Sea Only1



Source:

[1] MODIS Aqua and SeaWiFS data are shown for their respective periods of activity. Dotted lines show the rolling average of each sensor. Implementation periods for selected historical GEF projects are shown as green bars.

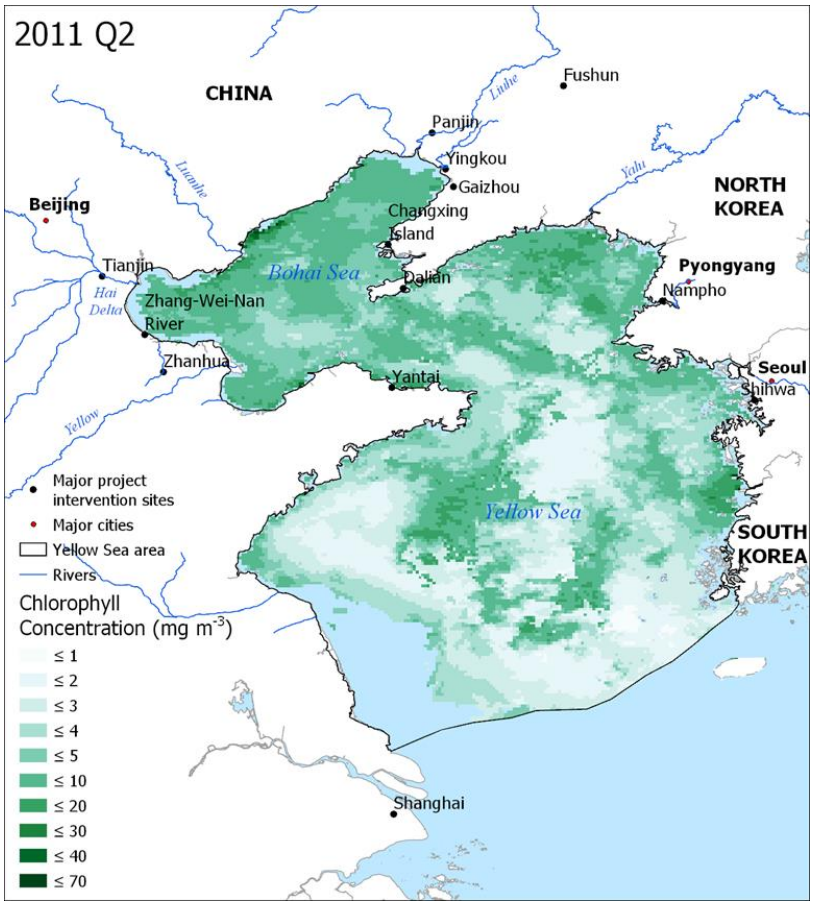
Figure 2: Average Chlorophyll Concentration in Quarter 3 of 2002 in the Yellow Sea Large Marine Ecosystem1



Source:

[1] This represents a period of relatively low chlorophyll concentration. Key GEF project areas also are shown, along with major cities and rivers in the region. Areas of blue represent pixels that had no days with chlorophyll data during the period.

Figure 3. Average Chlorophyll Concentration in Quarter 2 of 2011 in the Yellow Sea Large Marine Ecosystem[1]



Source:

[1] This represents a period of relatively high chlorophyll concentration. Key GEF project areas are also shown along with major cities and rivers in the region. Areas of blue represent pixels that had no days with chlorophyll data during the period.

7. Post-Completion Assessment of GEF Project Outcomes

35. The geospatial analysis of remotely-sensed chlorophyll in the YSLME region provides a favorable overarching view of how GEF projects may have impacted the quality of sea water. Actions taken by GEF include the financing of waste infrastructure, facilitation of stakeholder groups, and enhancement of GEF project monitoring. It is important, from a post-completion and sustainability perspective, to understand if these actions and initiatives have been sustained, mainstreamed, replicated, upscaled, or caused market change. The following section attempts to respond to these questions through an in-depth document review and discussions with former project staff.

36. **The initiatives of several completed GEF projects have remained sustainable through as a result of subsequent and ongoing GEF-funded projects.** This is especially true for Project 597, which established PEMSEA. Project 597 outcomes have been furthered in Project 2700, (SDS-SEA) and the Scaling Up the Implementation of the Sustainable Development Strategy for the Seas of East Asia project (GEF ID 5405). Project 2700 scaled up the ICM work that was piloted in Project 597; it continued the stakeholder convening work by establishing an East Asian Seas Partnership Council and setting up PPPs. In addition to the two ICM pilot sites in the YSLME region, created under Project 597, there are now six more ongoing or planned ICM sites in the region in Leting, Dongying, and Lianyungang (existing), and Qingdao and Changyi (planned)—all in China.[15] The latest PEMSEA annual report also notes plans to establish a National ICM Coordinating Committee in the DPRK to scale up the Nampho ICM site that was established during Project 597.[16]

37. The SDS-SEA was adopted by 12 governments in 2003 (including China, DPRK and ROK—the three countries in the YSLME region) and two more in 2006, demonstrating a mainstreaming impact that has its roots in Project 597. Project 5405 focused more on the investment side, driving the SDS-SEA into action and furthering the work to build a "sustainable coastal and ocean-based blue economy." In 2015, the SDS-SEA was updated to take into account new or amended international and regional agreements, such as the United Nations Framework Convention on Climate Change, Sendai Framework for Disaster Risk Reduction, Rio+20 (The Future We Want), and Sustainable Development Goals of the United Nations.[17]

38. Another completed GEF project that has had outcomes furthered by subsequent GEF projects was Project 790. A subsequent project, Project 4343, supports the institutionalization of the Yellow Sea Commission to oversee SAP implementation for the YSLME area in order to reduce the decline of biological resources and ensure the restoration of depleted fish

[15] See http://pemsea.org/our-work/integrated-coastal-management/ICM-sites.
[16] PEMSEA. 2019. *PEMSEA Annual Report 2018*. Quezon City, Philippines: Partnerships in Environmental Management for the Seas of East Asia.
http://pemsea.org/sites/default/files/PEMSEA_Annual_Report_2018_20190627_compressed.pdf
[17] See http://pemsea.org/our-work/regional-marine-strategy.

populations.[18] The SAP was first developed under Project 790, which shows the sustainable use (at least in the short-term) of a main project outcome. The Yellow Sea Commission, which will include the Inter-Ministry Coordinating Committee established under Project 790, is intended to become financially self-sustainable, although details on how this will take place have yet to be gathered.

39. Project 1323 also has seen its project outcomes sustained through a follow-on GEF project, Mainstreaming Integrated Water and Environment Management (GEF ID 5561). Project 5561, considered the second phase of Project 1323, further develops the evapotranspiration (ET) monitoring system, developed in Project 1323, and integrates a second monitoring component of "environmental capacity". This new component attempts to monitor pollution levels in the Hai River basin and, together with the ET method, combines water quantity and quality issues under a single monitoring framework. Project 5561 also aims to apply this integrated monitoring framework to other river basins that flow to the Bohai Sea—a scaling up of Project 1323 outcomes. Furthermore, Project 5561 is mainstreaming integrated water and environmental management (IWEM) planning (piloted in Project 1323) and is attempting to mainstream the monitoring framework within those Chinese public sector entities involved in the project, such as the Ministry of Water Resources and the Ministry of Ecology and Environmental Protection.

40. Project 1323 also evidences sustainability beyond additional GEF funding. A component of the ET monitoring system has been the use and installation of eddy covariance towers. These towers, used in Project 1323, also have been used in other peer-reviewed scientific studies, and are relevant to GEF-funded monitoring infrastructure.[19,20] A 2017 working paper, produced several years following project completion, notes that the monitoring system was replicated in a project relating to the Tarim River in northwestern China and that the integrated water resource management plan produced during the project was being implemented at a basin level program, post-project.[21] Beyond the monitoring system, Chinese government officials have noted that the IWEM work for this project has built the capacity of ministry officials and influenced the 12th and 13th Five-Year Plans for the Hai River basin, increasing the focus on wastewater management and pollution reduction in the Bohai Sea.[22]

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[18] See https://news.iwlearn.net/the-second-phase-of-undpgef-yslme-project-launched-in-seoul.

[19] Xu, Z., L. Shaomin, H. and Minggang. 2009. "Measurements of Evapotranspiration by Eddy Covariance System in the Hai River Basin." Proceedings of the 2009 International Symposium of HAIHE Basin Integrated Water and Environment Management.

[20] Xu, J., B. Wu, N. Yan, and S. Tan. 2018. "Regional Daily ET Estimates Based on the Gap-Filling Method of Surface Conductance." *Remote Sensing,* 10(4): 554.

[21] Duda, A. M., 2017. "Co-managing land and water for sustainable development." Global Land Outlook Working Paper, United Nations Convention to Combat Desertification.
https://knowledge.unccd.int/sites/default/files/2018-06/1.%20Land-Water%2BNexus__A_M_Duda.pdf.

[22] Discussion with Zhang Xiaolan, Deputy Director, Division of Technology Cooperation, Foreign Economic Cooperation Office, Ministry of Ecology and Environment. November 4, 2019.

41. The three completed projects (597, 790 and 1323) that have achieved sustainability as a result of continued GEF funding will face the challenge of sustaining programs and stakeholder groups beyond GEF support.

8. GEF-funded wastewater treatment infrastructure

42. Projects 2972 and 2979 have significantly contributed to wastewater treatment facilities in the Chinese provinces of Liaoning and Shandong. In general, Project Management Office (PMO) reports indicate that the facilities are achieving sustainability, at least at present.[23] With regard to Liaoning Project 2972, it appears that at least three of the four wastewater treatment facilities continue to run at full capacity, with operations having been transferred to the private sector. The Yingkou-Eastern and Panjin-Shuangtaizi wastewater treatment plants are presently running at full capacity (100,000 tons per diem) as does the Gaizhou sewage treatment plant (50,000 tons per diem). PMOs did not provide information on the Fushun facility. The Panjin facility was transferred to a private company in 2009, the Yingkou operation became private in 2019, and the Gaizhou facility is operated by a state-owned enterprise. It appears that all three companies are paid an agreed rate by the government per ton of waste processed. Although funding is described as sustainable, it is not clear how the provincial governments allocate the money for the treatment. The Project 2972 TE indicates that tariffs for waste producers were to be introduced to fund the wastewater treatment; these planned tariffs, however, appeared insufficient to sustain operations. There is no indication whether or not the tariffs now cover costs or whether funding is being allocated from a different public source.

43. PMOs also noted that wastewater treatment is a prominent feature in the 13th Five-Year Plan of Liaoning Province (2016–020). Project 2972 was key to raising awareness and has built the capacity of the public sector and other stakeholders to carry out wastewater treatment plans and build this into formal policy. The plan calls for the construction of rural township sewage treatment facilities and industrial treatment projects, sets target sewage treatment rates, and calls for the improvement of ecological flows, among other initiatives.

44. In Shandong Province, Project 2979 is another case of a GEF wastewater infrastructure investment in a septic tank management system in Yantai. PMOs indicate that the system remains operational and is managed by the Yantai City Drainage Service Center. The system has been expanded several times to over 3,000 septic tanks, up from between 1,000-2,000 at project completion. It is apparent from the PMOs that the management complies with tank treatment and cleaning standards. The amount allocated for operating expenses of the system was increased to Y 2.7 million per annum between 2016–19.

45. For both projects, it is encouraging from a sustainability perspective to learn that the public sector has taken over management of GEF-supported infrastructure. Financially, most of

[23] Correspondence with Yan Guangyu, Liaoning Urban Construction and Renewal Project Office (Project 2972) and Guangming Yan, Senior Urban Development Specialist and former Team Leader of Project 2979, World Bank.

these GEF investments appear sustainable as they have government-allocated budgets, showing stakeholder buy-in to GEF project outcomes.

9. Non-GEF Related Initiatives and Actions

46. To obtain a broad picture of all the actions and initiatives that might have influenced the YSLME since GEF's investment in the region, it is important to look beyond just GEF projects and their initiatives. In terms of the public sector, it is clear that throughout the last 20 years, YSLME countries—in particular, China and ROK—have become increasingly aware of and more willing to act to resolve their water pollution issues. As early as 1994, the two countries signed a Memorandum of Understanding relating to marine science and technology, which led to the establishment the following year of the China-Korea Joint Ocean Research Center. Most recently, both countries signed the China and Korea Marine Field Cooperation Plan for 2016–20, thus boosting cooperation with regard to marine issues. In particular, several GEF YSLME projects have been jointly implemented by the two countries.[2]

47. Unilaterally, the Government of China and the Government of ROK are taking steps to improve marine conditions within the YSLME. Based on China's 13th Five-Year Plan, the country plans to spend Y 559 billion (0.75 percent of gross domestic product) on its water treatment industry, with wastewater treatment funding to increase to 31 percent from the previous Five-Year Plan. Liaoning is the only one of the YSLME-bordering provinces among the four provinces earmarked to receive the most wastewater treatment funding.[24] In the meantime, the Government of ROK has enacted a Marine Spatial Planning and Management Act (2018) to establish an Integrated Marine Spatial Information Platform by 2022 that will create a unified platform for use by several agencies and various levels of government.[16]

48. These examples indicate that stakeholders are taking pollution in the YSLME region more seriously and are promoting long-term policy and cooperation to tackle issues beyond international development funding. There is evidence that GEF projects, through awareness-raising and capacity building, may have directly or indirectly influenced such shifts in policymaking.

IV. CONCLUSIONS

The evidence presented supports the conclusion that GEF projects in the Yellow Sea have achieved sustained impact. A geospatial analysis indicates improvement, albeit delayed, in the quality of water that may not have been possible without sustained environmental progress at least partially financed by GEF.

49. A geospatial analysis of remotely-sensed chlorophyll concentration from 1997 to 2019 shows an increase from the late 1990s to the mid-2010s, with a decline to approximately the same levels of the late 1990s. Trends in the greater YSLME and the Bohai Sea are similar,

[24] See www.gcis.com.cn/china-insights-en/industry-articles-en/231-china-s-13th-five-year-plan-the-wastewater-treatment-industry.

although the Bohai Sea constantly had a higher chlorophyll concentration, attributed to further input of nutrient pollution and a more enclosed sea. It is likely that GEF-financed initiatives and others have taken several years or decades to impact the quality of YSLME water. The theory is reasonable, considering that large, multi-country initiatives can take many years to coordinate before influencing policy. Government action to combat water pollution appears to have gathered force in the 1990s, when it became clear that pollution in the YSLME region was a growing challenge that called for investment in environmental projects, as well as funding from organizations such as GEF. Nevertheless, a growing population, shipping traffic, and waste water dumped into the water bodies of the region continued to deteriorate the quality of water into the 2010s. It was not until late 2010 that the cumulative impact of environmental initiatives and investment began to show a large-scale improvement in water quality.

50. Desk studies and discussions have pointed to various projects that show significant sustained impact following project completion although, in many cases, the impact is a result of continued GEF funding. For example, ICM pilot Project 597 continues to be replicated and mainstreamed into regional management plans through Project 2700 and Project 5405. This is an encouraging sign, given that sustained agency presence is a good indicator of long-term impact. It remains to be seen, however, whether or not project sustainability will continue were GEF funding to cease.

51. There is significant evidence of sustainability in wastewater infrastructure, since the majority of facilities appear to remain in operation at full capacity as a result of continued government financing (without continued GEF funding) and private sector management. Also promising is the fact that septic tank management is being scaled up to include more tanks. In addition, the water balance monitoring system that was piloted has been replicated in other areas of China.

V. Geospatial Analysis for Post-Completion Assessments

52. The post-completion evaluation pilot assessment indicates that geospatial analyses of environmental indicators provide a valuable tool to gain insight to the impacts of GEF initiatives. Not only does remote sensing allow for a pattern of observed time series data, but it also enables evaluators to understand the cumulative impact of GEF interventions, combined with other interventions, within a system or region to establish whether or not ecosystems are improving—a goal of which is at the center of GEF environmental funding. This type of coarse-scale analysis is not feasible through field visits nor from interviews that provide a limited focus of environmental progress. Furthermore, geospatial analyses are able to provide an initial assessment of the sustainability potential of GEF projects and programs that will influence the post-completion evaluation assessment. In terms of field visits, it may be more productive if the evaluator had a grasp of how environmental indicators have changed over time prior to the visit and is able to establish their cause while in the field.

53. Despite its usefulness, there is a limit to geospatial analyses. The method is useful only for those projects with environmental indicators that can be detected remotely. Such indicators include forest or habitat loss, other types of land use change, land degradation, some types of water quality, and a presence of surface water. Other indicators, such as those relating to policy

reform or gender inclusion may not be able to be remotely detected. Some indicators may be measured by ground-based monitoring systems, such as eddy covariance towers or stream discharge gauges. However, it is often a challenge to obtain such data compared to the data easily available from satellite imagery.

54. This case study of GEF Yellow Sea projects demonstrates that a mix of quantitative and qualitative methodology should be applied to post-completion evaluation assessments. Geospatial analyses and other monitoring of environmental indicators will provide more of an overview that can be complemented by interviews, research, and site visits. Together, the approaches create a holistic evaluation of sustainable impact.

1. Annex 2A. Overview of GEF Projects in the Yellow Sea Region

Project ID	Title	End and Start Dates	Implementing Agency	Selected Outcomes
587	Ship Waste Disposal	Start date: Dec 1992 End Date: Jun 1997	World Bank	Ports of Dalian and Tianjin: Prevented dumping of thousands of tons of ship waste into oceans; improved waste reception and treatment in multiple ports; provided new monitoring equipment, oil contaminant booms, and garbage transport trucks, among others.
597*	Building Partnerships for the Environmental Protection and Management of the East Asian Seas	Start date: Oct 1999 End Date: Dec 2006	United Nations Development Programme (UNDP)	Six integrated coastal management (ICM) demonstration sites and 18 parallel sites; exceeded human resource development training goals; created network of experts; collaborated with nongovernment organizations and others.
790*	Reducing Environmental Stress in the Yellow Sea Large Marine Ecosystem	Start date: Apr 2004 End Date: Mar 2011	UNDP	Increased capacities; establishment of Yellow Sea Partnership; analysis of environmental status and trends; regional joint cooperative cruises and full data exchange between countries; demonstrated activities of Yellow Sea LME Strategic Action Programme; developed regional scientific and management tools.
1323*	Hai River Basin Integrated Water Resources Management	Start date: Sep 2004 End Date: Jun 2011	World Bank	Integrated water and environmental management plans for pilot counties; vertical and horizontal integration; knowledge sharing between agencies; exceeded wastewater reduction targets in small cities along Bohai Sea; chemical oxygen demand (COD) and ammonia/nitrogen (NH3-N) reduction; introduced real water savings concept; introduced cooperative institutional mechanisms; developed and implemented integrated water and environmental management plans.
2188*	East Asian Seas Region: Development and Implementation of Public Private Partnerships in Environmental Investments	Start date: Jun 2004 End Date: Dec 2009	UNDP	Supported priority environmental infrastructure improvement projects from local governments and communities at selected PEMSEA sites; investment potential in environmental improvement reinforced by public-private partnership (PPP) development; established effective

Project ID	Title	End and Start Dates	Implementing Agency	Selected Outcomes
				PPPs; increased involvement of ICM practitioners in PPP process
2454	World Bank/GEF Partnership Investment Fund for Pollution Reduction in the Large Marine Ecosystems of East Asia (Tranche 1 of 3 tranches)	Start Date: Nov 2005 End Date: N/A	World Bank	
2700	Sustainable Development Strategy for the Seas of East Asia (SDS-SEA)	Start Date: Nov 2007 End Date: Jun 2013	UNDP	East Asian Seas Partnership Council; mainstreamed national policies and programs on sustainable ocean and coastal development; ICM scale up; strengthened use of human capital and intellectual resources; public-private cooperation; strategic partnership for sustainable development of East Asian Seas; corporations integrated sustainable responsibility into practices.
2972*	China: Liaoning Medium Cities Infrastructure (subproject of 2454)	Start Date: Dec 2007 End Date: Jun 2015	World Bank	Improved wastewater infrastructure; lowered nutrient loads of Liao River and Bohai Sea; increased cost recovery of utilities; increased staff skill; achieved all physical smart water management infrastructure targets.
2979*	Second Shandong Environment (subproject of 2454)	Start Date: Jun 2007 End Date: Dec 2013	World Bank	Improved wastewater collection and treatment; improved river quality and environment of project areas; reduced pollution discharge into Bohai Sea.
3025	World Bank/GEF Partnership Investment Fund for Pollution Reduction in the Large Marine Ecosystems of East Asia (Tranche 1, Second Installment)	Start Date: Jun 2007 End Date: N/A	World Bank	
4343	Yellow Sea LME Strategic Action Programme for Adaptive Ecosystem-Based Management	Approval Date: Apr 2013 Expected End Date: July 2019	UNDP	

Project ID	Title	End and Start Dates	Implementing Agency	Selected Outcomes
5405	Scaling up the Implementation of the Sustainable Development Strategy for the Seas of East Asia	Approval Date: Jun 2013 Expected End Date: September 2018	UNDP	
5561	China: GEF Mainstreaming Integrated Water and Environment Management	Approval Date: May 2014 Expected End Date: December 2021	World Bank	

* Projects considered for this post-completion evaluation assessment.

2. Annex 2 B. Ratings from Terminal Evaluations

Table 1: Terminal Evaluation Ratings on Relevance

Project ID	Relevance Rating	Relevant to other Projects	Relevant to Five-Year Plans	Relevant to Country Partnership Strategy	Relevant to Expressed Needs and Priorities
587					
597	Highly Satisfactory*				
790	Highly Satisfactory				
1323		Yes: to YSLME and PEMSEA projects	Yes	Yes	
2188	Satisfactory				Yes: Public-private partnership flexibility with local governments
2454					
2700	Highly Satisfactory, Satisfactory*				Yes: Country, development, and PEMSEA country organization priorities
2972	High for Objectives and Substantial for Design*		Yes	Yes	Yes: Major wastewater, solid waste, and water management issues in Liaoning Province
2979				Yes	Yes: Environmental needs and strategy in Shandong Province

Project ID	Relevance Rating	Relevant to other Projects	Relevant to Five-Year Plans	Relevant to Country Partnership Strategy	Relevant to Expressed Needs and Priorities
3025					
4343					
5405					
5561					

* Sourced from terminal evaluations or from terminal evaluation reviews.

Table 2: Efficiency

Project ID	Efficiency Rating	Major Evaluation Comments
597	Highly Satisfactory*	
790	Highly Satisfactory	
1323	Highly Satisfactory	Benefits to a large number of beneficiaries; shifting government focus away from visible results to cost-effective and efficient ones
2188	Satisfactory	Increased as a result of collaboration between private sector associations and international organizations
2700	Highly Satisfactory, Satisfactory*	Efficient funding of application requests for on-the-ground activities
2972	Modest*	Support institutional development to increase operational efficiency
2979	Satisfactory	

* Sourced from terminal evaluations, or from terminal evaluation reviews.

Table 3: Effectiveness

Project ID	Effectiveness Rating	Major Evaluation Comments
597	Highly Satisfactory*	Effective use of GEF funds through inclusive partnerships; integrated coastal management sites to target management strategies to local needs; increased collaboration (PEMSEA effective inclusivity, multisectoral and interagency collaboration, among others); trainings to develop human infrastructure.
790	Highly Satisfactory	Efforts to facilitate government ownership and support; moderately efficient with scientific outputs.
1323		Enabled as a result of government commitment during preparation and implementation stages; incentives for small-town wastewater management.
2188	Satisfactory	Increased as a result of collaboration between international organizations and private sector associations
2700	Highly Satisfactory	Building Partnerships for the Environmental Protection and Management of the East Asian Seas (PEMSEA) was an effective link between local initiatives and central government.
2972	Substantial for Objectives 1 and Objective 3; Modest for Objective 2*	

*Sourced from terminal evaluations, or terminal evaluation reviews.

Table 4: Sustainability Ratings and Common Themes in Project Design

Project ID	Sustainability Rating	Financial	Institutional	Social	Policy Oriented or Political
587	Likely	Fee schedule to provide funds for facilities and credit repayment; system maintenance			
597	Highly Satisfactory, Marginally Unlikely*	Dependent on reliable funding	Technical skills		Regional mechanism in place
790	Moderately Likely			Community engagement	

1323			Concept adoption		
2188	Moderately Likely*		Increasing stakeholder capacity and building networks		
2454		Focus on investments with strong commitment	M&E strategy to address various aspects		
2700	Satisfactory, Moderately Likely*		Building Partnerships for the Environmental Protection and Management of the East Asian Seas (PEMSEA) project		
2972		Municipal budget allocation for infrastructure operation	Utility capacity building		
2979		Sufficient municipal budget allocation (tariffs not at sustainable level)			
3025			Fund M&E strategy		
4343			Yellow Sea Large Marine Ecosystem Commission		Sustainable national and regional cooperation; country commitment through Yellow Sea LME Strategic Action Programme and National Standards Assessment Program approval and YSLME Commission funding.

5405		Leveraging investments from governments with measures to aid diverse government funding and continuation of PEMSEA Trust Fund	PEMSEA Resource Facility as the mechanism for the scale up of the Sustainable Development Strategy for the Seas of East Asia project	Inclusive and participatory project activity approaches	
5561					Commitment to national policies on evapotranspiration control and environmental capacity to mainstream integrated water and environmental management.

*Sourced from terminal evaluations, or terminal evaluation reviews.

Table 5: Summary of Available Annual Performance Report Ratings*

Project ID	Outcomes	Overall Sustainability	M&E Design	M&E Implementation
597	5		5	
790		3	4	5
1323	4	4	Modest	Substantial
2188		2	4	3
2700	5	3	4	3
2972	4	2	3	3
2979	4	4	Modest	Modest

* Sourced from Termination Evaluation Review Database of GEF's Independent Evaluation Office (accessed May 23, 2019).

Table 6: Key to Annual Performance Ratings

Rating	Scale
Outcomes	6-point scale: 1 = Highly Unsatisfactory; 2 = Unsatisfactory; 3 = Moderately Unsatisfactory; 4 = Moderately Satisfactory; 5 = Satisfactory; 6 = Highly Satisfactory
Overall sustainability	4-point scale: 1 = Unlikely; 2 = Moderately Unlikely; 3 = Moderately Likely; 4 = Likely
M&E design	6-point scale: 1 = Highly Unsatisfactory; 2 = Unsatisfactory; 3 = Moderately Unsatisfactory; 4 = Moderately Satisfactory; 5 = Satisfactory; 6 = Highly Satisfactory; However, for WB, 4-point Scale: High; Substantial; Modest; Negligible
M&E implementation	6-point scale: 1 = Highly Unsatisfactory; 2 = Unsatisfactory; 3 = Moderately Unsatisfactory; 4 = Moderately Satisfactory; 5 = Satisfactory; 6 = Highly Satisfactory; However, for WB, 4-point Scale: High; Substantial; Modest; Negligible