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IW:Science

Enhancing the use of Science in International Waters projects to improve project results

SYNOPSIS REPORT

RIVER BASINS

A global Synopsis of **River Basins** science and transboundary management

UNEP

GLOBAL ENVIRONMENT FACILITY 20 YEARS INVESTING IN OUR PLANET

GEF IW:Science Project

Synopsis Report of the River Basins Working Group

IW:Science

IW: Science, or *Enhancing the Use of Science in International Waters Projects to Improve Project Results* is a medium-sized project of the Global Environment Facility (GEF) International Waters (IW) focal area, implemented by the United Nations Environment Program (UNEP) and executed by the United Nations University Institute for Water, Environment and Health (UNU-INWEH). GEF ID Number: 3343.

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Synopsis Report of the River Basins Working Group

March 2012

This report is written as part of the IW:Science series of reports comprising a synopsis and analysis for each of five classes of global transboundary water system: River Basin, Lake, Groundwater, Land-based Pollution Sources, and Large Marine Ecosystems and Open Oceans. The findings and content of the Synopsis and Analysis Reports are then integrated into two IW:Science Synthesis Reports to provide a global water view with regard to *Emerging Science Issues and Research Needs for Targeted Intervention in the IW Focal Area, and Application of Science for Adaptive Management & Development and use of Indicators to support IW Projects.* All reports can be found on the IW:Science, UNU-INWEH, IW:LEARN and GEF websites.

This report was prepared under the responsibility of the IW:Science Core Partner and Lead Institution of the River Basins Working Group:

UNEP

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Cover photo: The floating markets of Cãn Thơ, in the Mekong Delta, Vietnam / *A. Dansie*

List of Acronyms and Abbreviations

ACRONYM	MEANING
ACZM	Alexandria Coastal Zone Management Project
ARET	Agricultural Research, Extension, Training Project
BSEP	Black Sea Environmental Management
BSSAP	Black Sea Strategic Action Plan
CBD	Convention on Biological Diversity
CEP	Caspian Environment Programme
CMEA	Coastal and Marine Environment in Sub-Saharan Africa
DSF	Decision Support Framework
DWQM	Danube Water Quality Model
EIA	Environmental Impact Assessment
ET	Evaporation and Transpiration
EU	European Union
FREPLATA	Environmental Protection of the Rio de la Plata and its Maritime Front: Pollution Prevention and Control and Habitat Restoration
GEF	Global Environment Facility
GIWA	Global International Waters Assessment
ICARM	Integrated Coastal Area and River Basin Management
IW	International Waters
IWRM	Integrated Water Resource Management
LME	Large Marine Ecosystem
MRC	Mekong River Commission
NGOS	Non-Governmental Organizations
NOWPAP	Northwest Pacific Action Plan

ACRONYM	MEANING
OSPAR	Oslo-Paris Convention for the Protection of the Marine Environment of the North East Atlantic
PROCUENCA	Formulation of a Strategic Action Programme for the Integrated Management of Water Resources and Sustainable Development of the San Juan River Basin and its Coastal Zone
RBWG	River Basin Working Group
SAP	Strategic Action Programme
SIDRP	Strategic Infrastructure And Development Reform Program
SIDS	Small Island Developing States
SPREP	South Pacific Regional Environment Programme
TDA	Transboundary Diagnostic Analysis
TER	Terminal Evaluation Report
TOR	Terms of Reference
UN	United Nations
UNCSD	United Nations Conference on Sustainable Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNU-INWEH	United Nations University Institute for Water, Environment and Health
US	United States
WB	World Bank
WBMRAS	World Bank Mekong Region Water Resources Assistance Strategy
WIO-LAB	Addressing Land-Based Activities in the Western Indian Ocean
WUP	Water Utilization Program

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The appendices for this report are available electronically from the IW:Science, UNU-INWEH, IW:LEARN and GEF websites

CHAPTER ONE

Introduction

Enhancing the Use of Science in International Waters Projects to Improve Project Results is a GEF IW:Science project conducted to recognize, capture, analyze and integrate the scientific findings from GEF International Waters (IW) projects, an investment of more than US $6 billion, and to disseminate them across the IW portfolio and beyond.

Executed by the United Nations University Institute for Water, Environment and Health (UNU-INWEH) and implemented by the United Nations Environment Programme (UNEP), the project was launched in 2009 and covers the five main areas in the GEF International Waters portfolio: river basins; lakes; groundwater; large marine ecosystems; and open oceans. A working group was formed to address each of these areas.

The project's objective is to enhance - through knowledge integration and information-sharing tools - the use of science in the GEF IW focal area to strengthen priority setting, knowledge sharing, and results-based, adaptive management in current and future projects. The project has three components:

1. Understanding and documenting, for future analysis and reference, the scientific experience and scientific best practices from the IW project portfolio.

2. Undertaking and reporting a comparative, cross-sectoral assessment of IW:Science, identifying intended users and impacts, contemporary scientific challenges, research and science-policy gaps, emerging issues, and global-scale impacts.

3. Creating an IW scientific learning network for information sharing and mutual learning among IW projects and with the wider water science community.

The first component consists of three main activities: (i) development of a project document database (by UNU-INWEH); (ii) review of the documents of relevant projects, with particular emphasis on extracting science; and (iii) analysis of the reviewed projects on the basis of a number of predefined core questions.

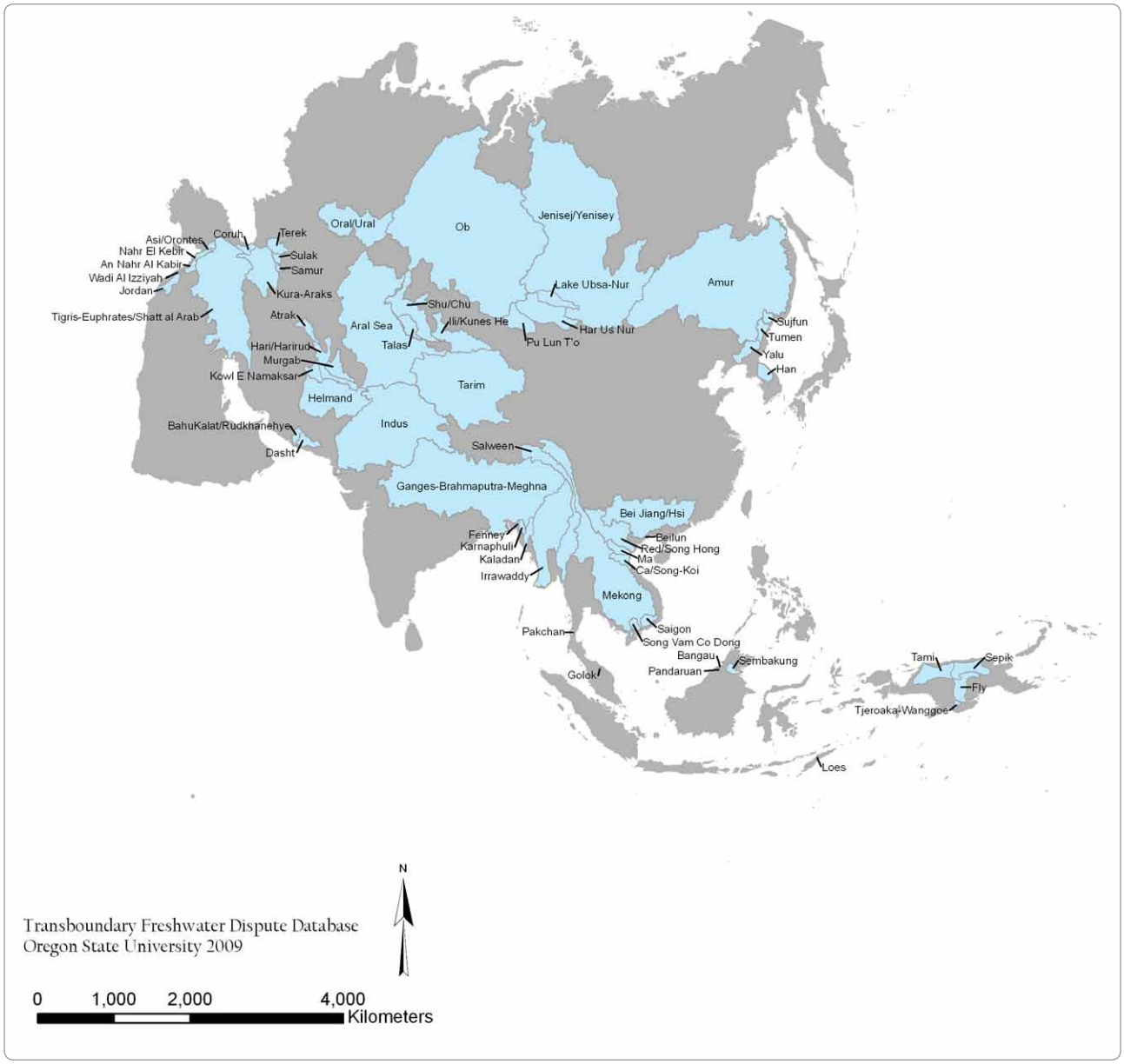
This Synopsis Report is the outcome of the second activity of the first component, as carried out by the River Basin Working Group (RBWG). Its purpose is to provide a clear review of relevant transboundary river projects in the GEF IW portfolio as a basis for further analysis, thus contributing to the objective of the IW:Science project.

This Report is based on the individual project synopsis survey carried out by working group members. Such a survey relies on project documents available in the IW: Science project documents database, to date the largest compilation of searchable IW documentation, in conjunction with additional information obtained by the individual reviewers from other sources such as project websites.

The individual synopsis surveys are guided by standardized templates, developed by UNU-INWEH in partnership with all Working Groups at the Project Inception Conference in Macao, January 2010, to assist in production of uniform reviews, allowing easy integration of information, both inside the set of river basin projects and across the five water system types.

The synopsis survey template is provided in Appendix A. Appendix B lists the River Basin Working Group members, and the individual project reviews are presented in Appendix C.

Figure 1 Transboundary River Basins of Asia



CHAPTER TWO

Overview of Reviewed Projects

2.1 List of projects and documentation issues

A total of 49 IW projects were originally assigned to the River Basin Working Group for review, with each member assigned three or four; however, the following six projects were dropped during the second RBWG meeting in Durban, South Africa in October 2010 because of the absence of key documents and/or cancellation of the project.

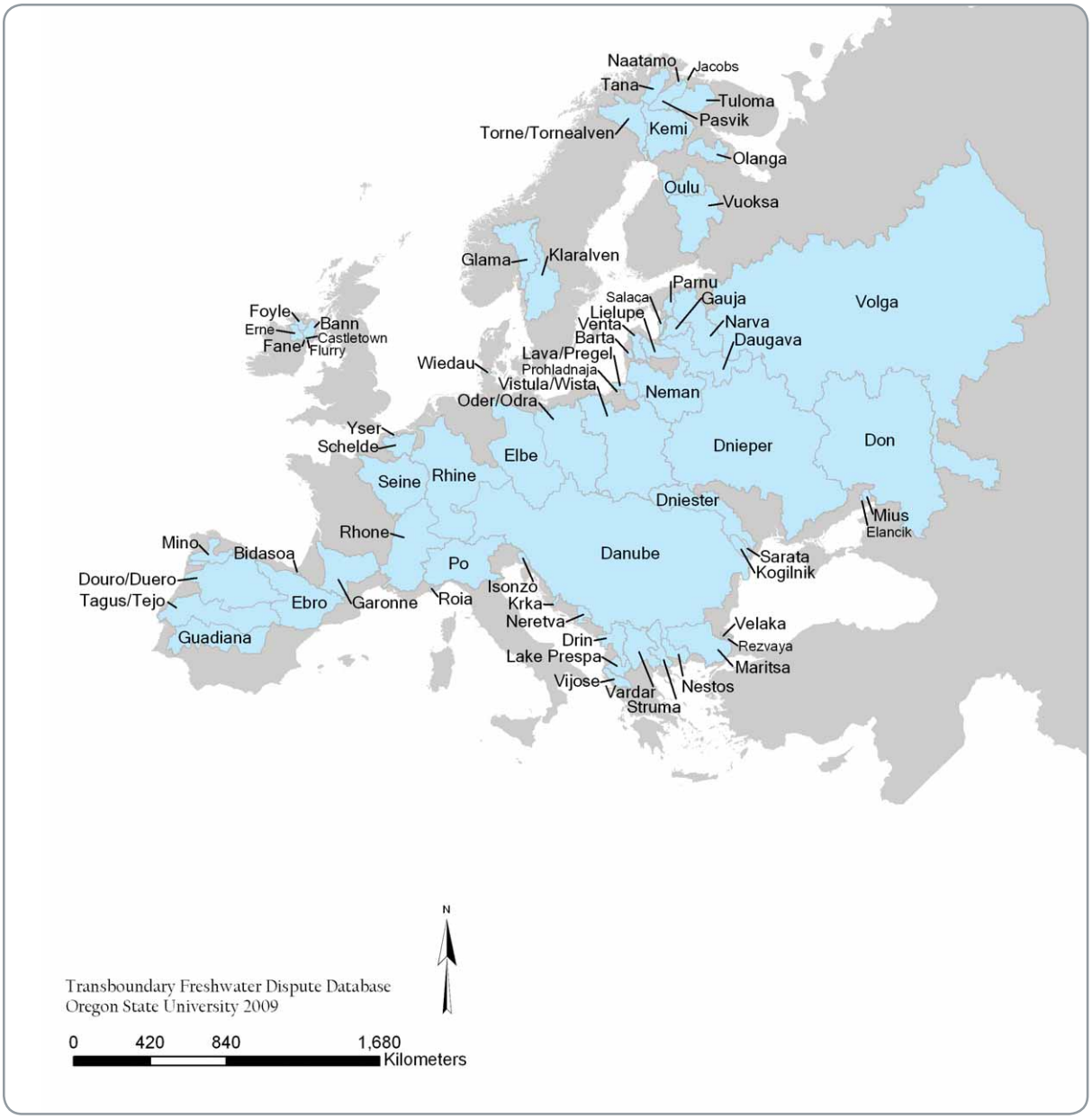
- GEF ID 459: Coastal Contamination Prevention and Sustainable Fisheries Management
- GEF ID 1159: Agricultural Pollution Control Project - under WB-GEF Strategic Partnership for Nutrient Reduction in the Danube River and Black Sea
- GEF ID 2136: Igarape 40 Cleanup, Manaus
- GEF ID 2706: Implementing Integrated Water Resource and Wastewater Management in Atlantic and Indian Ocean SIDS
- GEF ID 2760: East Asia Land-Based Pollution Reduction Investment Fund: The East Java Strategic Infrastructure and Development Reform Program (SIDRP)
- GEF ID 2961: Addressing Land-based Activities that Affect the Marine and Coastal Environment of the Northwest Pacific Region (NOWPAP)

One Project, GEF ID 615: Mekong River Basin Water Utilization project, was added, based on discussions at the Scientific Synthesis Group Meeting in Bonn in December 2011. Of the revised total of 44 projects assigned, 38 projects have been reviewed by the Working Group. Among these, 20 are completed projects, one project has unclear status, and the rest (17) – or almost half – are ongoing projects. The list below provides the summary of projects assigned along with the status of review, as of preparation of this synopsis report.

Table 1 Summary of Projects & Status Reviews as of April 2011

NO.	PROJECT TITLE	GEF ID #	# OF DOCUMENTS AND STATUS OF DOCUMENTATION IN IW: SCIENCE DATABASE	REVIEW STATUS
Reviewed (completed) Projects				
1	Developing the Implementation of the Black Sea Strategic Action Plan (BSSAP)	341	8 documents;	Reviewed
2	Developing the Danube River Basin Pollution Reduction Programme	342	44 documents;	Reviewed
3	Danube River Basin Environmental Management	399	39 documents; only few are specific to the project, key documents are missing	Reviewed
4	Implementation of the Strategic Action Programme (SAP) of the Pacific Small Island Developing States (SPREP)	530	33 documents; reasonably documented but final report is missing	Reviewed
5	Global International Waters Assessment (GIWA)	584	102 documents; well documented	Reviewed

Figure 2 Transboundary River Basins of Europe



NO.	PROJECT TITLE	GEF ID #	# OF DOCUMENTS AND STATUS OF DOCUMENTATION IN IW: SCIENCE DATABASE	REVIEW STATUS
6	Integrated Management of Land-Based Activities in the Sao Francisco Basin	586	11 documents; important documents (e.g. Final Report, SAP) missing from IW:Science database were found at the executing agency's website	Reviewed
7	Transboundary Environmental Issues in the Caspian Environment Programme (CEP)	596	87 documents; reasonably documented but most documents seemed not available during synopsis survey by reviewer; final and terminal evaluation reports are missing	Reviewed
8	Environmental protection of the Rio de la Plata and its Maritime Front: Pollution Prevention and Control and Habitat Restoration (FREPLATA)	613	9 documents; while few, the most important documents, e.g. Project Document, SAP, TDA, TER are available (except the Final Report)	Reviewed (project status unclear)
9	Mekong River Basin Water Utilization Project	615	66 documents; reasonably documented but key documents such as Project Completion and Evaluation Reports were obtained from MRC, and Component A (DSF) Main Report was obtained from a website of TNMC which contains all DSF final reports.	Reviewed
10	Georgia: Agricultural Research, Extension, Training Project (ARET)	633	12 documents; not clear how many are missing	Reviewed (partially)
11	Formulation of a Strategic Action Programme for the Integrated Management of Water Resources and Sustainable Development of the San Juan River Basin and its Coastal Zone (PROCUENCA)	791	27 documents; seems reasonably documented but many links are missing and some key documents were missing during the review	Reviewed (updated)
12	Building Environmental Citizenship to Support Transboundary Pollution Reduction in the Danube: A Pilot Project in Hungary and Slovenia	806	10 documents; reasonably documented	Reviewed
13	Development and Protection of the Coastal and Marine Environment in Sub-Saharan Africa (CMEA)	849	24 documents; not clear how many documents are missing	Reviewed
14	Implementation of the Strategic Action Programme for the Bermejo River Binational Basin: Phase II	886	17 documents; TER and Final Reports are missing	Reviewed
15	Agricultural Pollution Control Project - under WB-GEF Strategic Partnership for Nutrient Reduction in the Danube River and Black Sea	1355	21 documents; not clear how many are missing	Reviewed
16	Development and Implementation of the Lake Peipsi/ Chudskoe Basin Management Plan	1444	16 documents; seems reasonably documented but some documents seemed not available during the review by the RBWG member; SAP not available	Reviewed
17	Control of Eutrophication, Hazardous Substances and Related Measures for Rehabilitating the BLACK SEA Ecosystem: Phase 1	1580	13 documents; seems reasonably documented; but links to TER and Final Report seemed missing during the review by the RBWG member	Reviewed
18	Guangdong - Pearl River Delta Urban Environment	2135	5 documents; major technical reports are missing	Reviewed

NO.	PROJECT TITLE	GEF ID #	# OF DOCUMENTS AND STATUS OF DOCUMENTATION IN IW: SCIENCE DATABASE	REVIEW STATUS
19	Control of Eutrophication, Hazardous Substances and Related Measures for Rehabilitating the Black Sea Ecosystem: Tranche 2	2263	9 documents; some major documents are available but progress, monitoring and evaluation reports are missing	Reviewed
20	Fostering a Global Dialogue on Oceans, Coasts, and SIDS, and on Freshwater-Coastal-Marine Interlinkages	2722	59 documents; seems reasonably documented	Reviewed
Reviewed (on-going) Projects				
21	Demonstrations of Innovative Approaches to the Rehabilitation of Heavily Contaminated Bays in the Wider Caribbean	614	8 documents; some key documents are missing (TDA, SAP)	Reviewed (project ongoing)
22	Environmental Protection and Sustainable Management of the Okavango River Basin	842	76 documents; seems well documented	Reviewed (project ongoing)
23	Danube/Black Sea Basin Strategic Partnership on Nutrient Reduction, Tranche I	1014	81 documents; seems some documents were not available during the review of the project	Reviewed (project ongoing)
24	Anatolia Watershed Rehabilitation Project - under WB-GEF Strategic Partnership for Nutrient Reduction in the Danube River and Black Sea	1074	8 documents; not clear how many documents are missing	Reviewed (project ongoing)
25	Addressing Transboundary Concerns in the Volta River Basin and its Downstream Coastal Area	1111	23 documents; seems well documented but many links are missing	Reviewed (project ongoing)
26	EB25RD/GEF Environmental Credit Facility (formerly entitled Slovenia: National Pollution Reduction Project)	1229	9 documents; technical documents are not yet available (TDA, SAP, Final Report)	Reviewed (project ongoing)
27	Addressing Land-based Activities in the Western Indian Ocean (WIO-LaB)	1247	46 documents; seems well documented but some seemed not available during the review by the RBWG member	Reviewed (project ongoing)
28	Hai River Basin Integrated Water Resources Management	1323	16 documents; documents available are essentially at the project formulation stage	Reviewed (project nearing completion)
29	Integrated Ecosystem Management in the Prespa Lakes Basin of Albania, FYR-Macedonia and Greece	1537	25 documents; seems reasonably documented, unclear how many are missing	Reviewed (project ongoing)
30	Environmental Infrastructure Project - under Strategic Partnership Investment Fund for Nutrient Reduction in the Danube River Basin and the Black Sea	1542	11 documents; major technical reports are not yet available (TDA, SAP, Final Report, TER)	Reviewed (project ongoing)
31	Hazard Risk Mitigation and Emergency Preparedness Project	1889	7 documents; TDA, SAP are not available	Reviewed (project ongoing)
32	Demonstrating and Capturing Best Practices and Technologies for the Reduction of Land-sourced Impacts Resulting from Coastal Tourism	2129	12 documents; major technical documents (e.g. TDA, SAP, final report, final evaluation report) are still not available during the review by the RBWG member	Reviewed (project ongoing)

NO.	PROJECT TITLE	GEF ID #	# OF DOCUMENTS AND STATUS OF DOCUMENTATION IN IW: SCIENCE DATABASE	REVIEW STATUS
33	Bosnia: Integrated Ecosystem Management of the Neretva and Trebisjnica River Basin - under Investment Fund for the Mediterranean Sea LME Partnership	2132	18 documents; not clear how many documents are missing	Reviewed (project ongoing)
34	Integrated and Sustainable Management of Transboundary Water Resources in the Amazon River Basin Considering Climate Variability and Change	2364	27 documents; seems reasonably documented with TDA and progress, final and evaluation report not yet available	Reviewed (project ongoing)
35	Implementation of The Dnipro Basin Strategic Action Program for the reduction of persistent toxics pollution	2544	26 documents; seems reasonably documented, not clear how many are missing as the project is still ongoing	Reviewed (project ongoing)
35	Establishment of a Basin Management Framework for the Integrated Management for the Tisza Transboundary River Basin	2617	56 documents; seems reasonably documented	Reviewed (project ongoing)
37	Development and Adoption of a Strategic Action Program for Balancing Water Uses and Sustainable Natural Resource Management in the Orange-Senqu River Transboundary Basin	2701	27 documents; not clear how many documents are missing	Reviewed (project status unclear)
38	Good Practices and Portfolio Learning in Transboundary Freshwater and Marine Legal and Institutional Frameworks	3340	7 documents; major technical documents are not yet available (TDA, SAP, etc.)	Reviewed (project ongoing)
Projects not reviewed				
39	Black Sea Environmental Management (BSEP)	397	6 documents;	Not reviewed
40	Determination of Priority Actions for the Further Elaboration and Implementation of the Strategic Action Programme for the Mediterranean Sea	461	33 documents;	Not reviewed
41	Combating Living Resource Depletion and Coastal Area Degradation in the Guinea Current LME through Ecosystem-based Regional Actions	1188	95 documents; seems reasonably documented but not clear how many are missing	Not reviewed (project ongoing)
42	Danube/Black Sea Strategic Partnership - Nutrient Reduction Investment Fund: Tranche 2	1661	10 documents; not clear how many documents are missing	Not reviewed (project ongoing)
43	Alexandria Coastal Zone Management Project (ACZM)	2602	18 documents; not clear how many documents are missing	Not reviewed (project ongoing)
44	Croatia: Agricultural Pollution Control Project - under the Strategic Partnership Investment Fund for Nutrient Reduction in the Danube River and Black Sea	3148	12 documents; not clear how many documents are missing	Not reviewed (project ongoing)

This synopsis is limited by at least two constraints. First, approximately half of the reviewed projects are currently being implemented; hence, a comprehensive assessment of the use or application of science is not yet possible. Second, most of the reviewed projects do not have sufficient documentation. In fact, in several cases key documents such as TDA, SAP, Final and Evaluation Reports are missing. Missing documentation proved a major obstacle, even with access to the online databases of IW:LEARN, and GEF Online, brought together under the IW:Science database. The IW:Science database also incorporated documents located on 96 external IW project websites, and each of the IAs were contacted for missing documentation. However, significant gaps remain. In at least one project (Project 399), and possibly others, some of the documents filed under the project are not for that project but for other related projects in the same river basin.

To provide a reasonable assessment of assigned projects, given limited documentation, members of the RBWG have tried to secure project documents/reports from other sources such as websites (e.g., IW:LEARN website, project website, executing agency's website, etc.) and by communicating with project contacts or relevant organizations. It is also noted that for at least a few projects, important or key project reports that were not available during the review of the project were located during preparation of this synopsis report. Given that the assessment of each project depends on the availability of documents for review, it is likely that this report may be augmented if or when additional documents become available.

Amazon River / *UN Photo, P. Sudhakaran*

2.2 Summary of purposes of reviewed projects

A brief assessment of the nature and purposes of projects revealed their diversity. The following provides a rough categorization of projects based on their nature and purpose:

- Integrated approaches to sustainable management:
  - Projects composed of activities geared for the sustainable management of water and other related natural resources. GEF projects under this category include, but are not limited to, the following Projects: 341, 342, 530, 586, 596, 613, 791, 886, 1074, 1323, 1444, and 2701.
- Support to implementation of river basin agreements:
  - GEF Project 615 was intended to support implementation of several provisions of the Mekong Agreement through formulation of procedural and technical rules, with the latter founded on development and application of a Decision Support Framework or DSF (comprised of knowledge base, integrated basin model, and impact assessment tools).
- Development of methodologies, database and/or guidelines for assessment and management of river basins:
  - These include GEF Projects: 1247, 399, 584, and 615.
- Demonstration or application of established measures, practices or technologies:
  - These projects include those that initiate measures such as improving on-farm environmental practices (Project 633) or other good land-use practices (Project 849), demonstration and/or replication of good practices in nutrient reduction (Projects 614, 2617)or reducing transboundary persistent toxic pollutants (Project 2544), mitigation of impacts of extreme events such as flooding and mining accidental spills (Project 1889), etc.

- Projects with very specific targets, such as pollution reduction:
    - These projects underline the importance given to water quality by focusing on improving water quality by reducing pollution. GEF projects with such objectives include Projects 342, 1014, 1229, 1542, 1580.
- Institutional development, capacity building and strengthening collaborations:
    - These projects aim for development or strengthening of institutional frameworks (Projects 596, 1111, 2364), as well as capacity building (Projects 596, 1247, 1537), improving public-private partnerships (Project 2136), fostering dialogues (Project 2722), and fostering good governance (Project 3340), among others.

This general description of reviewed projects provides a summary of the role of science in the projects, discussed further in Section 3.1 below.

Land use change in river basins affects basin hydrology and sediments loads of rivers, sugar cane field in Brazil / *UN Photo, E. Debebe*

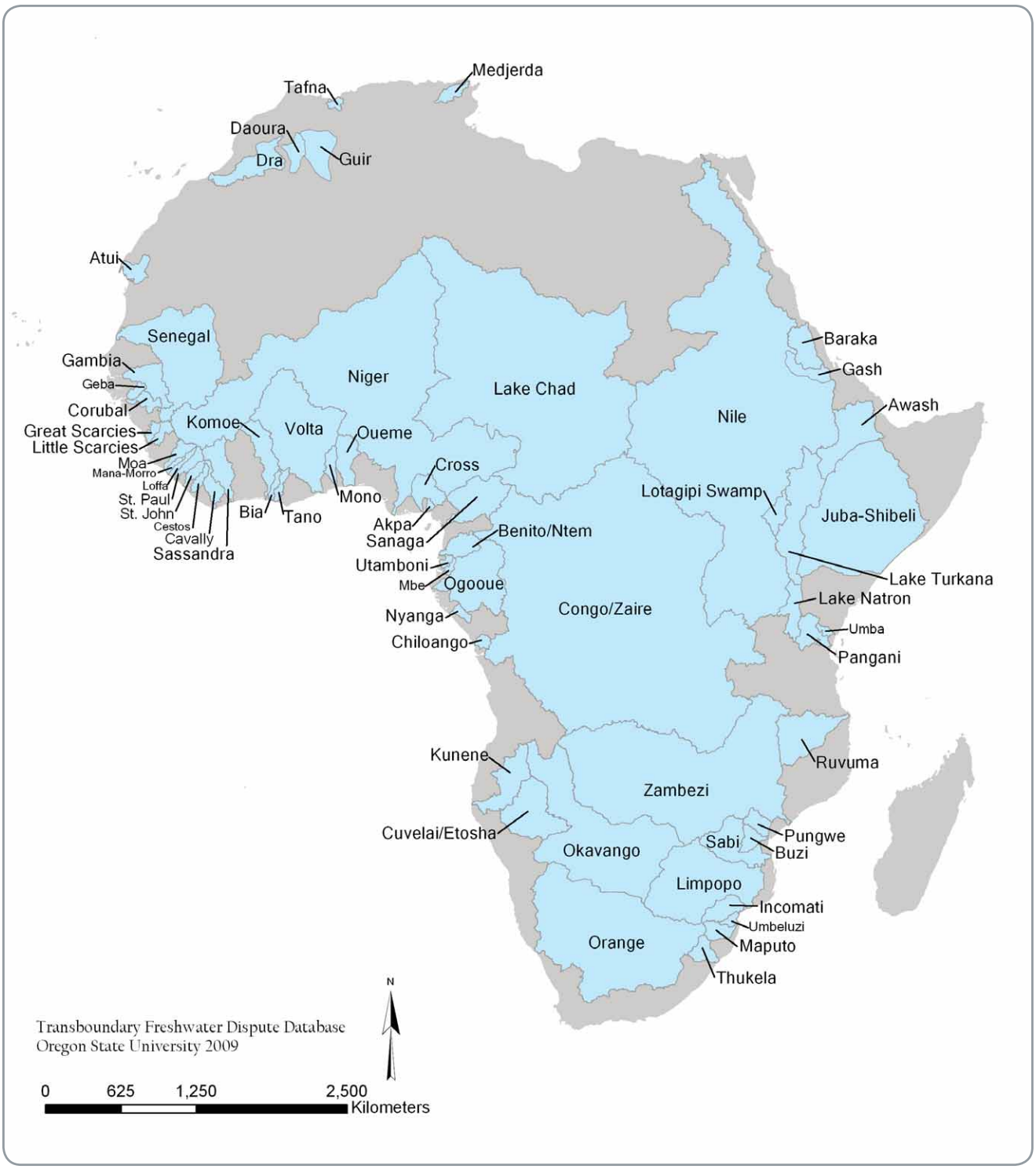
2.3 Significant and successful scientific components

It has to be noted that the following discussions are based mainly on the limited documents reviewed per project. Thus, while a few projects are identified below as having demonstrated significant and successful components, this does not mean that other projects have not. The absence of information does not necessarily mean the absence of successful components, although it is also noted that in some projects science has a minimal role (Projects 1014, 1111, 1247, etc.).

Significant and successful scientific components identified for projects under the river basin IW system type are as follows:

- Development and application of methodologies, strategies, or models:
    - This is particularly the case for Project 584, in which an innovative methodology, which includes causal chain and policy option analyses, could serve as a platform for future international assessment of aquatic resources. The methodology adequately addresses comprehensive coverage of related causes/factors/stressors of aquatic issues.
    - Project 1580 also developed a special methodology to estimate fish stocks in the Black Sea, based on landing data. This is an interesting methodology since stock assessment surveys are not properly implemented by all countries and/or assessment methods are not compatible.
    - Project 1537 has established a viable monitoring strategy and supporting infrastructure; however, its success is not yet clear as monitoring was planned to start in 2010 and updates are not yet available.
    - Project 596 has also developed and harmonized models on environmental impacts, which were used in developing scenarios on pollution discharge; Project 342 has developed the Danube Water Quality Model (DWQM) to support transboundary analysis.

Figure 3 Transboundary River Basins of Africa



- In Project 615, a decision support framework (DSF) was developed to describe changes in river flow and assess impacts that can occur as a result of infrastructure development and climatic variations within the basin, providing a powerful analytical basis for determining water utilization "rules" or "procedures" (and technical guidelines) for implementation of several provisions of the 1995 Mekong Agreement. The framework also provides similar support to the basin development planning process through assessment of environmental and socio-economic impacts of development options and assistance to project and strategy development in each of the riparian countries.

- In Project 2617, an early warning system was created to mitigate the impacts of floods.

- Development of baseline information, demonstration projects and environmental plans, and conducting of feasibility studies, case studies and environmental analysis:

  - Projects 791 and 1889 have collected baseline information and developed demonstration projects to support local environmental projects or mitigate the impacts of mining accidents, respectively.

  - Project 586 produced a river basin and coastal zone environmental analysis. This subsequently provides a sound scientific and technical basis for strategic remedial actions to protect the marine environment from land-based activities. Project 596 has also identified the root causes of problems. This knowledge will be indispensable in formulating remedial measures.

  - Project 1889 conducted extensive feasibility studies and comprehensive risk assessments to identify the most appropriate measures for implementation, particularly for prevention and mitigation of impacts of flooding, landslides, and mining accidents. An environmental management plan was also developed under this project.

  - Similarly in Project 615, the DSF was used for impact assessments and applied in several national case studies in the four MRC member countries.

  - Moreover, Project 806 has developed case study analyses for two countries, Hungary and Slovenia. These studies aimed to support these countries in fulfilling their obligations under the Aarhus Convention.

  - Several other projects have also shown successful use of scientific methodologies in the assessment or characterization of study areas. These studies are significant inputs to well-informed decision and policymaking. For example, Project 2701 has utilized science adequately in exploring potential new sources of water, referred to as marginal water, to meet demand, and in considering flood management and groundwater assessment; Project 614 has updated the inventories of point and non-point sources of pollution.

- Publication and use of important project outcomes:

  - These include publication of the State of Pollution in the Black Sea report and the Black Sea Red Data Book (Project 1580), and many other publications such as reports (e.g. Projects 584, 2722) and scientific articles in international journals (e.g., Project 584).

Other successful components that may not be directly related to science are as follows:

- Establishment of financial mechanisms:

  - Project 1229 has successfully set up a credit facility, implemented through four banks. The program provided 49 loans to 34 clients, all successfully invested in wastewater control technologies and being repaid.

- Strengthened collaborations:

  - Project 2722 has demonstrated that even within a limited timeframe, it is indeed possible to bring together stakeholders and to put oceans, coasts and SIDS reasonably high in priority on the global, regional and national policy agenda; and to increase understanding of the inter-linkages between freshwater and coastal or marine environments through cross-sectoral and multi-stakeholder approaches.

The project 'Addressing Transboundary Concerns in the Volta River Basin and its Downstream Coastal Area' (GEF ID 1111) is a regional initiative designed to facilitate the integrated management, sustainable development and protection of natural resources of the Volta River Basin within the six riparian countries of Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali and Togo. Here in Burkina Faso, young girls carry pots with water from the community well / *UN Photo, K. Muldoon*

  - Project 614 developed an integrated inter-institutional plan aimed at increasing coordinative, managerial, planning and enforceable capacities of the institutions responsible for coastal zone management.

- Policy-related outcomes:
  - Activities under Project 1580 have resulted in an agreement on a new set of water quality objectives to be proposed to the Black Sea Commission.

- Criteria for emission standards have also been established under Project 596.

  - Establishment of institutional mechanisms for better coordination among riparian countries: Under Project 615, five procedures (and corresponding technical guidelines) were formulated and adopted by the basin council. These procedures are related to data and information exchange and sharing; water use monitoring; notification, prior consultation and agreement; maintenance of flows on the mainstream; and water quality. Such procedures contain provision for reporting and revision to ensure effective implementation.

CHAPTER THREE

Summary of Issues in Reviewed Projects

The following sections discuss different issues in the use of science in GEF IW projects. While gaps are inevitable in the synopsis survey, efforts were made to produce a significant review of issues.

3.1 Role and use of science in projects

With possibly a few exceptions, the role of science in these projects is, in general, to provide the basis for project design, as well as to support implementation of project activities. Specifically, science is used

- In studies and analyses or assessments of river basin and other international waters issues and in identification of measures and/or models and preparation of management plans (Projects 342, 399, 586, 596, 613, 615, 1074, 1111, 1247, 1323, 1889, 2132, 2136, 2364, 2544, 2722);
- In identifying specific and serious gaps in the information available to address transboundary problems and issues (Projects 341, 614, 615, 791, 1111);
- In improving comprehension of biophysical and socio-economic indicators (Project 2544);
- As a basis for development of sound methodologies (Project 584) to support integrated river basin management; or design, setting up and/or implementation of monitoring programs (Projects 596, 615, 1355, 1580, 1889, 2760);
- In generating knowledge on particular subjects, such as types and sources of pollution and droughts (Project 2364);
- In the application of scientific methods such as in quantifying erosion and water pollution rates (Project 886), monitoring of water quality (Projects 2132, 2135), and many other aspects (Project 2617); for projects focused on implementation schemes, the role of science is limited, apart from informing the basis on which these schemes are founded;
- In adoption and application of established science for management, such as wastewater and environmental pollution (Project 1542), cleaner production (Project 2544), integrated ecosystem management (Projects 2263), adaptive management (Project 2701), improved on-farm environmental practices (Project 633), or other scientific best practices (Project 2701); in areas where science has been developed, well-developed approach and practices were adopted;
- As a basis for developing procedures for collaborative undertakings to address river basin issues (Project 615) or global and regional issues (Project 2722), as well as local ones, through awareness campaigns to encourage public participation (Project 806), and to support institutional capacity building (Project 2701);
- As background information for the project prepared through a review of literature on specific knowledge areas (Projects 1889, 2364, 3340), such as eutrophication (Projects 1444, 1537), biodiversity etc. (Project 1111), and that used in preparation of TDA (Project 1537) and SAP (Project 399);
- To support sound decision making (Projects 613, 1014, 1580); in particular, the DSF developed in Project 615 was intended partly to provide support to the basin development planning process by assessing environmental and socio-economic impacts of development options.

- In application of social sciences in analyzing fiscal and institutional mechanisms (Project 1229), and to support development of legal and institutional frameworks (Projects 615, 2364);

- In understanding specific relationships, such as linkages between environmental and consequent socio-economic changes (Project 615), freshwater and coasts and oceans (Project 2722), impacts of climate change (Project 2722), etc.

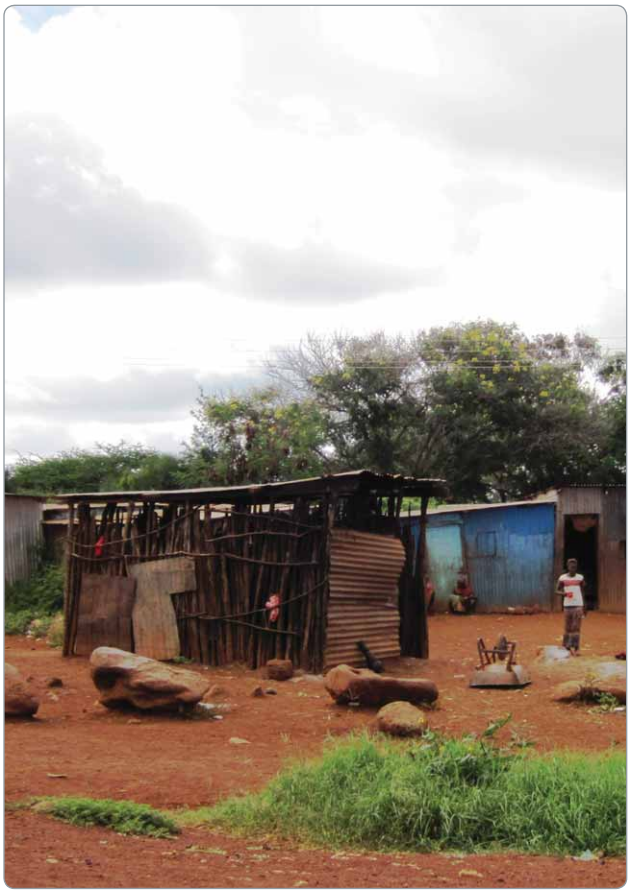
On the other hand, several gaps were also observed in the use of science in the projects reviewed. For instance, while linkages between land-based activities and coastal resources, freshwater resources and coasts and oceans, and the like seemed well recognized, there was a lack of appreciation of the linkages between ET management (under knowledge management component) and mainstream activities (e.g., IWRM) (Project 1323). This is also true for the complementary issues of water and sanitation (Project 2136).

In the review of assessment and monitoring programs, it was found that application of useful technologies, such as remote sensing and remotely sensed data, was lacking (Projects 1444, 2364).

It also appears that the impacts or influence of climate change are not incorporated even in projects that could be significantly affected. In some cases, this could be because the subject is beyond the scope of the project (Projects 1580).

On the social science side, incorporation of local management structures and approaches is missing (Project 2701), despite the fact that best localized experiences might have been useful in future interventions for sustainable solutions. Moreover, while socio-economic data were present as background information, these seemed not to be effectively incorporated in the design.

In general, multiple causality in a transboundary context has been well considered (in terms of both understanding and managing) in the design of most projects. However, whether it is adequately considered in project implementation is not always clear, given the lack of information in some projects (Project 3340).



Land use within river basins and the availability of clean, safe water affects all communities worldwide / *A. Dansie*

3.2 Issues covered in reviewed projects

Appendix D shows the matrix of issues covered in the projects reviewed. Although there are missing entries in some projects, the matrix generally indicates that issues related to water quality, such as contaminants and eutrophication/nutrients are seemingly of high importance and thus widely covered in most projects, along with issues on hydrology or water balance and biodiversity. Social impacts are widely recognized; hence, the importance of governance and management seemed to have been effectively emphasized as well.

Other issues that appear to have been covered well include those related to fisheries, wetlands, invasive species, dams, climate change, and economics. Coverage of issues related to cyanotoxins or phytoplanktons, diversions, dredging, food webs, and lake restoration seemed minimal for projects under the river basin IW system type.

3.3 Significant natural and social science findings

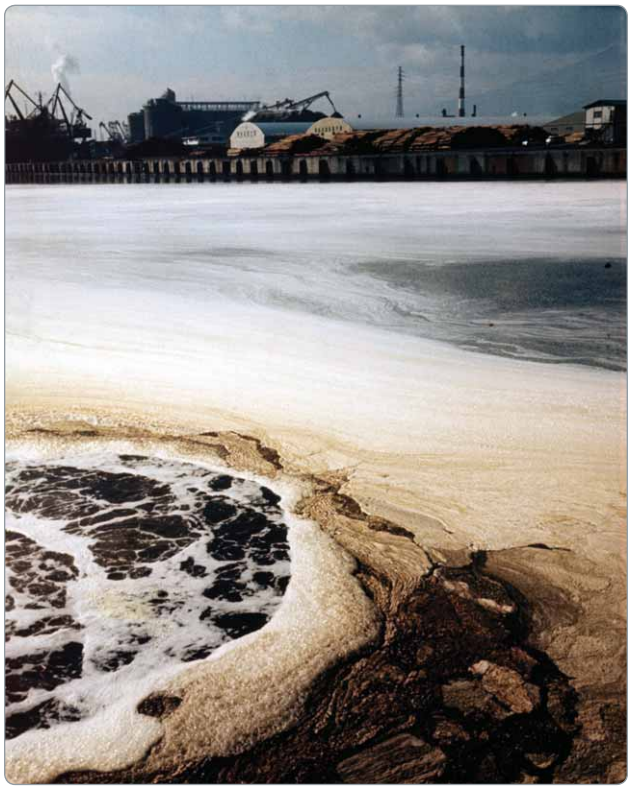
Based on available documents, natural and social sciences found in the review may be grouped and described as follows:

- *Increased knowledge on the issues of the basin:* this includes detailed knowledge of land use, which is an indispensable tool for planning (Project 586), updated information on the state of marine pollution (Project 1247), environmental conditions (Project 614), or identification of causes of environmental problems that are not immediately evident (Project 613);

- *Confirmation of established science and relationships:* for instance, soil loss, as a major problem, results in other undesirable consequences such as less than optimal use of water resources, degradation of the coastal zone, flow modification, accelerated land degradation, etc. (Project 586); eutrophication in a basin is increased by human activities and discharge of polluted effluents (Project 806); the discharge of industrial and domestic wastewater has drastically altered the physical/chemical conditions of the water and sediments (Project 2136); changes in soil moisture and evaporation caused by deforestation could lead to persistent drought (Project 2364);

- *Findings that may contradict common knowledge on the issues in respective basins:* for Project 586, construction of the Xingo dam has not increased saline intrusion in the basin; using the DSF, a WB-initiated study found that the Mekong flow regime is highly robust and that with good planning and management, there is likely much room for infrastructure developments benefiting all member states, including China (Project 615); another finding was that the ecosystem is recovering, not worsening, as was anticipated (Project 1580);

- *Current basin problems may be partly due to previous history:* the complexity of basin problems may be attributed to inappropriate development, such as in an historically haphazard and sectoral manner, with relatively little integrated planning and within relatively weak institutional frameworks (Project 586);



Point source pollution, direct discharge of nutrients and pollution into rivers such as this pulp mill, has seriously impacted waterway health on a global scale / *UN Photo*

- *Importance of public participation and related factors:* this includes identification of specific legal, institutional, and practical barriers to public access to environmental information in riparian countries (Project 806); country-driven and bottom-up approaches were instrumental in achievement of project objectives (Project 806); engagement of NGOs and other stakeholders in all phases of the project is essential for developing effective and sustainable measures to improve public involvement (Project 806); awareness raising at the earliest possible stage, possibly before initiation of the project, would facilitate stakeholder commitment and effectively address issues such as the demands of competing work commitments and the full integration of high level government officials (Project 806); identification of weakness in policy-making capability of the partner countries (Project 1444); and promoting the interest of the civil society and the private sector from the very beginning, as these do not tend to generate on their own (Project 613);

- *Additional evidence on the relationships of physical and human components of river basin issues:* for example, land degradation is tied to the socio-economic condition in the Okavango basin, thus gaining an understanding of the relationship between natural and socio-economic forces is paramount (Project 842); unsustainable development of the basin has been complicated by the extreme social and economic difficulties faced by the riparian countries (Project 2544);

- *Implementation issues:* while there is recognition of the critical role of social science tools in natural resources management, how to ensure the science input into the social science approach remains a question (Project 1323); although there are existing methodologies and courses of action based on assessments conducted for integrated freshwater and coastal management, only few countries have effectively been able to fully and permanently implement plans at the national and sub-national level. This could be due to weak institutional structures, lack of capacity, lack of high-level commitment, and financial constraints (Project 2722).

The survey also reveals that in certain projects, social systems have not been considered alongside environmental or ecological systems.

With the exception of possibly only one project in the Amazon River Basin (Project 2364), the impacts of climate change are, generally, not yet explicitly incorporated, possibly due to limitations in the scope of the project, although in some cases climate change has been identified by reviewers as a significant driver in the study basin. For example, climate change is missing in the study of rainfall magnitude and intensity that would exacerbate erosion rates. The potential role of climate change in lake water quality was not discussed in the proposal of Project 1444. Moreover, the potential impact of climate change on the supply and demand side of the water balance is not taken into account in calculating water resource balance; an account of those capacity challenges would have enhanced the success of any intervention (Project 2701).

It has also been observed that preparation of an EIA is usually more of a procedural requirement than a scientific assessment (Project 1323).

There are also findings that have potential application in the future. For instance, the ET management system could help similar project designs (Project 1323).

3.4 Design and use of (local/ international) science networks and scientific advisory bodies

The various kinds of engagement by local and international science networks and scientific advisory bodies can be grouped as follows;

Preparation of background documents, reports or assessments or plans:

- National or regional experts are involved in preparation of regional assessment reports (Projects 584, 613) through a bottom-up approach: for example, the project documented the importance of active participation of regional and local players in identifying and developing Amazon cooperation initiatives, highlighting the importance of the role played by the local and indigenous peoples of the Amazon in sustainable development (Project 2364).

- This also includes involvement of organizations and independent consultants (Project 2722), and involvement of stakeholders in TDA preparation

(Project 1111), national assessments (Project 1537) and policy studies (Project 2722). Local experts also contribute knowledge and opinions in the preparation of SAP (Projects 399, 886).

Project inception and design:

- Several indications of this aspect are found in the synopsis survey. Local or stakeholder participation began with development of the project brief/proposal (Projects 586, 615, 791, 1889, 2617) or in project startup workshops or inception discussions (Projects 615, 1229, 2701). A large number of institutions or organizations were found to have taken part in preparation of project proposals (Project 791), contributing their experience and hands-on knowledge. Such involvement of stakeholders in the planning of activities is possibly facilitated by a good involvement plan (Projects 886, 1889). Clear documentation also indicates the involvement of a local scientific network from the very beginning of project design, through implementation to project completion (Projects 615, 1580).

Involvement in workshops, meetings, seminars, fora, regional/international conventions and conferences:

- This seems to be quite common in the projects reviewed (e.g., Projects 342, 614, 615, 791, 842, 886, 1444, 1247, 1537, 1580, 2136, 2263, 2722) and mainly regional or international in nature. Local or country experts are also involved in regional workshops and as part of the regional assessment group (Project 584).

- This group of activities also includes capacity-building workshops to involve representatives from all relevant government agencies (Project 806), as well as regional working group meetings that engaged specialists and international experts (Projects 615, 2544).

Involvement in consultations and stakeholder dialogues:

- Participation of local experts or stakeholders at grassroots level was facilitated by a series of consultative workshops (Projects 399, 586, 615, 3340), as well as through stakeholder dialogues (Project 2136) and e-dialogues (Project 3340).

- One project (Project 1889) demonstrated a notable approach for engaging stakeholders in consultative meetings. In particular, those responsible for the project made an effort to disseminate information before such meetings through radio announcement and press advertisements, and disclosure at publicly accessible places (e.g. libraries, city halls, etc.) to get maximum participation from stakeholders

Involvement in steering and working groups and roundtables:

- International and local experts were involved in steering groups (Projects 584, 3340) and thematic task teams (Project 584) or working groups (Project 615) and roundtables (Project 2722).

Establishment of networks, partnerships or coordinating groups:

- This includes establishment of regional coordinating councils (Project 586) or units (Project 1111) and partnerships (Project 3340), and installation of focal points in each country for local scientific networks (Project 1247). One of the important achievements of a project is establishment of expert groups in each region that then becomes a network of national or regional experts (Project 584). Although not part of project objectives, a number of "networks" among those involved in the project have developed, engendering better cooperation, particularly at technical levels (Project 615).

Research cruises, tours, training and other education programs:

- For example, tours in other countries provide a platform for engagement of other international experts (Projects 806, 614). International and local scientists participated in research cruises (Project 1580). Training programs are organized (Projects 615, 1111, 1580, 2136, 2544) particularly for local specialists, and other education programs are also conducted to involve experts (Project 842). In one project (Project 3340), a cadre of local experts trained in tool delivery to ensure replication and on-going development of the tools. Local communities are also involved in community-based information and training programs (Project 586).

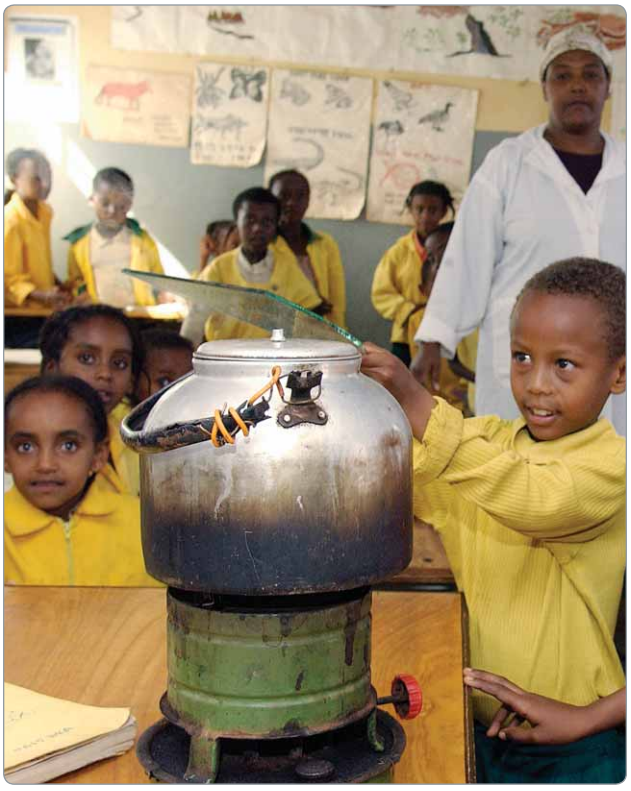
Publications and project reviews:

- The wider international community is considered to have contributed to the project through the literature (including documented experiences) reviewed (e.g., Project 1889) and cited in the specialist reports (Project 2701). In some cases, involvement of wider scientific entities occurs through involvement of project reviewers (Project 1537, 1889). In addition, joint publications were prepared and published by international and local scientists (Project 1580).

Implementation:

- For instance, local communities, such as universities, are a part of the project staff, some on a short-term contractual basis and/or as advisors (Project 1444). In the Mekong Basin WUP (Project 615), local experts are highly involved in project implementation,

Participation of local and international scientific bodies as shown above appears mixed in nature. In a single project, several methods may be adopted. But in general,



Engagement of local science institutions, such as Universities, is important to the success and sustainability of IW projects. Here the next generation of scientists, policy designers and decision makers conduct a science experiment in the classroom / *UN Photo, E. Debebe*

engagement of local experts is high for specific projects in a river basin, whereas for projects with bigger scope (e.g. regional or global), the engagement of international experts and experts at the national or regional level is higher.

One unique approach (Project 2722) is the organization of gatherings in which participants are able to discuss issues in an informal way without the pressure of coming up with resolutions at the end of the meeting. Such informal sessions (without requiring agenda/minutes) were emphasized in the evaluation of the Mekong WUP (Project 615) as a means to allow participants to fully understand and appreciate the subject and share viewpoints.

Engagement Issues

Extensive efforts were made to engage local and international scientific entities, although local and/or international involvement of experts or scientists (Projects 1111, 1355, 2544) was often low. Moreover, in many teams, social scientists and policy scientists were underrepresented (Project 584). In some cases, significant involvement of experts from line agencies of riparian countries seemed lacking (Project 615).

Not all projects made efforts to include institutions or research bodies. In at least one project, mobilization and incorporation of research bodies was not considered in the project design (Project 2701). Had it been considered, this would have "ensured that the work was not just done by 'consultants' but could have meaningfully enhanced the science base as well as building the capacity at the post graduate levels in the region".

Also, there appears to be a complete lack of recognition regarding involvement of local resource management institutions and Indigenous Knowledge Systems, and of how involvement could have created a vertical continuum from local to provincial to national and trans-national levels (Project 2701).

In some instances, local communities were not engaged at an early, or at any stage of the project (Projects 530, 1111), although some projects have components to engage them (Project 530). In other cases, the interaction with local communities was limited (Project 584), possibly due to the regional and global scope of the project. In cases where the project is more of a macro-level planning process, engagement of local communities

might be possible in demonstration activities (Project 1323) but lack of information hinders verification.

The seeming lack of participation from local stakeholders could be due to the absence of stakeholder analysis and a stakeholder involvement plan (although this was planned in the proposal), which led to some shortcomings (Project 2722). For example, while there was very significant awareness of the Global Forum among national, regional and global stakeholders, there was little awareness at the local level.

Regarding involvement of private sectors and NGOs, despite the absence of some key documents, it appears that implementation of several projects seemed to lack a good deal of involvement from private sectors and NGOs (Project 2364, 2722).

Networks seem to have been established in an ad hoc manner; however, some exceptions are evident: for instance, Project 2722 in which the networks may be integrated into the Global Forum structure. Another example is establishment of local management bodies (Project 1537), but the absence of legislative backing and limited funding may put their sustainability in question. Nevertheless, such networks would possibly result in long-term benefits.

Ownership Issues

The above description of involvement of local and international scientific bodies does not only have implications regarding the quality of science applied but also on the ownership of the project.

For some projects, local ownership seem well integrated (e.g. Projects 615, 1542, 1889, 2544). This is supported by adoption of technologies that match with available local expertise and can thus be maintained (Project 1542); or by mentoring of local scientist by world-renowned scientists (Project 1580); or by creation of dedicated project management offices (Project 2135). In other projects, the issue of ownership seemed to have been approached through the usual, but at times dubious methods, such as stakeholder consultations (Project 2136) during the preparation phase.

Due to some weakness in the project design, certain specific shortcomings or inequalities were apparent. For instance, there is unequal ownership in the regional capacity assessments, especially in the case of Africa and Latin America (Project 2722). The terminal evaluation report concluded that stakeholder ownership of the outcomes of the project has to be strengthened for a number of steering committee members and partners.

Land use within the Danube River Basin, Romania / *A. Dansie*

3.5 Scientific best practices

The following may be considered as scientific "best practices" that can be adopted in other transboundary river basin projects:

- *Adoption and/or application of established concepts or paradigms:* a significant portion of the projects indicated consideration of established and well accepted concepts. Such concepts or paradigms include holistic and ecosystem approaches (Project 584), Integrated Water Resources Management (Project 584), integrated river basin management (Project 342), integrated pest management (Project 584), demand management (Project 584), integrated

watershed management (Project 2722), integrated coastal zone management (Projects 584, 2722), community-based natural resource management (Project 2701), environmental flows (Projects 615, 2701), etc. The coupling of ecological and social systems is also evident in the majority, if not all, of the projects reviewed.

- *Development and application of a comprehensive basin model package,* which includes development of a knowledge base, integrated basin models, and impact analysis tools (Project 615).

- *Application of tools and methodologies in the preparation reports,* such as literature reviews (Project 2364), needs assessment (Project 806), feasibility studies (Project 1889), case studies (Projects 615, 806), causal chain analysis (Project 584), and policy option analysis (Project 584), among others. The conduct of joint research (Project 1580) is also worth mentioning.

- *Preparation of Transboundary Diagnostic Analysis,* Strategic Action Plans (Projects 596, 613, etc.) as well as Environmental Management Plans (Project 1889).

- *Encouraging public or stakeholder participation at different or all stages,* that is from project inception to project completion. Stakeholder participation has been largely emphasized in most projects although some limitations are observed, as discussed earlier in this report. Moreover, participatory processes and bottom-up approaches are also adopted in some projects (e.g. Projects 584, 1111).

- *Adoption of state-of-the-art methods and knowledge available globally,* such as efficient irrigation methods/systems (Project 584), multi-purpose reservoirs (Project 586), adoption of best agricultural practices, recycling (Project 614), sludge utilization (Project 614), etc.

- *Capacity building and awareness raising activities,* such as capacity-building workshops, technical assistance (Project 806), study tours or research cruises, training, etc.

- *Wide dissemination of results,* which is implemented through various media such as print publications and through websites, with the latter found common to most projects. Publication of scientific articles in international journals is noteworthy in this aspect, as only a few projects seemed to have accomplished it.

As indicated above, integrated approaches such as IWRM and ICARM seem common in the reviewed projects, reflecting consideration of every aspect of river basin management.

Regarding implementation, one observation that could be noted by other projects is the capability to achieve objectives despite some constraints. In one reviewed project (Project 1580), re-focusing of the main activities, based on priorities of the key stakeholders and findings of some research activities, was needed.

Making assumptions that are unlikely to be right, given the characteristics of the catchment and absence of evidence, possibly indicates a rather "textbook" approach to the problems in the subject basin (Project 1537) and could subsequently put the SAP at risk. Such practice needs to be corrected whenever found.

Issues on the adoption of local/traditional knowledge

Results of the synopsis survey for the river basin IW system type indicate that adoption of local or traditional or indigenous knowledge seems to be lacking, bearing in mind that only limited documentation is available in many projects. There was a good understanding of traditional practices and their limitations in terms of mapping heritage sites and understanding traditional crops, yet there was no explicit application of an existing knowledge or method for implementation (Project 886). Moreover, it appears that a project had plans to include the local community through building sanitation facilities and in economic activities, but there was no specific mention of using local knowledge in the project (Project 1444). Traditional knowledge of local communities should also be considered in interpreting quantitative environmental indicators, but no documentation is available, thus far, on whether this has been applied (Project 615). As another example, it was observed there was no indication of the use of local knowledge in the design of a project (Project 1542), although one reason for this could be that the problem seems to have a known solution.

Figure 4 Transboundary River Basins of Latin America

3.6 Communication of results and science

While this can be difficult to assess in a few projects, given limited documentation, a significant number of projects had indeed adequately communicated results in a number of ways, as follows:

- Gatherings, such as workshops, meetings, seminars, conferences, symposia, fora, etc. (e.g. Projects 596, 614, 615, 806, 886, 1111, 1247, 1444, 1537, 1542, 1580, 1889, 2364, 2617, 2722). This communication vehicle is used by the majority of projects reviewed.

- Awareness activities and media such as awareness raising in museums and aquaria (Project 2722), videos (Project 2617), mass media (Project 1444), and other campaigns such as school outreach (Project 1444);

- Demonstration activities, such as pilot projects (Project 2364);

- Networks, e.g., exchange of information among scientific centres involved in project implementation (Project 2544);

- Publication of reports, books, background documents, newsletters, etc. on websites, which may be the project website, the executing agency's website or the website of international organizations or collaborations (e.g. IW:LEARN, GEF project websites). This vehicle is used by most, if not all, projects (Projects 584, 586, 613, 614, 615, 806, 1111, 1247, 1323, 1580, 1889, 2129, 2364, 2617). Some websites, however, do not contain adequate information (Projects 2364, 1323) and in some cases only photos and a few documents are available (Project 1111).

- Publication and distribution of documents in hardcopies (Projects 615, 1580); on this point, it is interesting to note the publication of formulated and adopted procedures and technical guidelines in the local languages of riparian countries (Project 615).

- Publication in peer-reviewed journals (Projects 584, 613, 615, 806, 1580).

A specific effort on "Knowledge Management" is worth mentioning (Project 1323). This could be a good approach for enhancing communication of science knowledge to stakeholders. An Educational Study Pack (a series of books on the state of ecosystem), recommended and introduced in some schools and universities (Project 1580), is also noteworthy.

While communication of project results seems reasonable, communication of science in particular seems inadequate, as noted in several projects (e.g. Projects 530, 791, 886, 1247, 1323). This is further illustrated by the presence of only a few publications in peer-reviewed journals. Given that journal publications would indicate the strength of scientific components in the projects, more effort on this aspect in future GEF IW projects would significantly improve the quality of science used in projects. This has been stressed in one of the reviewed projects in which a project steering committee meeting emphasized there should have been more peer review of the literature produced (Project 2722). A lack of peer review could have some effect on the quality of documents that grew out of the project: i.e., the lack of formality and visibility of findings and recommendations did not enable efficient contribution to national policies.

Use of generated data/information and project results

An indication of the success of communication of science and project results could be its uptake and use by other entities. For example:

- GIWA recommendations have guided development and implementation of GEF projects in Latin America (Project 584);

- The Decision Support Framework (DSF) developed for the Mekong River Basin was not only used as the analytical basis for formulation of technical rules, as the project had intended, but was also applied in national case studies, in studies for other river basins of member states, and in the WB Mekong Region Water Resources Assistance Strategy (WBMRAS). Moreover, the outputs of WUP have been incorporated in the MRC Strategic Plan 2006-2010.

- Use of data/information in the preparation of the Black Sea Diagnostic Report (2010) by the

Permanent Secretariat of the Black Sea Commission (Project 1580);

- Project results have contributed to achievement of the goals of the Black Sea-Danube Strategic Partnership for Nutrient Reduction (GEF-World Bank – UNDP), advanced implementation of the EU Water Framework Directive, and in general improved environmental sustainability, in line with the Millennium Development Goals (Project 2617);
- Significant inputs into the UN processes, such as the UNCSD, UN Open-ended Informal Consultative Process on Oceans and the Law of the Sea, and the UN Ad-Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction (Project 2722);
- The policy brief on marine biodiversity is playing a catalytic role to the CBD process of measuring the progress in implementation of work on marine and coastal biodiversity (Project 2722);
- Lessons learned and policy change has been duplicated across many spheres, for example, OSPAR initiatives with seamounts and the Coral Triangle Initiative (Project 2722);
- Project findings (Project 596) are implemented in national programmes (with ToR).
- The UN AdHoc Open-ended Informal Working Group on issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction used the outcomes and policy papers of the Global Conference (Project 2722).

3.7 Science and management implications

Findings and outcomes of the different GEF IW projects indicated a number of science and management implications.

The importance of implementation of widely accepted management concepts, such as ecosystem-based management (Project 584), has been emphasized, including use of scientific research findings for decisions in respective basins (Project 1580).

International cooperation is also underlined in these projects, given the internationality and regional nature of transboundary water issues (e.g., Projects 342, 614). Coordination mechanisms, such as an Intersectoral Coordination Committee in each country (Project 596), play a key role in implementing activities among countries at the regional level, and with sub-national entities and countrywide stakeholders, to ensure that policy reforms and priority investments are actually implemented. The significance of public involvement is also emphasized. The need to sustain global and integrate efforts is also highlighted so as to maintain momentum and ensure that activities lead to development of national and local policies and strategies, with subsequent implementation (Project 2722). Furthermore, close interaction with the private sector on oil and gas issues will help ensure that the stage is set for follow-up of project activities (Project 596) through strong national commitments to specific reforms and investments. In other cases, restructuring of institutions seems to be the direction needed (Projects 614, 615).

Increasing the knowledge base is an essential aspect (Projects 342, 584, 791, 1889) as this is indispensable in any science-related undertaking to support decision-making. Considerable gaps are acknowledged in existing knowledge, for example in the interactions between water and land use (Project 586), and it is important to conduct further studies to better understand issues (Projects 613, 2722). Establishment of environmental monitoring systems, in particular, provides an opportunity for regular coordination among different government agencies (Project 1889). Moreover, with regard to the inter-linkages of freshwater and coastal and marine environments, there is a need to identify social and economic costs associated with land-based sources of marine pollution and to determine how integrated watershed management and coastal management can provide cost-effective solutions (Project 2722). Modelling needs may also have an influence and may shape monitoring and data collection programs in a river basin (Project 615).

Project outputs (e.g., DSF and procedures) may give riparian countries confidence to implement measures, assured that they will not harm other countries nor endanger sensitive ecological resources (Project 615). Furthermore, the ability to determine the impacts

of development scenarios and the availability and adoption of agreed rules may have implications on the mobilization of external financial resources or investments for urgently needed major water resources development projects (Project 615).

Sustainability of some project components or their outcomes relies on continuous support, as well as on the availability or improvement of local expertise or technical personnel (Projects 615, 1542). For instance, an appropriate technology in the design of Waste Water Treatment Plants (WWTP) may be the one that can be sustained by the local engineers and managers (Project 1542). While it may be difficult to provide or keep suitable staff for the long term, continuity of personnel should be encouraged and this may have implications on (available or future) professional incentives for staff to stay working in river basin secretariats.

A final implication is that actions should clearly correspond to findings and project outcomes: for example, development of international scientific programmes and formulation of international agreements for investigation, conservation, exploitation and sustainable management of bioresources (Project 596); acceptance by all riparian countries of developed tools (i.e. DSF) as a reference for decision making in order to move forward on effective policy development and planning processes (Project 615); protection of the main source of drinking water and the coastline from organic pollutants in domestic wastewater discharge (Project 2760); or actions to address drought, flood and forest fires in the basin (Project 2364).

3.8 Use of indicators and research, monitoring and assessment issues

Use of indicators

In general, there are two types of indicators used in these projects. One is the type used to assess the performance or success of project implementation. Some projects seem to have limited the use of indicators to only this aspect (e.g. Projects 584, 1323, 2722).

The second type includes those that give an indication of the outcomes or impacts of the projects or development scenarios. These include indicators to assess the status

Mongolians Bathe in Ulaanbaatar River / *UN Photo, E. Debebe*

of the system (Project 1074). Some projects use process, stress-reduction and environmental status indicators (Projects 1111, 2132, 2364, 2617). These can aid in decision-making and river basin planning (Project 615) and in supporting SAP implementation (Project 586). They can be found in the TDA (Projects 842, 886, 1580), transboundary monitoring plans (Project 1537), state of environment reports (Project 1580), assessment reports (Project 615), or generally in the project design (Project 2701). However, whether or not these indicators are followed through remains in question, due to the current status of projects (Project 1537) or, in some cases, because of the absence of documents indicating use (Projects 633, 886, 2364).

Proxy indicators seem to be widely used in some projects but their contribution is varied, from significant to low. Several projects, on the other hand, seem to have no or minimal use of indicators in development of monitoring strategies (Projects 530, 1229, 1247, 2136). It should also be noted that there is a varied range of acceptance (from rejection to wide acceptance) by stakeholders of these indicators or results of assessments.

Research, monitoring and assessment issues

Several unique or interesting research, monitoring and assessment issues are to be found in the reviewed documents, as outlined below:

- Extended coverage of transboundary waters (for the management of international waters) (Project 584), linking international river basins to their adjacent Large Marine Environments (LMEs);
- Study to evaluate the contribution of river navigation to increase the competitiveness of agriculture in the basin (Project 586);
- River basin modelling (Project 1111) and water quality modelling (Project 342);
- Strengthening implementation of EIA as a management tool, in particular as it concerns transboundary and cumulative impacts (Project 1247);
- The use of before and after data collection to evaluate the impact of the project (Project 1542), or implementation of an environmental monitoring system/program (Projects 614, 1889);
- Governance of marine areas beyond national jurisdiction and inter-linkages between freshwater and marine and coastal areas (Project 2722);
- Development of a region-wide analysis of the transboundary impacts of land-based activities (Project 1247);
- Adoption of monitoring procedures and technical guidelines (Project 615) and standardized measurements across the basin along with development of a manual for monitoring (Project 1889);
- Collective efforts by a large number of scientists (in the hundreds) to pull together pertinent information from hundreds of technical reports (Project 613);
- Collaboration among national governments at the highest level, such as a Joint Ministerial Declaration signed by environment ministers, which is expected to rejuvenate environmental cooperation (Project 2544);

Other issues include the unclear link between SAP and pilot implementation projects (Project 791). It was also found that SAP does not include commitments to reach objectives or quantifiable numeric indicators to measure the achievement of the goals of the project (Project 613).

Finally, the absence of a monitoring and evaluation plan, although included in the project proposal or design, could be due to unavailability of funds for the implementation of such a plan (Project 2722).

Human population growth in the Mekong Delta is seeing rapid urbanization and land use change, a bridge under construction in Vietnam where ferries were the only option for crossing this part of the delta before / *A. Dansie*

3.9 Contribution of science in achieving project objectives

The contribution of science in achieving project objectives appears in a variety ways:

- In articulation of the problems through basic scientific information (Projects 596, 1444);
- In selection of alternatives and design of project activities or interventions (Project 1889);
- As a solid analytical basis for formulating procedures and technical guidelines on maintaining flows and water quality adopted by member states of a river basin (Project 615);
- In development of methodologies or strategies, such as used in assessment of international waters or in implementation of activities to reduce pollution (Project 2617);
- In development of tools and measurements: for example, for monitoring ecosystems in general [1580] or marine pollution in particular (Project 1247);
- Use of basic scientific method to map and estimate sediment loads (Project 886);
- In creation of databases for managing coastal or other water environments (Projects 596, 615, 1247);
- In development of case studies (Projects 615, 806), feasibility studies (Project 1889), and in preparation of basin management and/or development plans (Projects 615, 1580, 1889).

In many cases, science is integrated in the literature review as the basis for data and information gathering [1580] and leads to an improved understanding of issues, contributes to project formulation, and helps identification of appropriate measures (Project 2364). In a few cases, although sound, the science used in projects is not necessarily cutting edge (Project 1537).

Scientific information has raised awareness of the status of coasts and oceans and enhanced understanding of the causes, thereby encouraging stakeholders to participate and contribute to the success of the project (Project 2722). Generally however, it should be noted that where the project's focus is on institutional measures, natural science has made a low contribution in the implementation (e.g., Project 1111).

Livestock and land use of agriculture in the La Plata river basin / *A. Dansie*

CHAPTER FOUR
Conclusions

The reviewed documents clearly indicate the diverse but significant role of science in GEF projects, from formulation to completion. With regard to river basin projects, various issues and scientific concepts and methodologies are adopted. However, some gaps are identified in this report and it is recommended that such components be considered in future projects, whenever applicable.

While a significant natural and social science presence is evident, and has potential for replication in other areas, communication of this science to the wider community seems limited, particularly through the vehicle of peer-reviewed publications. Increasing efforts to ensure more peer-reviewed publications would contribute to enhancing the quality of science in GEF projects and its subsequent use. Nevertheless, it is noteworthy that publication of reports and other information through websites and print media has contributed to the success of projects.

Efforts to engage local and international scientific entities to the greatest possible extent are also observed; however, limitations were found. Development and implementation of a stakeholder involvement plan in every project seems a likely method to address this. At the same time, such a plan should be complemented with an adequate budget, as it was found that monitoring activities are not adequately implemented in some cases, due to a lack of funds.

Individual project reviews, and subsequently this synopsis report, are dependent on available documentation. The absence of adequate project documentation has had an impact on the ability of reviewers to conduct a complete evaluation; consequently, it is strongly recommended that availability of documents be improved and that communication between project staff and reviewers be deemed essential.

The Mekong River / *A. Dansie*

CHAPTER NUMBER

Header

IW:Science

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