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IMPLEMENTATION COMPLETION AND RESULTS REPORT

IDA-47650

CREDIT

IN THE AMOUNT OF SDR 146.9 MILLION

(US\$ 221.96 MILLION EQUIVALENT)

TO

INDIA

FOR THE

Integrated Coastal Zone Management Project (P 097985)

December 2020

Sustainable Development
South Asia Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective June 30, 2020)

Currency Unit = INDIAN RUPEE INR

INR 75.53 = US\$1

FISCAL YEAR

April 1 - March 31

Regional Vice President: **Hartwig Schafer**

Country Director: **Junaid Kamal Ahmad**

Regional Director: **John A. Roome**

Practice Manager: **Christophe Crepin**

Task Team Leader(s): **Milen F. Dyoulgerov Vollen, Sitarama Krishna Addepalli**

ICR Main Contributor: **Deepa Balakrishnan**

ABBREVIATIONS AND ACRONYMS

BCA	Benefit Cost Analysis	MoEF	Ministry of Environment and Forests
BEAMS	Beach Environment and Aesthetics Management Services	MoEFCC	Ministry of Environment, Forest and Climate Change (earlier MoEF)
BISAG	Bhaskaracharya Institute of Space Application & Geo-Informatics	MPA	Multi-phase Programmatic Approach
CBO	Community-Based Organization	MPCS	Multipurpose Cyclone Shelters
CDA	Chilika Development Authority	MRCI	Marine Research, Conservation and Information Centre
CIA	Coastal Environmental Impact Assessment	MSME	Micro, Medium, and Small Industries
CPCB	Central Pollution Control Board	NCBI	National Center for Biotechnology Information
CRZ	Coastal Regulation Zone	NCSCM	National Center for Sustainable Coastal Management
CVCA	Critically Vulnerable Coastal Areas	NCZMA	National Coastal Zone Management Authority
CZM	Coastal Zone Management	NDC	Nationally Determined Contribution
CZMP	Coastal Zone Management Plan	NDPR	National Detailed Project Report
DBOT	Design-Build Operate Transfer	NOx	Nitrogen Oxides
DCZMA	District Coastal Zone Management Authority	NPD	National Project Director
DoFE	Department of Forest and Environment	NPMU	National Project Management Unit
DPR	Detailed Project Report	NPV	Net Present Value
DSDA	Digha-Shankarpur Development Authority	O&M	Operations and Maintenance
EA	Environmental Assessment	OHS	Occupational Health and Safety
ENCORE	Enhancing Coastal and Ocean Resource Efficiency Project (FY20)	OP/BP	World Bank: Operational Policy/Bank Procedure
ERR	Economic Rate of Return	OSDMA	Odisha State Disaster Management Authority
ESA	Ecologically Sensitive Area	OSPCB	Odisha State Pollution Control Board
ESIA	Environmental and Social Impact Assessment	PAD	Project Appraisal Document
ESMP	Environment and Social Management Plan	PCB	Pollution Control Board
GDP	Gross Domestic Product	PDO	Project Development Outcome
GEC	Gujarat Ecology Commission	PEA	Pilot Investment Execution Agency
GEER	Gujarat Ecological and Education Research Foundation	PM	Particulate Matter
GHG	Greenhouse Gas	PMU	Project Management Unit
GIS	Geographic Information System	PPF/(PPA)	Project Preparation Facility (Advance)
GoG	Government of Gujarat	PPP	Purchase Power Parity
GoI	Government of India	PVBCR	Present Value of Benefit/Cost Ratio
GoO	Government of Odisha (erstwhile Orissa)	SCZMA	State Coastal Zone Management Authority
GoWB	Government of West Bengal	SHG	Self Help Group
GPCB	Gujarat State Pollution Control Board	SICOM	Society of Integrated Coastal Management
HL	Hazard Line	SoI	Survey of India
HTL/LTL	High Tide Line / Low Tide Line	SOx	Sulphur Oxides
ICR	Implementation Completion and Results Report	SPMU	State Project Management Unit
ICRZ	Island Coastal Regulation Zone (ICRZ)	STP	Sewage Treatment Plant
ICZM	Integrated Coastal Zone Management	TEEB	The Economics of Ecosystems and Biodiversity
ICZMP	Integrated Coastal Zone Management Plan	UNEP	United Nations Environment Program
IDA	International Development Association	UNFCCC	United Nations Framework Convention on Climate Change
IESWM	Institute of Environmental Studies and Wetland Management	UT	Union Territory (of the Government of India)
ISR	Implementation Status and Results Report	VOC	Volatile Organic Compounds
IUCN	International Union for Conservation of Nature	WBSEDCL	West Bengal State Electricity Distribution Company Limited
JMC	Jamnagar Municipal Corporation		
M&E	Monitoring and Evaluation		
MARC	Marine Aquarium and Research Centre		
MIS	Management Information System		
MLD	Million Liters per Day		

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DATA SHEET

BASIC INFORMATION

Product Information

Project ID	Project Name
P097985	Integrated Coastal Zone Management
Country	Financing Instrument
India	Investment Project Financing
Original EA Category	Revised EA Category
Full Assessment (A)	Full Assessment (A)

Organizations

Borrower	Implementing Agency
The Republic of India	Society of Integrated Coastal Management

Project Development Objective (PDO)

Original PDO

The project development objective is to assist GoI in building national capacity for implementation of comprehensive coastal management approach in the country, and piloting the integrated coastal zone management approach in states of Gujarat, Orissa and West Bengal.

FINANCING

	Original Amount (US\$)	Revised Amount (US\$)	Actual Disbursed (US\$)
World Bank Financing			
TF-91901	100,000	8,332	8,332
IDA-47650	221,965,000	189,965,001	178,921,051
Total	222,065,000	189,973,333	178,929,383
Non-World Bank Financing			
Borrower/Recipient	63,710,000	54,300,141	50,022,621
Total	63,710,000	54,300,141	50,022,621
Total Project Cost	285,775,000	244,273,475	228,952,005

KEY DATES

Approval	Effectiveness	MTR Review	Original Closing	Actual Closing
15-Jun-2010	12-Aug-2008	28-Jun-2013	31-Dec-2015	30-Jun-2020

RESTRUCTURING AND/OR ADDITIONAL FINANCING

Date(s)	Amount Disbursed (US\$M)	Key Revisions
16-Dec-2015	92.74	Change in Results Framework Change in Components and Cost Change in Loan Closing Date(s) Reallocation between Disbursement Categories
21-Dec-2017	133.29	Change in Loan Closing Date(s) Change in Implementation Schedule
21-Dec-2018	149.39	Change in Loan Closing Date(s) Reallocation between Disbursement Categories
25-Mar-2020	169.91	Cancellation of Financing Reallocation between Disbursement Categories
09-May-2020	170.62	Change in Loan Closing Date(s)

KEY RATINGS

Outcome	Bank Performance	M&E Quality
Satisfactory	Satisfactory	Substantial

RATINGS OF PROJECT PERFORMANCE IN ISRs

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US\$M)
01	01-Dec-2010	Satisfactory	Satisfactory	10.84
02	05-Jul-2011	Satisfactory	Satisfactory	12.60
03	17-Jan-2012	Satisfactory	Satisfactory	16.44
04	28-Oct-2012	Satisfactory	Moderately Satisfactory	20.75
05	29-Dec-2012	Satisfactory	Moderately Satisfactory	24.35
06	23-May-2013	Satisfactory	Moderately Satisfactory	36.05
07	29-Sep-2013	Moderately Satisfactory	Moderately Satisfactory	40.06
08	01-Apr-2014	Moderately Satisfactory	Moderately Satisfactory	56.05
09	29-Sep-2014	Moderately Satisfactory	Moderately Unsatisfactory	61.48
10	22-Mar-2015	Moderately Satisfactory	Moderately Unsatisfactory	73.19
11	24-Sep-2015	Moderately Satisfactory	Moderately Unsatisfactory	86.94
12	19-Jan-2016	Moderately Satisfactory	Moderately Unsatisfactory	92.74
13	23-Sep-2016	Moderately Satisfactory	Moderately Satisfactory	107.82
14	28-Mar-2017	Moderately Satisfactory	Moderately Satisfactory	116.51
15	07-Dec-2017	Moderately Unsatisfactory	Moderately Satisfactory	129.82
16	01-Feb-2018	Moderately Satisfactory	Moderately Satisfactory	138.39
17	08-Aug-2018	Satisfactory	Satisfactory	145.62
18	21-Feb-2019	Satisfactory	Satisfactory	153.32
19	23-Oct-2019	Satisfactory	Satisfactory	169.91
20	29-Jun-2020	Highly Satisfactory	Highly Satisfactory	175.01



SECTORS AND THEMES

Sectors

Major Sector/Sector (%)

Agriculture, Fishing and Forestry 25

Other Agriculture, Fishing and Forestry 25

Public Administration 10

Other Public Administration 10

Transportation 10

Ports/Waterways 10

Water, Sanitation and Waste Management 55

Waste Management 25

Other Water Supply, Sanitation and Waste Management 30

Themes

Major Theme/ Theme (Level 2)/ Theme (Level 3) (%)

Private Sector Development 100

Jobs 100

Urban and Rural Development 17

Urban Development 17

Urban Infrastructure and Service Delivery 17



Environment and Natural Resource Management	82
Environmental Health and Pollution Management	48
Air quality management	16
Water Pollution	16
Soil Pollution	16
Renewable Natural Resources Asset Management	17
Biodiversity	17
Environmental policies and institutions	17

ADM STAFF

Role	At Approval	At ICR
Regional Vice President:	Isabel M. Guerrero	Hartwig Schafer
Country Director:	N. Roberto Zagha	Junaid Kamal Ahmad
Director:	John Henry Stein	John A. Roome
Practice Manager:	Gajanand Pathmanathan	Christophe Crepin
Task Team Leader(s):	Tapas Paul	Milen F. Dyoulgerov Vollen, Sitarama Krishna Addepalli
ICR Contributing Author:		Deepa Balakrishnan



I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES

A. CONTEXT AT APPRAISAL

Context

- 1. India is one of the world's fastest-growing economies, and its populous coastal zone, which is richly endowed with natural resources, is a wellspring of economic opportunity.** From the early 1960s to the mid-2000s, India more than doubled its economic growth rate, which rose from 1.9% per capita in 1961–1990 to 4.6% in 1991–2008. Real per capita income was US\$1,040 in 2008–09, more than double the 1993–94 level. The country's 7,500-km coastline is the territorial frontier of a resource-rich zone of immense economic opportunity, socio-cultural significance, and environmental importance. In 2010, nearly 250 million people (17% of the national population) lived within 50 km of the coast, in 73 districts (of 593 nationwide). The 77 cities and towns in these areas include some of the world's largest and most densely populated urban agglomerations—Mumbai, Kolkata, Chennai, Kochi, and Visakhapatnam. A significant share of India's economic infrastructure is on the coast, including 197 major and minor ports and other maritime facilities, along with 308 large industrial units serving the petroleum and import-based industries (among others). Most national oil and gas reserves are in the shallow ocean shelf; substantial mineral deposits lie along 35% of the coast. As of 2010, coastal fisheries provided 1 million full-time jobs, while post-harvest fish processing employed 1.2 million people in 3,638 fishing villages and 2,251 fish landing centers. Coastal and marine ecosystems have some 6,740 km² of mangroves, coral reefs, seagrasses, and seaweeds. The unique flora and fauna of India's coastal salt marshes, sand dunes, estuaries, and lagoons include major stocks of fish, marine mammals, reptiles, and turtles. The coast is also dotted with sites of cultural and archaeological interest; some are nationally and internationally significant.
- 2. Sustainable use of these coastal and marine resources is vulnerable to competing economic interests and the effects of climate change.** Rapid economic growth has propelled numerous unplanned and competing activities that sometimes misuse or overuse coastal resources, degrade ecosystems, and spur conflict among stakeholders. A key challenge in the coastal and marine space is to accommodate the needs of so many users sustainably, even as climate change and coastal hazards increasingly threaten coastal economies and livelihoods. Cyclones - averaging nine per year- inflict losses of life and property that often hit poor rural and coastal communities the hardest. It is estimated that a rise in sea level of 1 m could flood nearly 6,000 km² in India and displace tens of millions of people temporarily or permanently. A sobering lesson of the December 2004 tsunami is that India's coastal and marine areas are vulnerable to the effects of seismic disasters.
- 3. The capacity to safeguard coastal resources was weak, aggravated by fragmented policies and an inadequate institutional framework, and certain to have human, economic, and environmental impacts.** Government agencies with jurisdiction over activities in coastal areas did not engage in joint planning or sufficiently coordinate their efforts. In February 2005, an Expert Committee (chaired by Dr. M.S. Swaminathan) of the Ministry of Environment and Forests (MoEF) recommended:¹ (a) adopting an integrated coastal zone management (ICZM) approach based on precautionary principles to ensure safety and security of lives, socio-economic assets, and ecological wealth; (b) applying integrated coastal zone planning as a mechanism for intersectoral collaboration and decision-making; (c) devolving coastal management responsibilities to the states and local governments; (d) creating an institutional architecture to foster integrated planning and management;

¹ See http://iomenvi.in/pdf_documents/MSS_Report.pdf.



and (e) establishing an appropriate coastal zone management (CZM) knowledge base. In response, the Government of India (GoI) articulated its CZM vision in the 2006 National Environment Policy:² (a) reform the CZM regulatory framework, and (ii) develop institutional arrangements, capacity, and knowledge systems to enable the desired shift to ICZM approaches. Simultaneously, the GoI requested World Bank support to address the lag in implementing CZM as advocated under the Coastal Regulation Zone (CRZ) Notification of 1991.

4. **The rationale for involving the World Bank in the project under review was based on the need for comprehensive experience and support in reforming CZM.** The implementation of GoI’s vision and policies for comprehensive coastal management would require stronger national and subnational capacity, backed by experiential learning. ICZM was regarded as a nationwide reform that required large learning gains and evidence before it was scaled up across the states. The World Bank emerged as the government’s partner of choice in piloting the ICZM approach, given the Bank’s capacity to mobilize international expertise, proven experience, and knowledge of ICZM, as well as financial resources. To elicit broad lessons on implementing ICZM that could be used to scale up the approach across coastal states, three coastal states representing both east and west coast of India (Gujarat, Orissa (Odisha), and West Bengal) with differing levels of development and CZM challenges were selected for the pilot. They were selected through extensive consultation among GoI sector ministries, based on the range and significance of the CZM issues encountered by coastal communities, and the selection was endorsed by a meeting of the National Coastal Zone Management Authority (NCZMA) attended by all coastal states.

Theory of Change (Results Chain)

5. **The project had four implementing agencies** - the Ministry of Environment, Forest and Climate Change (MoEFCC) at the national level, with leadership responsibilities, and the respective Department of Forests and Environment (DoFEs) of Gujarat, Odisha, and West Bengal, the three pilot states. The MoEFCC and state DoFEs had the mandate and experience in CZM. The project’s “do as you learn and learn as you do” iterative approach to capacity building (Figure 1) was designed to develop theoretical, practical, and collaborative skills in national and state agencies, community-based and non-governmental organizations (NGOs), the private sector, and more importantly the communities.

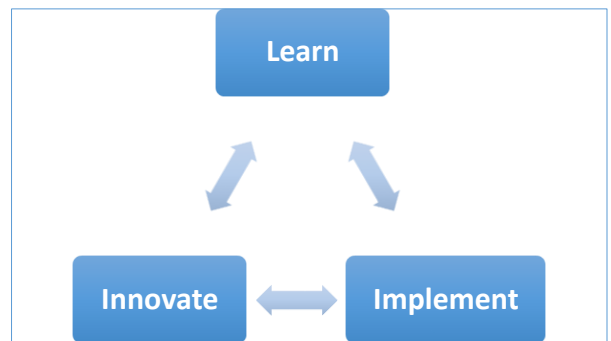


Figure 1: Capacity Building Approach of the Project

6. **The Theory of Change for this Implementation Completion and Results Report (ICR) (Figure 2)³ was drawn ex-post from the 2010 Project Appraisal Document (PAD),** which describes how project inputs and outputs were expected to lead to the desired medium-term outcome (the coastline of India planned and managed through the ICZM approach). The PAD explains that the project would pilot a new approach (ICZM) based on sound research and accurate scientific data, under the premise that involving stakeholders in coastal resource management would reduce the pressure on coastal areas and enhance the sustainability of their resources. The medium-term outcome would be sustained through the short-term outcomes: improved institutional capacity

² See <http://moef.gov.in/wp-content/uploads/2018/04/nep2006e.pdf>

³ Figure 2: Theory of Change, was developed retroactively for this ICR; it was not presented at appraisal or included in the PAD.



for implementing comprehensive CZM approaches, and ICZM pilots implemented in three states. The Results Framework in the PAD presents development indicators for the expected outcomes.

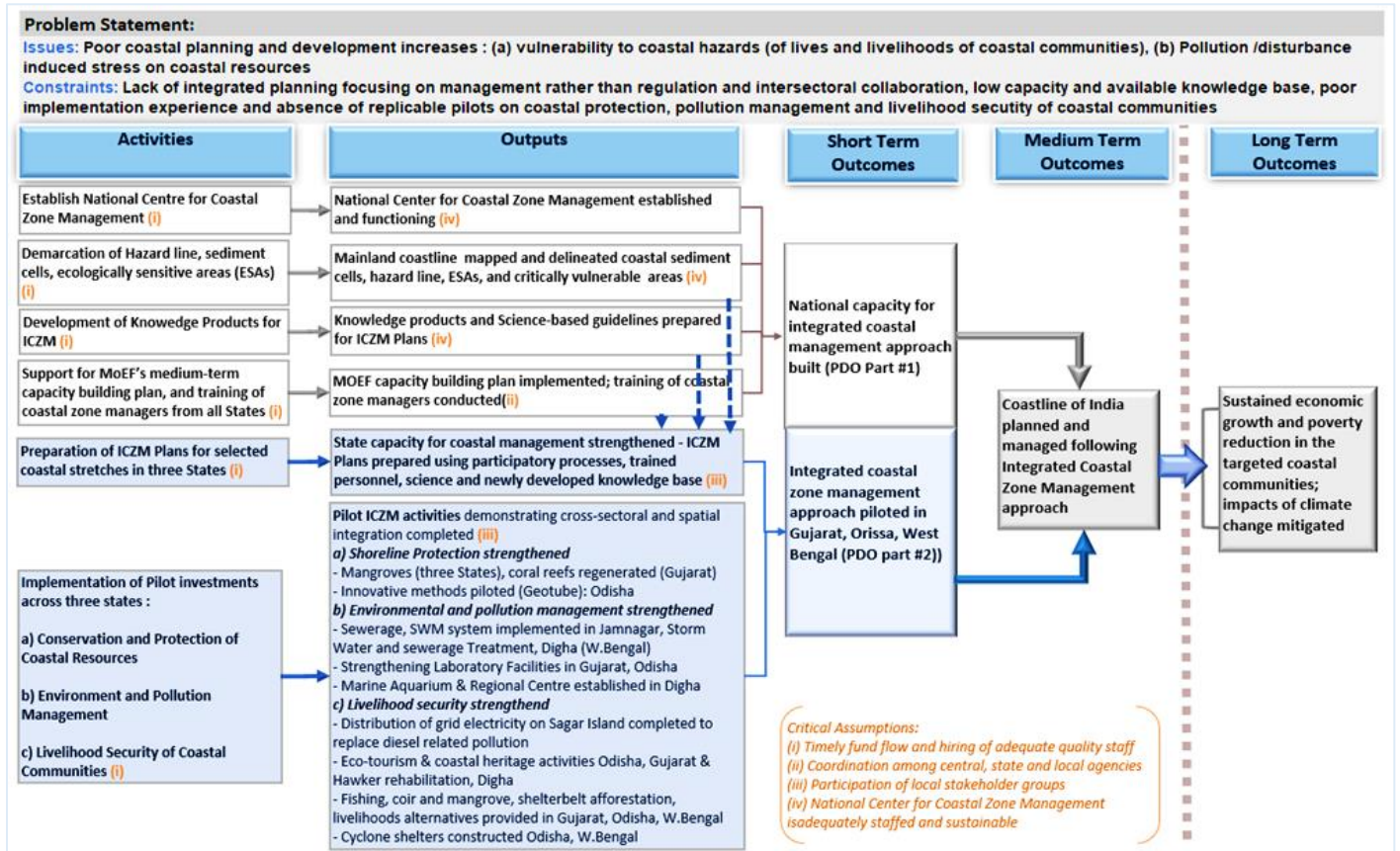


Figure 2: Theory of Change for the India Integrated Coastal Zone Management Project

Project Development Objectives (PDOs)

7. The PDO is to assist the GoI in building national capacity for implementation of a comprehensive coastal management approach in the country and piloting the integrated coastal zone management approach in the states of Gujarat, Orissa (Odisha), and West Bengal.

Key Expected Outcomes and Outcome Indicators

8. The project would monitor progress in achieving the development objective through the following *outcome indicators*:

- The existence of an appropriate national institutional structure for guiding and coordinating the implementation of ICZM approaches.
- The number of “knowledge benchmarks” showing improvement according to end-users of knowledge services.
- The number of completed pilot ICZM activities demonstrating cross-sectoral and spatial integration. The number of other ICZM Plans initiated to replicate the lessons learned.



Components

9. **Component 1: National ICZM Capacity Building (approval cost: US\$87.30 million; actual cost: US\$77.44 million).** In addition to overall project management, Component 1 focused on expanding the institutional capacity and knowledge base for integrated management of coastal zones. Activities included: (a) mapping, delineating, and demarcating hazard lines and delineating coastal sediment cells all along the mainland coast of India; (b) mapping, delineating, and demarcating as required, of the ecologically sensitive areas (ESAs) along the coast of mainland India; (c) building the capacity of MoEF as the secretariat for the NCZMA and developing a nationwide training program for ICZM; and (d) setting up and operationalizing the new National Center for Sustainable Coastal Management (NCSCM).
10. **Component 2: Piloting ICZM Approaches in Gujarat (approval cost: US\$74.10 million; actual cost: US\$58.18 million).** Component 2 financed capacity building of Gujarat State agencies and institutions; participatory preparation of the ICZM Plan for the coastal sediment cell that included the Gulf of Kachchh; pilot investments; and project management at the state level. Pilot investments were designed to demonstrate ICZM approaches to support ecological and socio-economic aims on the heavily industrialized Gulf of Kachchh along the Gujarat coast. The pilot investments: (a) conserved and protected coastal resources, including the establishment of a mangrove shelterbelt plantation, regeneration of the coral reef, (b) managed environmental pollution by completing the sewerage system for Jamnagar City to prevent further coral reef degradation, and improving the capacity of state agencies for pollution monitoring, and (c) improved the security of livelihoods by promoting ecotourism and other activities in coastal communities within and outside forest areas.
11. **Component 3: Piloting ICZM Approaches in Odisha (approval cost: US\$49.30 million; actual cost: US\$44.56 million).** Component 3 financed capacity building of Odisha State agencies and institutions; participatory preparation of the ICZM Plan for the coastal sediment cells that included the Paradeep–Dhamra, and Gopalpur–Chilika stretches, pilot investments; and project management at the state level. The pilot investments: (a) conserved and protected coastal resources, including the protection of Olive Ridley turtles⁴ and other aquatic wildlife, the establishment of a mangrove shelterbelt plantation, conservation of coastal archaeological heritage sites, and demonstration of alternative technology for shoreline protection in the village of Pentha; (b) managed pollution by setting up facilities for monitoring pollution, building the capacity of monitoring agencies, and installing solid waste management facilities in the coastal town of Paradeep; and (c) improved the security of livelihoods by supporting farming improvements in 60 fishing villages on the periphery of Chilika Lake and the Gahirmatha Wildlife Sanctuary, assisting fisher groups to develop small-scale, community-based tourism, promoting industrial and marketing activities (such as coir-making), and providing cyclone shelters in 13 coastal villages where shelters had not been constructed under earlier programs.
12. **Component 4: Piloting ICZM Approaches in West Bengal (approval cost: US\$75.00 million; actual cost: US\$48.78 million⁵).** Component 4 financed capacity building of West Bengal agencies and institutions, including Calcutta University; preparation of an ICZM Plan for the Digha–Shankarpur stretch and Sagar Island; pilot investments; and project management at the state level. The pilot investments: (a) conserved and protected coastal resources, including the establishment of a mangrove shelterbelt plantation, protection of the Digha beach shoreline and the southern end of Sagar Island, and rehabilitation of the marine aquarium

⁴ Odisha coast has one of the world's largest known rookeries of Olive Ridley sea turtle.

⁵ Changed Cost of Component 4 during the first Project Restructuring (2015): US\$ 53.98 million



at Digha; (b) managed pollution by completing the sewerage and solid waste management systems for Digha, supporting the cleaning and environmental improvement of Digha beach and relocating hawkers, and establishing an electrical grid for Sagar Island; and (c) improved the security of livelihoods on Sagar Island by promoting forestry-based livelihoods, supporting the growth of local small-scale tourism and ecotourism, and providing cyclone shelters for coastal villages.

13. *Error! Reference source not found.* summarizes the project components, activities, and subprojects at the national level and in the pilot states.

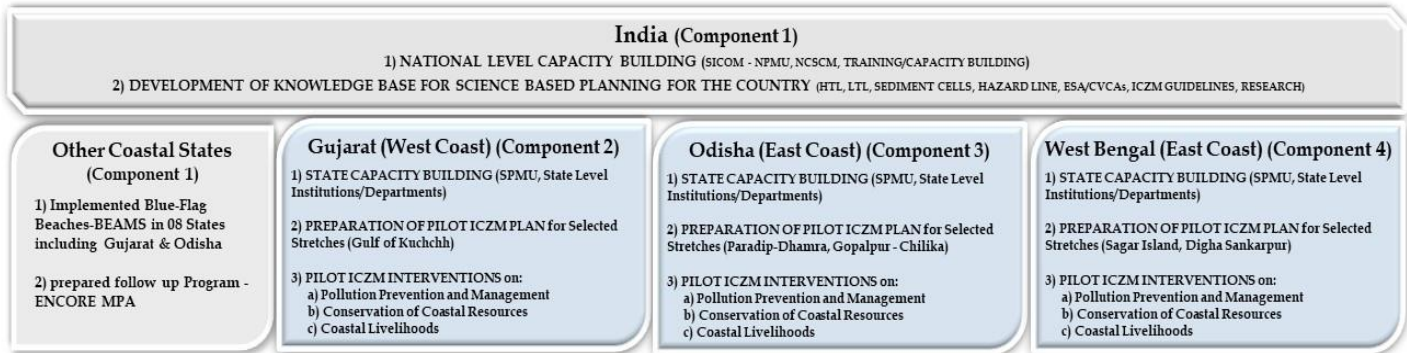


Figure 3: Components and Project Activities at National and State Levels

B. SIGNIFICANT CHANGES DURING IMPLEMENTATION (IF APPLICABLE)

Revised PDOs and Outcome Targets

14. **By August 2015, 78% of the contracts for 76% of the total estimated cost (revised) had been awarded, with work still ongoing.**⁶ To ensure that the implementing agencies could continue to make progress in achieving the PDO, the First Project Restructuring was approved on December 16, 2015 (Report No. RES21289) to (a) extend the closing date by 24 months from December 31, 2015, to December 29, 2017; (b) reallocate funds among project components, and (c) amend the Results Framework.

Revised PDO Indicators

15. **The Results Framework was sharpened to reflect the project’s focus on applying ICZM in the pilot states.** Indicator 1, “Existence of an appropriate national institutional structure for guiding and coordinating implementation of ICZM approaches,” was changed to include state level outcomes, as follows: “Institutional structure at national, and state level supportive of ICZM established according to defined criteria.” Indicator 2, “Knowledge benchmarks showing improvement according to end-users of knowledge services,” was changed to reflect the emphasis on ICZM information and data needs, as follows: “Knowledge and planning base in ICZM established according to defined criteria.” Indicator 3, “Number of pilot ICZM activities demonstrating cross-sectoral and spatial integration completed” was changed to better capture outcomes arising from pilot activities in the three states, as follows: “Implementation of demonstrable ICZM pilot activities carried out.” Indicator 4, “Number of other ICZM Plans initiated to replicate the lessons learnt” was revised to measure the technical and scientific capacity achieved for ICZM, as follows: “National and state-level technical capacity established for ICZM planning with supporting technical staffing according to defined criteria.” Indicator 5 was added to better

⁶ Refer Aide Memoire of Aug 31 – Nov 9, 2015; Annex 4- Procurement Management: “512 contracts worth INR 966 crores were awarded till August 31, 2015. NPMU and SPMUs have to procure another 138 contracts worth INR 311.5 crores. Contracts were awarded but works were still going on completed”.



capture the number of direct project beneficiaries, including women: “*Direct project beneficiaries (number), of which female (%)*.” The Restructuring PAD 2015, provides complete details of revised PDO Indicators and Intermediate Indicators for each component. Refer [Appendix B](#) which includes a table to facilitate comparison.

Revised Components

16. The project components were not changed during the life of the project.

Other Changes

17. **Four restructurings (Report Nos. RES30277, RES34590, RES40499, RES41100) extended the project closing date by 30 months and canceled savings of US\$32 million due to a depreciation of the Indian rupee (INR) by approximately 70% in relation to the US dollar.** The Second Project Restructuring extended the closing date by 12 months from December 29, 2017, to December 29, 2018, to complete activities that required much more time than initially expected: mapping the hazard line; preparing the ICZM Plan for West Bengal through NCSCM; and initiating preparation of the follow-on project, Enhancing Coastal and Ocean Resource Efficiency (ENCORE) Multiphase Programmatic Approach (MPA) Phase 1 (P167804). In 2018, World Bank management suggested that the Task Team hold discussions with MoEFCC, the Society of Integrated Coastal Management (SICOM), and other relevant implementing agencies to identify opportunities for scaling up initiatives to enhance the livelihood security and resilience of coastal village communities. To realize those opportunities, the Third Project Restructuring extended the closing date from December 29, 2018, to March 31, 2020, and reallocated Credit proceeds among the disbursement categories. The Fourth Project Restructuring canceled savings worth US\$32 million, as noted. The Fifth Project Restructuring extended the closing date by three months to June 30, 2020, to finish activities amid the constraints arising from the COVID-19 pandemic. See [Appendix B](#) for details.

Rationale for Changes and Their Implication on the Original Theory of Change

18. For the pilot states, ICZM was a novel concept. By definition, it had to be implemented through multisectoral approaches, institution building, institutional collaboration, and community participation. It took time to develop adequate knowledge, capacity, and operational experience on ICZM in national and state project management units, implementing agencies, and coastal communities. The project’s emphasis on consolidating learning over time helped build momentum to implement activities and prepare pilot ICZM Plans. The PDO indicators were revised for clarity and better monitoring of intended outcomes, without reducing the scope of the PDO.

II. OUTCOME

A. RELEVANCE OF PDOs

Assessment of Relevance of PDOs and Rating

19. **The relevance of the PDO is rated as High.** From the time of appraisal to the present ICR for this project, the PDO has reflected the priorities and policies of both the World Bank and GoI, and it has supported the internationally agreed Millennium/Sustainable Development Goals.

20. **Throughout implementation, the project objective supported priorities outlined in World Bank partnership and framework strategies.** For example, project development outcomes supported all three pillars of the



Country Strategy for India FY2009–12 (Report No. 46509-IN)—achieving rapid, inclusive growth; ensuring development is sustainable; and increasing the effectiveness of service delivery. Under the subsequent Country Partnership Strategy (CPS) 2013–17 (Report No. 76176-IN), the project contributed to all three engagement areas (integration, transformation, and inclusion)—for instance, by increasing off-farm employment (transformation) and higher female labor force participation (inclusion). At closing, the PDO remains relevant to the current Country Partnership Framework (CPF) (FY2018-22; Report No. 126667-IN). Achievement of the PDO supports all three CPF Focus Areas - (1) promoting resource-efficient growth, (2) enhancing competitiveness and enabling job creation, and (3) investing in human capital. For instance, the project supported more informed planning for sustainable development and climate-resilient growth in coastal areas. It trained ICZM professionals in central and state agencies, including the newly established NCSCM, a research institute within MoEFCC mandated to provide knowledge for ICZM throughout India. It established a national Institution, the Society of Integrated Coastal Management (SICOM), under MoEFCC to be the National Project Management Unit (NPMU) for the project, guide and coordinate ICZMP in all States and UTs of India as also to provide technical inputs to MoEFCC in all coastal and marine-related matters. Finally, it unlocked the economic potential of coastal communities in several ways, including more opportunities in the tourism industry, and improved environmental protection and biodiversity conservation by enhancing the management of biodiversity on more than 110,000 hectares (ha).⁷ More broadly, the project was a significant addition to the World Bank’s long-term engagement in CZM, and it supported the achievement of Millennium Development Goal 7 (environmental sustainability) and Sustainable Development Goals 1, 5, 8, 13, and 14.

21. **From appraisal onward, the project objective has aligned with national aims expressed in government policies and strategies.** For example, the project reflected the government’s ambitions, as defined in the 11th Five-Year Plan (2007–12)⁸ and National Environment Policy 2006, to achieve inclusive and sustainable growth; expand the use of scientific, social, and local information in environmental management plans for coastal areas; and incorporate ecological concerns into human development initiatives. The PDO was relevant to the objectives of the 12th Five Year Plan (2012–17), “Faster, More Inclusive and Sustainable Growth,” particularly the Plan’s focus on inclusive growth of coastal communities and conservation of marine resources.⁹ Those aims were to be attained by (a) demonstrating that environmental sustainability can be achieved through scientific resource management and grassroots participation; (b) building the capacity of government agencies and local communities to plan, design, and implement sustainable development approaches in coastal areas; (c) enhancing livelihood opportunities for coastal communities; and (d) specifically targeting women to participate in planning and benefit from project activities.

22. **The project’s orientation toward climate and coastal resilience also mirrors more recent national agendas and commitments.** For instance, the PDO coincides with the government’s “India – Three Year Action Agenda (2017–20)”¹⁰ with respect to developing a policy and regulatory framework to enhance sustainable tourism and boost growth in coastal areas, establishing the scientific capacity to support disaster - and climate-resilient development, enhancing livelihood opportunities for low-income coastal communities, and promoting science-based decision-making on ICZM. The project objective also contributes to outcomes envisioned in the “Strategy

⁷ See World Bank (2018), “Country Partnership Framework for India for the Period FY18–FY22,” World Bank - India Country Management Unit (pp. 90, 124), available at: <http://documents1.worldbank.org/curated/en/277621537673420666/pdf/126667-R2018-0190-REPLACEMENT-India-CPF-Final-post-Board-08242018.pdf>. Accessed May 2020.

⁸ See https://niti.gov.in/planningcommission.gov.in/docs/plans/planrel/fiveyr/11th/11_v1/11th_vol1.pdf (p. 201).

⁹ See https://niti.gov.in/planningcommission.gov.in/docs/plans/planrel/fiveyr/12th/pdf/12fyp_vol1.pdf (pp. 117, 222–25, 239, and 256 emphasize the role of coastal zone management in India’s sustainable development).

¹⁰ See https://niti.gov.in/sites/default/files/2018-12/India_ActionAgenda.pdf (pp. 69-71).



for New India @ 75,” developed by the government policy think tank NITI Aayog.¹¹ A key component of India’s Nationally Determined Contributions (NDCs)¹² as a signatory to the 2015 Paris Agreement under the United Nations Framework Convention on Climate Change is to enhance investments in sectors vulnerable to climate change, including coastal regions. Project objectives and outcomes also directly support India’s climate commitments for promoting climate-resilient economic development, expanding the implementation of ICZM approaches across the country, setting up a National Coastal Mission under the National Action Plan on Climate Change,¹³ and expanding scientific development and capacity building.

B. ACHIEVEMENT OF PDOs (EFFICACY)

Assessment of Achievement of Each Objective/Outcome

23. **The PDO has two equally important and mutually dependent parts.** The first part is to assist Gol in building national capacity to implement a comprehensive coastal management approach in India, and the second is to pilot ICZM approach in the states of Gujarat, Orissa (Odisha), and West Bengal. The ICZM pilots cannot succeed if national and state capacity in ICZM is lacking, and ICZM capacity cannot be fully built and tested without direct experience in implementing ICZM through the pilots.

PDO Part 1: Building national capacity for implementation of a comprehensive coastal management approach in the country

24. **The project built the capacity to support the implementation of an ICZM approach at the national and state level in three overarching ways.** First, it developed institutions and helped advance structural reforms to improve the capacity and enabling environment for implementation; second, it expanded the ICZM knowledge base, including through research and development (R&D); and third, it supported the development of the requisite skills for ICZM.
25. **At the national level and in the pilot states, the project established or supported multiple institutions to expand capacity to design, develop, and implement ICZM.** At the national level, it established SICOM¹⁴ within MoEFCC to be responsible for national guidance and coordination of Integrated Coastal Zone Management Plans (ICZMPs) in all coastal states and union territories (UTs) of India, as well as to act as the National Project Management Unit (NPMU) for the ICZM Project. SICOM organized 17 training programs for Government Departments, NGOs, academicians on ICZM; its support included establishing roles and responsibilities, training staff, and developing the overall capacity for ICZM in the country. By the time the project ended, 117 skilled staff supported by the project were employed in ICZM planning and implementation at the national level in NCSCM and SICOM. Within the states, Odisha established an independent society (the Integrated Coastal Zone Management Society of Odisha) to serve as the State Project Management Unit (SPMU). Gujarat designated the Gujarat Ecology Commission (GEC),¹⁵ which had extensive experience and expertise in environmental issues, as the SPMU, while West Bengal selected the Institute of Environmental Studies and Wetlands Management (IESWM)¹⁶ to act in that

¹¹ See https://niti.gov.in/sites/default/files/2019-01/Strategy_for_New_India_2.pdf (pp. 29, 81, 107, 153).

¹² See https://www4.unfccc.int/sites/submissions/INDC/Published_percent20Documents/India/1/INDIA_percent20INDC_percent20TO_percent20UNFCCC.pdf (pp. 23–4, 29, 30, 35).

¹³ World Bank (2018: 90).

¹⁴ See <http://sicom.nic.in/>.

¹⁵ See <https://gec.gujarat.gov.in/> and <http://www.geciczmp.com/>.

¹⁶ See <http://www.ieswm.org/>.



role. For effective implementation and coordination of all ICZM-related activities, the SPMU Odisha was designated as the technical secretariat of the Odisha State Coastal Zone Management Authority (SCZMA). In West Bengal, IESWM was designated as the technical secretariat for the West Bengal SCZMA.

26. **The project catalyzed structural reforms in numerous institutions and helped strengthen their capacity to fulfill their regulatory and/or R&D roles.** NCSCM¹⁷ was established as a leading national institution¹⁸ for coastal and marine area research and management and provided with adequate human resources, research, and technical facilities. The NCZMA added new members¹⁹ to strengthen its multisectoral approach to coastal management and reflect the diversity of stakeholders in the coastal space, including government ministries such as agriculture (fisheries), earth sciences, environment, water resources, disaster management, tourism, urban development, remote sensing agency, NCSCM, and representatives from India's coastal states. The SCZMAs in project states had already been established, but under the project, they began to fulfill their regulatory roles and responsibilities and provide annual reports to NCZMA. Each SPMU helped to build the capacity of the Project Executing Agencies (PEAs) responsible for implementing the pilot activities under Components 2, 3, and 4. For example, the project strengthened the capacity of the Gujarat and Odisha State Pollution Control Boards (GPCB and OSPCB) and the Gujarat Ecological Education and Research (GEER)²⁰ Foundation to monitor coastal pollution; the capacity of the Wildlife Wing of Odisha; as also GEC and GEER in Gujarat to monitor and surveil coastal wildlife; and the capacity of several institutions to conduct coastal research, including Calcutta University, the Marine Aquarium and Research Centre (MARC)²¹ of the Zoological Survey of India, Chilika Development Authority (CDA), the MS Swaminathan Research Foundation (MSSRF), and Bhaskaracharya Institute for Space Applications and Geo-Informatics (BISAG).²² These efforts developed a broad institutional foundation for ICZM. Aside from the experience gained in serving as the NPMU, SICOM designed and implemented a nationwide Beach Environment and Aesthetic Management System (BEAMS) to enable beaches to attain international ecological certification.
27. **A nationwide consultation used the knowledge and experience gained under the project to develop and implement a set of policy reforms to support coastal management.** Promulgated in January 2019, the Coastal Regulation Zone Notification 2019 (CRZ 2019) seeks to *"conserve and protect the unique environment of coastal stretches and marine areas, besides livelihood security to the fisher communities and other local communities in the coastal areas and to promote sustainable development based on scientific principles taking into account the dangers of natural hazards, sea-level rise due to global warming."*²³ CRZ Notification 2019 represents a gradual shift toward ICZM and away from the traditional "regulatory line" approach to coastal management in India: (i) it recognizes the knowledge products developed through this project—including the high tide line (HTL), low tide line (LTL), hazard line, ESA, and critically vulnerable coastal area (CVCA) maps created by NCSCM and Survey of India (SoI)—as key inputs for the states and UTs to prepare Coastal Zone Management Plans; (ii) it suggest that CZM plans may be developed or updated by state governments or UTs by *"engaging reputed and experienced scientific institution(s) including NCSCM of MoEFCC"*, (iii) it suggests that the Plans shall be prepared *"in consultation with the concerned stakeholders."* The Island Coastal Regulation Zone Notification 2019 was also published,²⁴ integrating science-based planning and knowledge products developed by the project.

¹⁷ See <http://ncscm.res.in/>.

¹⁸ See <https://pib.gov.in/PressReleasePage.aspx?PRID=1596334> (The Government of India Press Release on NCSCM)

¹⁹ See <http://moef.gov.in/wp-content/uploads/2017/11/6-10-2017-NCZMA-NOTIFICATION.pdf>.

²⁰ See <https://geerfoundation.gujarat.gov.in/>.

²¹ See <https://zsi.gov.in/App/regcenters.aspx?link=477>.

²² See <https://bisag.gujarat.gov.in/>.

²³ See <http://egazette.nic.in/writereaddata/2019/195679.pdf> (p.30).

²⁴ See <http://moef.gov.in/wp-content/uploads/2019/03/S.O.1242E-DATED-08-03-2019-ICRZ-NOTIFICATION-2019.pdf>.



28. **The knowledge base created by the project supported the implementation of the pilots and informed preparation of climate- and disaster-resilient ICZM Plans in each pilot state.** The knowledge and planning base (See Annex 1 and references in **Appendix A**) developed by NCSCM and the three states was the starting point in 2014 to develop guidelines for preparing ICZM Plans. Through Coast Online digital platform, users have access to the completed hazard line map of the entire coast of India. The map, based on aerial photography of 80,000 km², incorporates data on 150 major and minor ports, coastal ESAs (covering approximately 34,160 km²), CVCAs, erosion, flooding, tidal waves, sea-level rise, HTL, and LTL to support all coastal states and UTs in preparing disaster management plans²⁵ and managing coastal vulnerability. NCSCM also established the Coastal and Marine Biodiversity Integration Network²⁶ (CoMBINE), a national digital repository of more than 11,000 marine species.
29. **Capacity developed at state institutions has been instrumental in creating and expanding the knowledge base and skills for ICZM planning and implementation.** The implementation of pilot activities created ICZM capacity and operational experience through the iterative “do as you learn and learn as you do” process mentioned earlier. Based on this expanded capacity, BISAG started a School of Integrated Coastal Zone Management²⁷ to train students and government officials. The databases developed by BISAG were used to prepare the ICZM Plan for the designated coastal areas in Gujarat. The Gujarat State Disaster Management Authority used the BISAG data to select sites for cyclone shelters, and GPCB used it to develop a zoning atlas. Similarly, maps produced by IESWM were used to develop the CZM maps for West Bengal. The project supported IESWM to acquire the capacity for geomorphologic and wetland research covering multiple aspects of ICZM. Calcutta University developed a widely used database “Cataloguing and dissemination of the microbial diversity of Sundarbans.”²⁸ The GPCB²⁹ and OPCB³⁰ acquired the capacity and advanced equipment to regularly, rapidly monitor the physical and chemical properties of seawater to assess environmental pollution abatement in coastal areas. The upgrading and modernizing of MARC in Digha, West Bengal, not only increased tourism but reduced the aquarium’s operation and maintenance (O&M) costs while increasing the survival of its specimens.³¹ These positive results indicate that MARC is likely to continue its vital role in raising awareness of coastal resources.
30. **National and international institutions and initiatives benefit from knowledge developed under the project.** NCSCM has collaborated with 15 consortia and more than 11 institutions from India’s coastal states. Its international scientific partners include the University of Maryland,³² Centre of Ecology and Hydrology, Global Climate Research Fund,³³ University of Amsterdam, Future Earth Coasts,³⁴ and the Belmont Forum.³⁵ As the knowledge partner for the coastal states and UTs, NCSCM contributed to preparing and updating CZM maps of all coastal states, ICRZ Plans for 10 Andaman and Nicobar Islands, and Integrated Island Management Plans for 14 islands of Lakshadweep. NCSCM has provided knowledge support and expert advice to the Indian Ocean Rim

²⁵ See <https://pib.gov.in/PressReleasePage.aspx?PRID=1596334>.

²⁶ See <http://combine.ncscm.res.in/combine/>.

²⁷ See <https://bisag.gujarat.gov.in/organization-and-research>.

²⁸ See <https://www.ncbi.nlm.nih.gov/biosample/?term=Sundarban>.

²⁹ See <http://www.geciczmp.com/Data/Sites/1/docs/brochures/gpcb brochure.pdf> and <https://www.youtube.com/watch?v=kQSIbVrevz4>.

³⁰ See http://ospboard.org/wp-content/plugins/publication/uploads/files_1558940075_1429.pdf.

³¹ SICOM (2019), “Final Report: Monitoring and Evaluation of Integrated Coastal Zone Management Project”, prepared by AFC India Limited. Unpublished. Pp. 114–16, p.145.

³² See <https://ian.umces.edu/search/?cx=014990081039478878087%3Akeg1ysml30w&cof=FORID%3A11&ie=UTF-8&q=NCSCM> and www.ncscm.res.in/cms/cia/pdf/research/Cumulative%20Coastal%20Environmental%20Impact.pdf.

³³ See http://gotw.nerc.ac.uk/list_full.asp?pcode=NE%2FS009019%2F2&cookieConsent=A.

³⁴ See <https://www.futureearthcoasts.org/academy-ramesh-ramachandran/>.

³⁵ See <https://www.belmontforum.org/projects/>.



Countries, the West Africa Coastal Alliance platform, federal agencies such as NITI Aayog,³⁶ and the Solar Energy Corporation of India (SECI). It has also advised NCZMA on the quality of CZM Plans submitted by the states. NCSCM consultancy services are projected to generate revenue of over US\$15 million (INR1.13 billion) between 2018-19 and 2022-23.

31. **The project strengthened national and state technical capacity through substantial hiring and training of ICZM professionals and the creation of laboratory and other research facilities.** NCSCM employed 109 scientific and technical staff (33 scientists and 76 project-based scientific staff). SICOM organized conferences, cross-learning, and knowledge exchange programs attended by national and international experts. In sum, across the pilot states, the project supported more than 220 training programs, 26 workshops, more than 10 conferences and seminars, and 13 national and international exposure visits for government officials, SPMU and PEA staff, community-based organizations (CBOs), academicians, researchers, members of civil society, and representatives of coastal communities. Many of these individuals, equipped with ICZM experience and qualifications, have left state institutions for opportunities elsewhere, including the private sector, thus broadening ICZM expertise beyond institutions directly supported by the project. The project equipped the NCSCM laboratory and seven laboratories in the pilot states with advanced instruments to undertake research and develop tools for coastal resource conservation. The Lake Chilika³⁷ Ecosystem Health Report,³⁸ initiated in collaboration with NCSCM and the University of Maryland, is prepared and disseminated every two years. The findings are discussed with Chilika fishing communities to maintain their engagement in conserving the lake ecosystem. Improved capacity and facilities at Odisha DoFE led to Olive Ridley turtle numbers rising from 90,000 in 2006 to 1.11 million in 2018 and the population of saltwater crocodiles increased from 1,659 in 2011–12 to 1,713 in 2017–18.³⁹

PDO Part 2: Piloting the integrated coastal zone management approach in states of Gujarat, Orissa (Odisha), and West Bengal

32. **ICZM Plans and pilot activities in all three states were designed and implemented in a participatory manner.** In Gujarat, the ICZM Plan covered the Gulf of Kachchh and adjoining areas (774 km⁴⁰ or 45% of the state coastline; 17,578 km²), benefiting a population of over 3 million. In Odisha, the plan covered the Paradeep–Dhamra, and Gopalpur–Chilika stretches (9,730 km², 40% of the state coastline), with a population of over 7.5 million people. In West Bengal, the plan covered the Digha–Shankarpur stretch (635 km²) and all of Sagar Island (282 km²), two of the state’s most important tourist destinations. The preparation and implementation of plans and pilot activities were participatory (Figure 4), engaging nearly 72,000 local inhabitants and 2,500 representatives of stakeholder groups that included government agencies,

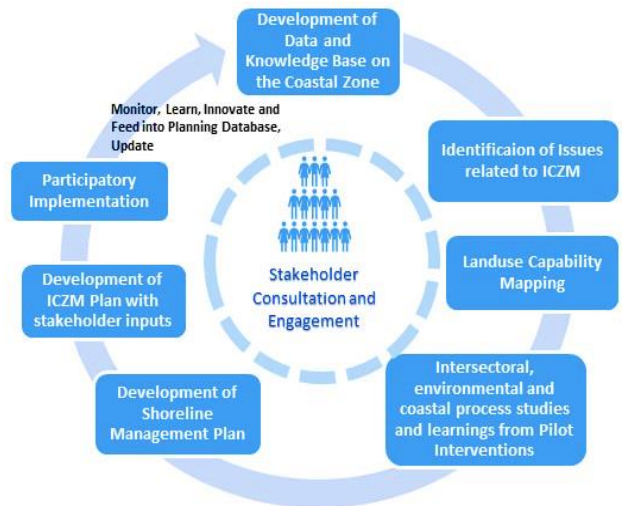


Figure 3: Participatory Process of ICZM Plan Preparation

³⁶ See https://niti.gov.in/planningcommission.gov.in/docs/aboutus/committee/wrkgrp12/enf/wg_envr.pdf, pg. 51 (Working Group).

³⁷ Chilika Lake is a brackish water lagoon and unique Ramsar site covering 1,100 km² and supporting more than 150,000 fisherfolk.

³⁸ See <https://www.chilika.com/publication.php>.

³⁹ SICOM (2019), *Ibid* p: 89.

⁴⁰ ICZM Plan for Gulf of Kachchh.



the private sector (industry and small and large businesses), fishing communities, other members of civil society, and tourists.⁴¹

33. **Pilot investments helped to reduce the risk of hazards, lay the groundwork for eco-tourism in beach areas, limit the harm from coastal pollution, and demonstrate the socio-economic benefits of improved marine resource management.** Investments in multipurpose cyclone shelters and mangrove restoration/plantation⁴² involved local communities⁴³ resulting in technical, institutional, and socio-economic experience to reduce hazards and increase coastal resilience. SICOM implemented a program using its beach improvement system (BEAMS)⁴⁴ to provide infrastructure as well as pollution abatement, safety, and surveillance services; the program enabled eight beaches in seven states and UTs⁴⁵ to achieve international Blue-Flag eco-certification.⁴⁶ In 2020, the project supported India's own ecolabeling initiative for beaches –“I#AM#SAVING#MY#BEACH- across all major beaches of India.⁴⁷ Standardized techniques of beach management in South East Asia got SICOM the coveted Golden Peacock award⁴⁸. Investments in pollution management in designated coastal areas reduced pollution and the incidence of waterborne disease, increased fish stocks, improved satisfaction in tourist areas, and delivered higher incomes to coastal communities.⁴⁹ The successful demonstration of Geotube technology to control coastal erosion at Pentha, Odisha⁵⁰ protects the lives of over 41,000 residents of 58 villages and the 250,000 tourists who visit annually. Following the restoration and augmentation of the MARC at Digha, the number of visitors rose from 9,130 in 2014–15 to 376,758 in 2018–19,⁵¹ indicating MARC's increased effectiveness in raising public awareness of the importance of coastal resources. Completion of sewage treatment plants (STPs) in Gujarat and West Bengal benefited more than 648,000 local residents and over 5 million tourists to Digha.⁵² A survey showed that 94% of visitors to Digha were satisfied with the new infrastructure and facilities.⁵³ The 100% electrification of Sagar Island in West Bengal directly benefited 206,844 persons, and visiting pilgrims. Access to electricity enabled Sagar Island businesses to at least double their revenues.⁵⁴ Over one thousand electric rikshaws—a clean mode of transport and a completely new type of employment—began to serve the island. Schools and colleges began to operate computer and science labs, and modern life-saving equipment, laboratories, and surgical facilities were installed in the island block hospital. The hospital's rate of successful deliveries rose to 84%, to the benefit of women and their newborns. With refrigerators, the pharmacies increased the drug inventory on the island.^{55,56}

⁴¹ ICZM Plans for 3 Pilot States (Stakeholder Consultation Reports)

⁴² Forest Survey of India (FSI) (2009, 2011, 2013, 2015, and 2017), “India State of Forest Report,” MoEFCC.

⁴³ SICOM (2019), p. 68.

⁴⁴ See <http://sicom.nic.in/projects/beach-environment-aesthetic-management-services-beams>.

⁴⁵ The eight Blue Flag beaches are Ghoghla (Diu), Kasarkod and Padubidri (Karnataka), Kappad (Kerala), Rushikonda (Andhra Pradesh), Golden (Puri-Odisha), Shivrajpur (Dwarka-Gujarat), and Radhanagar (A&N Islands). See <https://timesofindia.indiatimes.com/india/clean-green-and-safe-8-indian-beaches-get-coveted-blue-flag-tag-create-record/articleshow/78606232.cms>.

⁴⁶ <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1663535>

⁴⁷ India was also awarded 3rd prize on best international practices on pollution abatement by International Jury comprising of UNEP, United Nations World Tourism Organization, United Nations Educational, Scientific and Cultural Organization, Coastal and Marine Union (Non-profit), International Life Saving Federation, Foundation for Environmental Education etc.

⁴⁸ <http://goldenpeacockaward.com/gpima-winners.html>

⁴⁹ SICOM (2019), p.33, 91–2, 94, 96, 102–03, 105, 117, 119, 123, 133, 136, 139, 151–52, 160).

⁵⁰ See <https://www.technicaltextile.net/news/pentha-project-in-india-protected-against-cyclones-255419.html>.

⁵¹ SICOM (2019), & Unpublished and tourist statistics at Digha MARC from ZSI (2020).

⁵² National ICR (2020).

⁵³ SICOM (2019), p. 96.

⁵⁴ *Ibid.* p. 149.

⁵⁵ *Ibid.*

⁵⁶ See <https://www.telegraphindia.com/west-bengal/sagar-island-plugs-into-state-grid/cid/436613>.



34. **The project promoted interventions for protecting coastal ecosystems.** In doing so it engaged communities in activities supporting more secure livelihoods reflecting local conditions and preferences. About 3,300 community organizations were formed to identify interventions to develop livelihoods and conserve coastal ecosystems. The development of ecotourism infrastructure and opportunities increased tourist arrivals by 20%–25%, with additional income accruing to local communities. Villagers set up revolving funds as an alternative to moneylenders (who often charge exorbitant interest rates of 36–60% per annum) for financing important expenses and coping with emergencies. The micro-enterprises developed to provide more secure livelihoods were folded into current government programs, which helped entrepreneurs benefit from marketing linkages to the government’s promotional programs, cooperatives, and sales outlets and contributed to the long-term sustainability of their new micro-enterprises. On Sagar Island, a survey of 638 self-help groups (SHGs) involving 2,912 households showed that they had generated an income of around US\$ 2.17million (INR 159.5 million) from an investment of US\$ 0.62 million (INR45.5 million).⁵⁷ In Odisha, 89% of the beneficiaries of livelihood interventions supported through the project reported an increase in household income.⁵⁸ In total, activities supported by the project to enhance livelihoods benefitted more than 6.74 million persons directly; more than 50% (3.38 million) of those beneficiaries were women. More than 2.14 million persons, of whom 1.05 million were women, are estimated to have benefited indirectly from the project’s livelihood interventions.⁵⁹ The pilot interventions also provided important lessons for preparing future ICZM Plans.
35. **In summary, interventions implemented under the project positively impacted the lives of the coastal population in the three pilot states.** According to SICOM, by 2019–20 the project had reached a cumulative 17.8 million direct beneficiaries, of whom about 8.6 million are women (48.2%). After discounting for any overlap in this number, the total number of beneficiaries by the end of the project was 11.9 million, relative to the target of 11 million, and 50% were women. For details on the calculation of project beneficiary numbers and a comparison with the methodology used in the PAD, see [Appendix D](#).

Justification of Overall Efficacy Rating

Rating: High

36. **Based on the above assessments, the achievement of the development objective is rated High.** The operation achieved its objectives and intended outcomes. The project helped to shift the focus of coastal development in India from a strictly regulatory approach to an inclusive, multi-sectoral, science-based decision-making approach. It developed and integrated the requisite knowledge base and skilled human resource base while promoting coastal planning and management, private sector participation, innovation, and sustainable livelihood options for coastal communities. The knowledge and capacity generated through the project also supported the implementation of national and state policies guiding coastal development (such as CRZ Notification 2019), led to the development of a dedicated national research institution and a dedicated managerial institution at the national level to guide, coordinate, and pursue ICZM agenda in all maritime States and UTs for ICZM, prepared pilot ICZM Plans for selected stretches and demonstrated successful models of ICZM.

⁵⁷ See <http://sicom.nic.in/milestones/livelihood-security-coastal-community/livelihood-development-sagar-block>.

⁵⁸ SICOM (2019), p: 103.

⁵⁹ National ICR (2020), beneficiary calculation in 2020 by NPMU and SPMUs.



C. EFFICIENCY

Rating: Substantial

37. **Implementation efficiency.** The project achieved its PDO and all targets within the funding limits and without reducing its scope. Implementation progress varied over time, including slowing down from mid-2014 to early 2016, mainly owing to factors outside of the project's control: Cyclone Phailin in Odisha, local elections in Gujarat and West Bengal (affecting procurement schedules), and delays in coastal defense and GoI security clearances for hazard line mapping. Delays affected staff hiring at the national level and stalled the release of government funds to the project. At the same time, such challenges further underscore the project's achievements in pioneering a novel approach (ICZM) in India's complex institutional environment, whereby effective implementation required the project to marshal multisectoral perspectives and real-time collaboration across multiple levels of governance—national, state, and local.
38. **The project duly considered economy and efficiency.** All expenditures were incurred in line with the respective policies. The project savings arising from the depreciation of the Indian Rupee (INR) were used effectively to support pilot activities. The net result was to increase the gains in capacity in agencies supported under the project, to provide robust funding for livelihood interventions, provide much-needed protection from natural disasters, and enable many coastal households to emerge from poverty. By mainstreaming livelihood interventions into ongoing government development initiatives, the project leveraged funds from government programs, reduced its implementation costs, and secured higher incomes for beneficiaries.
39. **Financial efficiency.** The methodology used for the ex-ante financial and economic analysis could not fully calculate project benefits and returns, because many anticipated benefits could not be fully quantified due to lack of data, and some were intangible (such as the investments in building institutional capacity) (see *Annex 9* of the PAD). The ex-ante analysis used a benchmark value per kilometer of coastline under ICZM to estimate the value of intangible ("soft") benefits arising across and within levels of government and in coastal communities from capacity and institution building (including SICOM, NCSCM)—benefits such as new reforms, policies, and approaches; technical assistance; and monitoring, compliance, and enforcement. Another consideration was that project benefits would be fully realized well after the project ended. The PAD notes that both the financial and economic rates of return over 30 years were underestimated, yielding a depressed financial rate of return of 4.8% (compared to the commercial bank lending rate of 8% in India in April 2010) and a substantial 20.2% economic rate of return (compared to the benchmark rate of 10% used by the World Bank in April 2010).
40. **The ex-post benefit-cost analysis (BCA) undertaken for this ICR differs in some respects from the ex-ante analysis.** The BCA for this ICR uses disbursed rather than estimated costs and looks at four types of benefits that flow from the pilot activities: (a) conservation and protection of coastal resources; (b) environmental and pollution management; (c) livelihood security for coastal communities; and (d) carbon emission averted (*Annex 4*). While the ex-ante BCA attempted to assess financial profitability and fiscal impact, the ex-post BCA did not, given the depreciation of the rupee between project appraisal and closing and the disruption in earmarked fiscal transfers from the central government.
41. **The ex-post economic analysis shows that the overall project is viable⁶⁰ for three discount rates (4%, 6%, and 10%), three lifespans (10, 20, and 30 years), and with and without accounting for carbon sequestration**



benefits (illustrated in *Tables 4.5–4.7* in *Annex 4*). When carbon benefits are excluded from the analysis, the results for the overall project, discounted at 10% over 30 years, are a net present value (NPV) of US\$303 million, with an economic internal rate of return (EIRR) of 32%, and a Present Value of Benefit over Cost Ratio (PVBCR) of 4.1, against an EIRR of 20.2% for the ex-ante BCA. Although the carbon benefits arising from the project will accrue at the global level, when the analysis takes them into account, the results are even more impressive: the NPV is US\$472 million, with an EIRR of 41% and PVBCR of 5.8. A sensitivity analysis shows that communities will reap the largest share of benefits in the near term (about 50% over the first 10 years from the start of the project), whereas ecosystem services will reap the largest share of the benefits (about 70%) in the long run (at 30 years).

42. **In the absence of this project, India may still have lacked a national consensus on the adoption of ICZM to promote resilience and sustainable development in coastal areas, would have had insufficient scientific and planning capabilities and be without good models for advancing its coastal development in a sustainable and productive manner.**

Assessment of Efficiency and Rating

43. **The project's efficiency can be examined in light of its disbursement and implementation time.** Against a total initial outlay of US\$285.7 million equivalent, the project ultimately disbursed US\$228.95 million. The project disbursed 100% of the revised amount at closure. As a result of the depreciation of the rupee, allocations to Components 2, 3, and 4 were reduced. A part of the savings was allocated to additional MSME-based livelihood activities in Gujarat, SICOM's BEAMS initiative and to prepare the ENCORE MPA, while US\$32 million equivalent was canceled during the restructuring in March 2020. Although the project took an additional four-and-a-half years for completion, the extra time was warranted to develop meaningful capacity in ICZM, broaden the scope of livelihood activities in Gujarat and Odisha, and implement two new activities. The initial two-year extension of the closing date was required for operational reasons as noted above. The subsequent extension may be regarded more as an indication of the project's effectiveness, coming as a response to higher capacity, client demand, and expectations for ICZM activities driven by the project, in turn adding another perspective of looking at its efficiency. The project was efficient at building on experience and knowledge, internalizing lessons learned, leveraging ongoing government programs, and supporting success by continuously adjusting to factors within and beyond its control.
44. **The project's efficiency can also be examined in light of the tangible and intangible benefits it generates.** As discussed, the EIRR is efficient and reaches 11% over 10 years, discounted at 6% (as recommended by the World Bank) and 32% over 30 years, discounted at 10% (versus 20.2% estimated at appraisal). The tangible benefits of the project—wastewater networks and treatment plants, mangrove afforestation, coral transplantation, disaster preparedness, access to clean energy, and income-generating activities—arise mostly under Components 2, 3, and 4. All of the components generate intangible benefits (such as the federated institutional structure for ICZM; science-based ICZM planning, monitoring, and decision support systems; knowledge sharing; and specialized expertise in coastal and marine management). These tangible and intangible benefits will improve the overall management of the coastal and marine environment in the years to come, and when the mangrove plantations reach maturity (in about 10 years), they will sequester carbon well into the future. In recognition of these benefits, the overall efficiency of the project is rated as **Substantial**.

⁶⁰ Financial viability means that the project generates net profits; economic viability means that it is generating social benefits (an "economic rent").

D. JUSTIFICATION OF OVERALL OUTCOME RATING

Rating: Satisfactory

45. **The overall outcome rating is Satisfactory.** This rating is based on the assessments of the relevance of the PDO (High), efficacy (High), and efficiency (Substantial). The PDO was relevant to national and World Bank priorities throughout the project period. It was achieved in its entirety and catalyzed policy and structural reforms that were beyond its scope. Institutionalization of the ICZM approach at the national and state levels, supported by adequate capacity and an enabling legal and regulatory framework, ensures that the outcomes will be sustainable. Against these achievements, however, the project took 9.5 years to complete, compared to the 5 years originally envisioned. For these reasons, the project outcome is rated **Satisfactory**.

E. OTHER OUTCOMES AND IMPACTS (IF ANY)

Gender

46. **The project was designed to generate additional benefits for women and socioeconomically underprivileged groups.** With its multidisciplinary and participatory approach to realizing ecological, social, and economic outcomes for coastal communities, the project strengthened livelihoods and supported the government's poverty alleviation goals, while reducing the vulnerability of coastal communities to climate change and natural disasters and improving marine resource management.
47. **The outcomes with respect to gender are particularly significant.** During the 2015 restructuring, a specific fifth PDO indicator on direct project beneficiaries—with 51% being women—was added. By completion, the project had showcased several pathways for mobilizing and including women. The project reached out to women when designing and implementing activities, the capacity-building programs encouraged higher levels of participation from women experts and officials, and women were represented at all organizational levels. The infrastructure created and the O&M norms agreed⁶¹ under the project were gender-informed and inclusive—such as the cyclone shelters built in Odisha and West Bengal, which were designed to meet the needs of women and differently-abled people.⁶² Women were prominent in the NCSCM, PMUs, and PEAs. Nearly 35% of scientists and technical experts at NCSCM are female, a high share in a traditionally male-dominated sphere.⁶³ The executive bodies of participating CBOs were required to have at least 50% female membership, and women's participation and representation were compulsory in all Social Audit Committees formed in project villages. At the community level, women formed SHGs specifically to focus on alternative livelihoods that met their requirements. Ultimately, SHGs had 733,109 women members in Gujarat, 66,685 in Odisha, and 3,124,546 in West Bengal (SHGs in West Bengal were also federated at the village level). The project's livelihood generation activities benefited 3,376,601 women directly (exceeding the project target) and 1,055,157 indirectly.⁶⁴

⁶¹ See <https://www.humanitarianlibrary.org/sites/default/files/2019/05/Handbook%20For%20Management%20%26%20Maintenance%20of%20Multipurpose%20Cyclone%20Flood%20Shelters.pdf> (pp. 8–37; p.8: facilities and features; p.14–15: women in Maintenance and Management Committee; p.36: considerations for gender during pre-disaster phase; p. 37: considerations for gender during disaster phase).

⁶² See http://www.icmpwb.org/main/icmpwbtdendernew/Applications/Tender_TD/uploads/1506169384Draft%20ToR%20-%20Impact%20Assessment.pdf (p.4).

⁶³ See <http://www.nasi.org.in/Report%20-%20Women%20in%20Science%20&%20Technology%20-A%20Vision%20Document.pdf>; see Table 4, p. 15 for comparative percentages for other scientific research organizations in India.

⁶⁴ National ICR (2020), and Annex of AM July 2020 - beneficiary calculation.



Institutional Strengthening

48. **As discussed, institutional strengthening was central to the PDO, and the project enabled government agencies and regulatory bodies to better fulfill their role towards CZM across the country.** MoEFCC, state DoFEs, research organizations, and regulatory bodies such as NCZMA and SCZMAs use knowledge, skills, and approaches developed by the project in their day-to-day operations. GoI has suggested using Hazard line, HTL, LTL mapped by NCSCM and Sol to be used for preparing Disaster Management Plans in all states and UTs⁶⁵.

Mobilizing Private Sector Financing

49. The project was successful in attracting private-sector interest through the implementation of state-level ICZM demonstration investments. Thus, while the project funded the INR780 million (around US\$ 10.6 million) Jamnagar sewage treatment plant (STP), the risk of financing was assumed by the operator for the 15-year duration as part of the Design-Build-Operate-Transfer (DBOT) contract. Under the terms of the contract, the operator can sell treated water to industries to maintain the treatment plant and pay an annual royalty of INR20 million (US\$ 0.27 million) to Jamnagar Municipal Corporation during the contract period. In turn, the demonstration of this first of its kind STP DBOT informed Gujarat's adoption of industry requirements for water re-use and conservation.

Poverty Reduction and Shared Prosperity

50. A total of 92,883 households benefited from livelihood interventions in the three pilot states and two special projects, Vedaranyam and the Green Action for National Dandi Heritage Initiative. Almost 51% of all beneficiaries surveyed in the pilot states⁶⁶ confirmed a reduction in migration after the interventions. More than 87% confirmed that alternative livelihood opportunities had reduced dependency, and 65% believed that women were empowered by project interventions.

Other Unintended Outcomes and Impacts

51. **The project had key policy outcomes and impacts that were not envisioned at the outset.** With the new National Coastal Mission (NCM) established under the government's National Action Plan on Climate Change (NAPCC), ICZM is recognized as a foundational approach for climate-resilient development policies and initiatives⁶⁷. The project as a whole was included in India's NDC for the Framework Convention on Climate Change in 2015.⁶⁸ Based on the outcome of the Jamnagar STP funded by the project,⁶⁹ the Government of Gujarat promulgated a Policy for Reuse of Treated Wastewater⁷⁰ for industrial purposes in May 2018.

⁶⁵ <https://pib.gov.in/PressReleaseDetailm.aspx?PRID=1596334>

⁶⁶ *SICOM (2019)*

⁶⁷ MoEFCC, Committee on Estimates (2018–19), "Performance of the national action plan on climate change, Sixteenth Lok Sabha, Thirtieth Report." Section 1.6. Available at: http://164.100.47.193/Isscommittee/Estimates/16_Estimates_30.pdf. Accessed July 12, 2020. See also <http://sicom.nic.in/projects/national-coastal-mission>.

⁶⁸ See <https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/India/1/INDIA%20INDC%20TO%20UNFCCC.pdf>, with reference to Section 2.4 (Coastal Region and island) on ICZM (p.23).

⁶⁹ See <https://www.hudco.org/writereaddata/PublicNotice/compendium-bestpractices16.pdf> (pp. 70–1).

⁷⁰ See https://gwssb.gujarat.gov.in/downloads/Policy_Reuse_Of_WasteWaterA.pdf.



III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME

A. KEY FACTORS DURING PREPARATION

52. **The key factors that affected project preparation are discussed below.** They include the challenges of setting realistic objectives, ensuring a simple design and appropriate selection of stakeholders, and implementing adequate risk and mitigation measures.

Realistic Objectives

53. **The PDO was realistic, however the novelty of the ICZM concept made it challenging to set targets for results.** Setting targets was complicated because the outcomes of all components were interdependent, and no benchmarks were available for ICZM in India at the design stage. During implementation, it became clear that the initial targets were less specific and ambitious than the project warranted. Following these reality checks and stakeholder consultations, the project amended the Results Framework in December 2015 to sharpen the focus on activities in pilot states and better capture their outcomes.

Simple Design

54. **The concept for the project design was simple: it would build capacity to implement ICZM demonstration activities, using these activities in turn to stimulate ICZM adoption and institutional capacity-building.** The project—the first Bank-financed ICZM project in the region—was designed to inculcate an integrated approach to coastal zone management through closely related capacity-building, scientific research, and pilot activities. In practice, however, the interlinking project activities under such an integrated approach had its implementation implications, whereby a delay in any single activity could affect the completion of other activities. For example, shoreline management plans - critical inputs to prepare ICZM Plans - could not be prepared without HTL, LTL, hazard line, sediment cell, and coastal process studies. As a result, the time required to achieve the PDO was longer than initially envisioned, although the decision to establish a dedicated ICZM research institution sped up the development of a cost-effective and locally relevant knowledge base on ICZM.

Appropriate Selection of Stakeholders

55. **At the outset, it was clear that the selection of implementing agencies and beneficiaries would be critical to success.** Reflecting the multifaceted nature of ICZM, multiple state and national agencies were selected to implement the project. Their inclusion created the synergy and collaboration required to achieve the project objectives. Beneficiaries were identified through a participatory rural appraisal, guided by predetermined criteria such as the inclusion of women and vulnerable groups. This approach was adopted to increase the likelihood that the project would achieve its target of directly benefiting coastal communities, including women.

Adequacy of Risk and Mitigation Measures

56. **Risk-mitigating measures integrated into the project design:** At appraisal, the risk associated with the project was assessed to be Substantial, because ICZM was a new approach for India. This rating remained in place throughout implementation. Several risk-mitigation measures, including interventions to mitigate and adapt to climate risks, were integrated into the design of the project, and during implementation, the adoption of innovative and timely measures helped to achieve the PDO despite the risks inherent in introducing a novel approach.



57. **Reputational risks:** The most prominent reputational risks were associated with the project's wide array of stakeholders and the need to ensure transparency in interactions at many levels. The project included several measures to ensure transparency in implementation, including access to legal recourse for vulnerable persons if they were unsatisfied with the project's grievance redress mechanisms. Participation of communities in design of interventions and plan preparation helped in reducing grievances.
58. **Risks to implementation capacity and sustainability:** Key risks in this regard concerned the low implementation capacity of staff, constraints on hiring quality personnel, and poor O&M of any assets created through the project. These issues were addressed systematically in project design. The NPMU and SPMUs were set up as independent societies to facilitate implementation efficiency and fund flow; their capacity was strengthened as needed with training programs in specific technical areas. A staffing plan was agreed upon before appraisal. For specific high-turnover posts, time-based consultancy contracts were used. MoEFCC and state governments assumed full financing and allocated resources for 100% of O&M for assets created by including them in the asset registers of local bodies or concerned departments.
59. **Risks to the knowledge proposition:** A critical element of the project design was to generate and disseminate knowledge related to ICZM. Risk related to this element of the project was reduced by establishing the NCSCM, building capacity in multiple PEAs to generate and share knowledge, and creating an enabling environment for science-based and socio-economic information to be used in preparing ICZM Plans.
60. **Risks related to procurement and financial management:** Assessments during preparation pointed to substantial procurement and financial management (FM) risks due to inadequate capacity in the NPMU and SPMUs. At appraisal, manuals on FM and procurement were prepared, and terms of reference (ToRs) were finalized for Procurement and FM Support Consultants at the NPMU and SPMUs. SICOM as the NPMU took the lead and trained and supported SPMUs and their PEAs (more than 40 accounting centers) in preparing timely accounts and reports with the help of these consultants.
61. **Risks of failing to ensure community participation and buy-in:** As noted, to ensure that the selection of beneficiaries would be based on need and include women and vulnerable groups, the project identified beneficiaries based on a transparent process of participatory rural appraisals. The transparency of this approach helped to create confidence and widespread buy-in among coastal communities. A few villages in Gujarat made co-contributions toward infrastructure development, as the project had a cap of US\$13,580 (INR1 million) per village.

B. KEY FACTORS DURING IMPLEMENTATION

Factors subject to government and/or implementing entities control

62. **Commitment to the ICZM process:** The key factors responsible for the achievement of the PDO were the commitment of the government at the central and state levels to the ICZM principles, adoption of participatory approaches, and generation and use of scientific and technical knowledge.
63. **Funds flow, staffing, procurement:** After initial progress, implementation started lagging in 2011-12, initially owing to staffing shortages at the NPMU (SICOM) and hazard line mapping delays linked to obtaining GoI security clearances for aerial photography. Other factors included procurement delays, especially for several



innovative ICZM private-public partnership activities, institutional challenges slowing progress under the West Bengal pilot, as well as delayed and/or insufficient budgetary allocations delaying the release of funds to the SPMUs. The appointment of a new National Project Director in June 2012 accelerated staff recruitment. Funds flow challenges at the center level were gradually addressed in the two years following on the 2015 project's restructuring. While the staffing plan at appraisal envisaged 15 professional staff at the NPMU and 10 each at SPMUs, drafted mostly from key government departments and agencies, at restructuring this level was raised to 20 in Gujarat and Odisha SPMUs and 15 in West Bengal. These levels were not fully achieved, with the subsequent short-term project extensions also impacting on staff turn-over and attrition.

64. **Benefits of restructuring:** Implementation consistently improved following the first two restructurings (2015 and 2017), particularly by the end of 2018. The restructurings sharpened the Results Framework and reallocated funds for greater efficiency and effectiveness.
65. **Delivery of knowledge products:** Most of the research and knowledge products essential for science-based coastal planning—namely, the HTL, LTL, hazard line, and sediment cell maps, as well as coastal process studies—were available by 2017, after long years spent obtaining the requisite clearances from coastal defense and security agencies. The work by NCSCM and multiple state agencies was instrumental in developing the knowledge base.
66. **Collaborative and participatory approach:** The focus on collaboration and participation increased the effectiveness and efficiency of implementation. The implementing agencies recognized that a collaborative, multi-stakeholder approach in implementing all activities—capacity building, research, development of ICZM Plans, and pilot interventions—was the key to realizing the project objectives. The transparent, participatory approach adopted to develop and implement the livelihood interventions resulted in a very high level of active and productive participation by the community members and local organizations; as against the traditional approach of each department looking only at its respective sector.

Factors subject to the World Bank Control

67. **Adequacy of supervision:** The Bank team had only two task team leaders for the duration of the project. The team carried out regular supervision missions, which helped to identify key implementation challenges and possible solutions. SPMU staff accompanied the Bank team, contributing to knowledge-sharing across the SPMUs. Through an independent review and assessment mission (October 2014) and following restructuring, the Bank refocused the project on its core institutional objectives: the establishment and efficient functioning of key project-related institutions; the satisfactory completion of all pilot investment projects; and the sensitization of PEAs on their role in supporting a program for sustainably managing the coasts of India.
68. **Regular, strategic, outcome-focused support:** The World Bank supported the NPMU, SPMUs, and PEAs with 20 implementation support missions. In response to institutional, fund flow, and procurement challenges, the Bank undertook five restructurings amid intensive communication with the NPMU, SPMUs, NCSCM, PEAs, and MoEFCC. It provided expert support through Bank staff and consultants during missions and interim technical missions (including on procurement, finance, and safeguards). The Implementation Status and Results Reports (ISRs) candidly detailed progress, setbacks, and challenges and proposed solutions to overcome them.



Factors outside the control of the government and/or implementing agencies

69. **As noted, factors outside the control of the project had a significant impact on implementation.** Cyclone Phailin in October 2013 made the project sites in Odisha inaccessible for months. Local election schedules in Gujarat and West Bengal prevented state governments from issuing any new procurement during the election timeframe. The significant devaluation of the rupee affected project finances, leading to savings and reallocation of funds among the components and cancellation of US\$32 million in March 2020.

IV. BANK PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOME

A. QUALITY OF MONITORING AND EVALUATION (M&E)

M&E Design

70. **The project developed comprehensive monitoring, evaluation, and learning (ME&L) framework.** The framework was designed to facilitate: (a) results and outcome-based management; (b) learning and process enhancement (through participatory methods, beneficiary satisfaction surveys, and independent technical, financial, and social audits); and (c) impact evaluation. The ME&L framework was aligned as far as possible with government systems for efficiency. A digital management information system (MIS) was planned to be developed, and key M&E staff at the NPMU and SPMUs were to prepare Annual Plans and be responsible for monitoring the project. A key element of the ME&L framework was continuous learning to permit timely course corrections during implementation. Three sets of indicators were developed: (a) input-output indicators to measure implementation performance, including related process indicators; (b) intermediate results indicators to measure the performance of each project component; and (c) outcome indicators to assess the achievement of PDOs. In the First project restructuring, some intermediate indicators were revised for greater clarity and focus, streamlining the Results Framework, and impacts related to coastal conservation and protection, pollution abatement, and coastal livelihoods were included.

M&E Implementation

71. **The project monitoring arrangements, embedded mainly in the PMUs and PEAs, captured information on project/activity-based inputs, processes, outputs, and outcomes for dissemination.** The project presented reports to the national governing body, governing council, and state-level steering committees to help them advise the project. The NPMU collected periodic reports on physical and financial progress from SPMUs, which obtained updates from the PEAs. All this reporting was based on user-friendly offline MS Excel formats and featured in the final third-party impact evaluation⁷¹ in 2018–19. Numerous key project outputs were GIS-based, such as HTL, LTL, hazard line, and sediment cell maps, Shoreline Management Plans, ICZM Plans, and various reports. The extensive mangrove plantations established under the project are geotagged. In hindsight, the project would have benefitted from a third-party impact evaluation at mid-term and centralized systematic data collection for all subsidiary activities using predetermined and validated data collection formats.

⁷¹ SICOM (2019).



M&E Utilization

72. **Reports and information submitted by the NPMU served as key inputs for ISRs, the Mid-Term Review report, and midcourse corrections.** The data presented by the SPMUs and NPMU during regular and interim special missions were collated and analyzed to understand the achievements, outcomes, and outputs of multiple interventions in different sectors, often spread across different geographies of three states. The resulting reports contributed to project evaluation and the upgraded project ratings in 2018. A digital, internet-accessible MIS would have enabled the more systematic and methodical collection and reporting of data by the PEAs and SPMUs for monitoring by the NPMU; specifically, on the beneficiaries after the addition of the beneficiary indicator in 2015.

Justification of Overall Rating of Quality of M&E

Rating: Substantial

73. **The overall rating of the quality of the M&E system is Substantial.** Indicators were redefined as needed in the first restructuring for clarity and to reflect lessons learned. The M&E system was sufficient to assess the achievement of the PDO and progress in implementation, with the exception of systematic, timely reporting on beneficiaries.

B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE

74. **The project was rated “category A” with possible significant environmental and social impacts.** The project triggered five safeguard policies. Two main policies fully applicable were OP/BP/4.01 (Environmental Assessment) and OP/BP 4.10 (Indigenous Peoples). Three safeguard policies were triggered from a precautionary point of view: OP/BP 4.04 (Natural Habitats), OP/BP 4.11 (Physical Cultural Resources), and OP/BP 4.12 (Involuntary Resettlement). The Borrower prepared an Environmental and Social Impact Assessment (ESIA), which was reviewed, approved, and disclosed in-country on November 27, 2009, and at the World Bank Info Shop on November 28, 2009. All safeguards provisions have been duly followed during implementation as outlined below and the project completed with no concerns raised.
75. **Based on the Environmental and Social Assessment, detailed Environment and Social Management Plans (ESMPs) were prepared for all potential environmental and social issues and impacts related to project interventions.** ESMPs covered each specific project activity and the associated key issues; proposed management measures (preventive, avoidance or minimization, management and compensation) and monitoring measures to ensure continued ESMP implementation and sustainability; and set out the institutional responsibilities, budget, and timeline for ESMP implementation. In the absence of an Environmental and Social Management Framework for the project, the team guided the Client to conduct project-specific ESIA and ESMPs to incorporate in bid documents for large infrastructure projects such as STPs, solid waste management, and MRCL, as well as projects taken up during later stages (including BEAMS). Avoidance, mitigation, and management/monitoring measures were incorporated in the bidding documents and implemented through contractors to ensure satisfactory safeguard compliance. The ESMPs were designed and implemented to ensure timely action and compensation for any incidents, such as the 2014 fatal incident⁷²

⁷² See Bateswar Temple, Kantiagarh, Casualty Incident report. The two victims had entered a restricted construction area off- working



at the site of heritage conservation works in Odisha under Component 3, whereby prompt remedial action and compensations were ensured for the families of the victims. The accident was investigated and resolved, registered in the Fatality Tracking System of the World Bank and has since been closed. At the time, an action plan was further prepared by the project and followed to enhance occupational and community health and safety management across all project work sites.

76. **The project set up a robust system to redress grievances, including access to legal recourse for vulnerable persons if they were unsatisfied with the project’s grievance redress mechanisms.** The Right to Information Act 2005 of the Government of India was applied to proactively share all information with communities through multiple communication channels and tools.
77. **Procurement:** The project complied satisfactorily with procurement policies. Procurement Plans were updated and published every 12–18 months following the World Bank Procurement Guidelines. For livelihood activities, procurement followed the principles of the World Bank Group’s “Community Participation in Procurement.” No procurement issues required reporting and auditing, but procurement staffing was challenging owing to a lack of personnel and capacity, especially considering that the Procurement Plan was complex and encompassed numerous small, medium, and large contracts. As a result, delays were observed in contract execution and payment. These complications are being addressed in the follow-up ENCORE project by: (a) managing all procurement through Systematic Tracking of Exchanges in Procurement – STEP - to monitor complex multi-agency procurements; (b) conducting regular training; (c) feedback from Post Procurement Reviews and missions, and (d) ensuring central monitoring of all procurement by the NPMU.
78. **Financial Management:** FM performance consistently complied with staffing, reporting, and auditing policies and standards. Fund flows between NPMU, SPMUs, and PEAs were seamless, quick, and based on need. In the years when the central government reduced budget allocation, the state governments provided the funds as an advance (later recovered from SICOM). The project submitted unaudited Interim Financial Reports to the Bank and presented claims regularly. Audit reports were submitted on time and unqualified (clean).

C. BANK PERFORMANCE

Rating: Satisfactory

Quality at Entry

79. **The World Bank team employed due diligence in basing the project on a solid diagnostic foundation that reflected national development priorities and those of the respective CPFs.** The project team drew on the Bank’s global experience with ICZM projects and lessons from multiple sector investments in India. Close consultations with GoI, state governments, coastal communities, and other key stakeholders helped to clarify and refine the project design and institutional arrangements. Provisions for safeguards were anticipated and adequate at the design stage, as were the provisions for procurement and FM. The team played a proactive and constructive role in the first restructuring (Level 1).

hours and died in the collapse of existing old structure. Investigation confirmed that the PEA had taken adequate pre-cautionary measures to prevent public entry to the unsafe area already declared “off-limits” for the period of the temple restoration work. Compensation have been given to the deceased families from Red Cross Assistance and sanction of *ex-gratia* payments from the Odisha Chief Minister’s Relief Fund.



80. **As discussed, several factors eased implementation, helping the project to achieve the PDO and exceed the target for direct beneficiaries in coastal communities, including women.** They included prior identification of project beneficiaries through a participatory process focused on the inclusion of women and vulnerable groups; the adoption of risk mitigation measures to counter the uncertainty of operating at multiple levels of governance to implement a novel concept such as ICZM; the preparation of procurement and FM guidelines; and the adoption of a robust, experiential capacity-building approach.

Quality of Supervision

81. **The Bank provided timely and adequate support and guidance to the project at the national, state, and community levels.** The implementation of project activities was supported by bi-annual supervision missions conducted by a multidisciplinary team. Field visits and multi-stakeholder discussions were integral to supervision missions. The Bank facilitated South-South knowledge exchange,⁷³ exposure visits between states,⁷⁴ exposure of officials to international experiments in ICZM,⁷⁵ and review of ICZM Plans by international experts. Achievement of the PDO was paramount in the team's efforts and the project restructurings. The Bank team provided detailed Aide Memoires and ISRs listing achievements, fallbacks, challenges, and actions required to achieve the planned outputs and outcomes, including direct support through training. The team assessed project progress and awarded ISR ratings accordingly. The final ISR rated the project as Highly Satisfactory, as it had achieved the PDO and catalyzed actions and reforms extending beyond the scope of the project, despite the inherent complexity of implementing a novel approach across multiple levels of governance and three states.

82. **The Bank team took proactive and constructive steps with the project to adapt to challenging circumstances and achieve the PDO.** During the first restructuring, the Bank team worked on refining the Results Framework to better measure project outcomes as well as to provide clarity to project officials as they designed and implemented project activities. Despite the substantial exchange rate fluctuation, the reallocation of funds among project components, cancellation of US\$32 million of the Credit, and allocation of more funds for livelihood activities kept the project on track to support comprehensive coastal development. When progress slowed, the Bank carried out an Independent Review and Assessment Mission in 2014 to restore the focus on the core institutional PDO.

Justification of Overall Rating of Bank Performance

Rating: Satisfactory

83. **The Bank team identified the strategic opportunity for this project, facilitated its preparation, and provided critical support to achieve the PDO over a decade of progress and challenges.** The Bank provided regular, timely, and sound supervision and adequate technical advice to address those challenges and ensure the quality of project components and activities. Implementation support extended across all project components, multiple sectors, and urban and rural locations along the coast. The project successfully convened multiple

⁷³ See <https://gujecocommission.wordpress.com/2014/11/19/integrated-interaction-on-coastal-zone-management-a-south-south-knowledge-exchange-initiative-on-integrated-coastal-zone-management-between-the-kingdom-of-morocco-and-state-of-gujarat-india/>.

⁷⁴ See http://www.iczmpwb.org/main/pdf/lecture_presentations/Report_%20Odisha%20Exposure%20visit_West%20Bengal%20SPMU.pdf.

⁷⁵ See <http://www.ncscm.res.in/conference/index.html>.



stakeholders, including the government, the private sector, and civil society, in testing multiple models and innovations for ICZM. This endeavor was supported with strong technical knowledge, international and national experience in project implementation, a deep appreciation of the national context, and the capabilities marshaled by Bank team members and specialized consultants. The Bank facilitated international exposure visits by project officials, identifying sites and organizations of interest; provided input for the international partnerships developed by NCSCM; and organized conferences with international speakers whose knowledge of ICZM experiences in various countries broadened the understanding of local policymakers, academics, and implementing staff.⁷⁶ Bank support, advice, reporting, and supervision were acknowledged and appreciated by MoEFCC and state governments. Whenever possible, the Bank team, jointly with NPMU and SPMU officials, met with senior policymakers at the national and state level to apprise them of the project's relevance and progress. Such interactions contributed to key policy changes and other broad, positive outcomes⁷⁷ that were not envisaged at appraisal but are expected to contribute to the sustainability of the project's results.

D. RISK TO DEVELOPMENT OUTCOME

84. **The national institutional structure for ICZM, the knowledge base and products, model ICZM Plans, and infrastructure developed under the project face little immediate risk to their sustainability.** Their continued relevance is reflected in the GoI's proposed NCM and is expected to be further expanded under the follow-on ENCORE MPA, which supports scaling up adoption of ICZM across all coastal states and UTs for enabling coastal communities to adapt to and mitigate climate risks. States and UTs will also continue to use the knowledge base developed by the project—the various maps and databases—to prepare and implement CZM Plans as directed by the CRZ Rules, 2019.
85. **Robust O&M plans, with contingency arrangements for periods during and after disasters, are in place for all public infrastructure developed through the project.** The cost of maintaining the small infrastructure, which is fully owned and maintained by the communities, is low, and these assets have been added to local government registries to ensure continuous maintenance. The large environmental infrastructure investments, such as the STP at Jamnagar, were developed through public-private partnerships and have robust revenue models to support O&M. Livelihood interventions and SHGs were linked to government programs to increase their sustainability.
86. **Political commitment to the ICZM approach is gaining momentum at the local, state, and national levels even though a long-term engagement is essential.** The risk to development outcome is moderate, given the interest on the ICZM approach at the national and state level, presence of institutions to drive the agenda, and the enabling institutional framework for the sustainable development of coastal zones developed through the project. The government, in its National Coastal Mission under the National Action Plan on Climate Change, views the ICZM approach as a key element of its strategy for adapting to climate change and rising sea levels. The financial stability gained by NCSCM showcases the demand for CZM-related services in India. The Blue

⁷⁶ See http://ncscm.res.in/cms/events/archived_events.php, and <http://www.ncscm.res.in/conference/images/ICZM%20REPORT%20VOLUME%201%20RELEVANCE%20TO%20INDIA%20AND%20SUMMARY%20OF%20INTERNATIONAL%20EXPERIENCES%20.pdf> (Report: International Conference on Integrated Coastal Zone Management: Lessons Learned and Relevance for India. July 9 – 11, 2019, Chennai).

⁷⁷ National ICR (2020).



Economy Vision 2025,⁷⁸ released by the Federation of Indian Chambers of Commerce and Industry, offers another indication that the private sector regards the Blue Economy as a key driver for growth.

V. LESSONS AND RECOMMENDATIONS

87. **Lesson 1: The ICZMP approach implemented by the project shows that a “good coastal environment is good for local communities and businesses, too.”** The project developed evidence in the three pilot states that demonstrated how sustainable, scientific management of coastal resources increases incomes for local communities and businesses. The results convinced stakeholders to envisage the coastal zone as encompassing both the marine and land area and to invest in the entire zone. An integrated management model increases fish yields, green cover, fodder, and fish stocks; brings in more ecotourists (vital for local businesses); offers better protection against natural disasters such as cyclones and storm surges; increases marine biodiversity and improves the quality of life. The project results derive from an integrated approach, rather than piecemeal interventions by different agencies, which may or may not be coordinated and timed to yield maximum benefits. **Recommendation 1: An integrated approach, with a regional and comprehensive outlook extending beyond administrative boundaries, agencies, or sectors, ensures overall development and sustainability and is recommended for future projects/programs.**
88. **Lesson 2: Even though it may be a lengthier process, an iterative “Do as you learn and learn as you do” approach works best for a new concept such as ICZM, where local science and knowledge are not fully established, capacity and data are lacking, and collaborative, multisectoral interventions are needed.** This capacity-building approach enables learning to be applied immediately and to generate further practical learning through the design and implementation of ICZM activities on the ground. The initial critical mass of investments arrived early in the life of the project to demonstrate the concept of ICZM, develop a solid socio-economic and scientific knowledge base, build capacity and confidence, and foster a culture based on a multi-stakeholder approach to design, planning, and implementation. The ICZM Plans arrived at the end of the project, when stakeholders had gained the capacity and confidence to develop and implement them, based on the adoption of innovative approaches and new policies, the continuous generation of knowledge, and growing awareness of ICZM and support for the approach in government, the private sector, and civil society. Novel and complex approaches take a long time to achieve “capacity” in the true sense—the skills, confidence, and conviction to carry ICZM forward as the basis for sustainable development in coastal areas. **Recommendation 2: Pilot or demonstration projects as part of larger projects or programs, along with a well-defined and implemented M&E framework to inform course corrections and scaling up, provide a testing ground for concepts and to build ownership and trust among stakeholders.**
89. **Lesson 3: The establishment of local research institutions is key to the sustainability and expansion of development initiatives in complex domains such as ICZM.** The decision to establish a new scientific institute (NCSCM) and multilevel institutional structure dedicated to ICZM was effective in achieving the PDO. Both investments supported and complemented each other to create a science-based, multi-sectoral, participatory ICZM process. **Recommendation 3: Filling the gaps in science and the knowledge base, and building a multi-level institutional structure, are important to ensure science-backed policy changes, effective implementation support and management at various levels, and to sustain longer-term outcomes.**

⁷⁸ See https://www.gatewayhouse.in/wp-content/uploads/2017/06/FICCI_Blue-Economy-Vision-2025.pdf.



90. **Lesson 4: When issues are multisectoral and require cooperation from multiple stakeholders at different levels, it is prudent to adopt a flexible and participatory approach.** A “disjointed incrementalism”⁷⁹ approach enabled the project to foster transformative interventions such as the STP in Jamnagar and grid electricity in Sagar Island. These interventions, although seemingly unrelated to traditional concepts of coastal management, were based on local needs and demands and led to gains for coastal communities and the marine environment. **Recommendation 4: An adaptive and programmatic approach that provides opportunities for applying collaborative adaptive models is preferable for operations requiring long-term commitment at a regional, multisectoral, or multi-stakeholder level.**
91. **Lesson 5: The success of ICZM depends not only on scientific capability but also on building a science-based culture of decision-making, in which scientific knowledge informs the development of policies and the planning, design, implementation, and management of project activities.** The project fostered this science-based culture by interacting regularly with decision-makers and ensuring their engagement at critical junctures. Building this culture also required orientation, handholding, and collaboration among decision-makers, technical experts, and civil society. Three key outcomes of this science- and data-driven planning and decision-making stand out: (a) the CRZ Notification of 2019, in which the government directs all states to use the HTL, LTL, and hazard line demarcations developed by NCSCM and Sol for preparing their respective State CZMPs which will be used for managing development along the coast; (b) direction under CRZ 2019 for preparation of integrated management plans for all CVCAs, inland islands in the coastal backwaters, and islands along the mainland coast; and (c) the three ICZM Plans prepared for selected stretches in the pilot states, which the GoI is planning to replicate in all coastal states and UTs. **Recommendation 5: To ensure system-wide and policy-level changes, development projects, and programs must commit resources and time for engaging, orienting, handholding, and collaborating with decision-makers, technical experts, and civil society. Clear subsidiarity must be established for complex, multisectoral activities under ICZM to achieve maximum impact. Responsibility (for implementation) should reside at the most effective and appropriate level, for reasons of (a) political legitimacy, (b) administrative efficiency, and (c) substantive issues related to the nature of cross-sectoral sustainability problems. Conflicting interests in practical implementation can be resolved only if those stakeholders with an active interest in outcomes are also involved in implementation.**
92. **Lesson 6: Maintaining long-term engagement and investments in the ICZM process will be the key to sustaining its benefits.** Experience from other countries such as Sri Lanka and the United States of America illustrates the need for long-term engagement of policymakers, accompanied by due investments in the ICZM process, to ensure the sustainability of social, economic, and ecological benefits. Engagement and investment depend in part on maintaining a steady flow of key scientific and other valuable information for stakeholders. **Recommendation 6: It would be useful to publish a report on the “State of the Coast and Ocean in India” every five years (perhaps by NCSCM). In turn, the states could develop annual ICZM action plans – deriving from their long term ICZM plans – for coastal areas; detailing policy reforms, investments, and implementation mechanisms to achieve the outcomes outlined in the Report.**

⁷⁹ A pattern of decision-making in organizations, identified by American political scientist Charles Lindblom, in which decisions are taken step by step as a problem unfolds.



ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS

A. RESULTS INDICATORS

A.1 PDO Indicators

Objective/Outcome: Building National Capacity for Coastal Zone Management, Piloting ICZM in Gujarat, Odisha, W.Bengal

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Institutional structure at National, and State level supportive of integrated coastal zone management established according to defined criteria	Yes/No	N 15-Jun-2010	Y 31-Dec-2015	Y 29-Dec-2017	Y 30-Jun-2020

Comments (achievements against targets):

Criteria met. Substantially achieved. (a) The National and (b) State Level Coastal Zone Management Authorities (NCZMA, and SCZMAs) are established and functional to support coastal zone management at the national level and all coastal states. NCZMA was reconstituted by including various departments involved in the coastal space including the National Centre for Sustainable Coastal Management (NCSCM) established under this project; **(c) NCSCM is established and functional** since 2010 with the required building, facilities, staff, and equipment. It has 7 scientific divisions, conducting research and generating knowledge products in coastal management. NCSCM is accredited with (i) ISO 9001:2015; (ii) ISO 45001:2018, and (iii) NABL certification ISO/IEC 17025:2017 in recognition of the organization's Quality Management System, Operational Health and Safety Management system, and Competence of Chemical and Biological Testing Laboratories. Plan for institutional structure at National, State, and District level supportive of integrated coastal zone management has not been prepared or submitted to the Government for approval. (Source: *Monitoring and Evaluation (M&E) Report - Integrated Coastal Zone Management Project, 2019*, <https://pib.gov.in/PressReleaseDetailm.aspx?PRID=1596334> (Press Information Bureau, Government of India), and www.ncscm.res.in).



Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Knowledge and planning base in integrated coastal zone management established according to defined criteria	Yes/No	N 15-Jun-2010	Y 31-Dec-2015	Y 29-Dec-2017	Y 30-Jun-2020

Comments (achievements against targets):

Substantially achieved. (a) ICZM plan preparation guidelines were prepared by NCSCM in 2014. The guidelines have been used to prepare ICZM Plans for the pilot states of Gujarat, Odisha, and West Bengal as directed by SICOM. It has been updated and revised in 2020 based on the recent ICZM plan preparation experience of NCSCM in West Bengal. *This has not been further sent for adoption by MOEFCC as required to meet the criteria (Refer SICOM 2019. Final Report: Monitoring & Evaluation of Integrated Coastal Zone Management Project (hereinafter M&E Report of ICZMP, 2019), Prepared by (AFC India Ltd for SICOM). Page 48 (Section 4.1.4).* **(b) Knowledge-base to facilitate sustainable coastal development** includes: (i) database for the entire Indian coast for coastal, marine biodiversity network: High Tide Line (HTL), Low Tide Line (LTL), Hazard line, Sediment cells, 11 types of Eco-sensitive Areas (ESAs), Critically Vulnerable Coastal Areas (CVCAs), have been prepared. Coastal Regulation Zone (CRZ) Notification 2019 of the GoI directs all States to use these knowledge products prepared by NCSCM for preparing CZM Plans for the States. CoMBINE is a unique coastal and marine biodiversity web portal managed by NCSCM that combines multiple databases on a single platform that allows searching wealth of information and repositories of data for the Indian coastal and marine flora and fauna; (ii) National GHG emission database: An assessment of GHG net emissions (unit measure CO2 equivalents) from all mangrove and seagrass ecosystems along the mainland coast and the Islands of India was carried out to delineate natural and human-induced stress on these ecosystems. The carbon sequestration capacity (blue carbon) of these ecosystems (mangrove and seagrass) of India has been analyzed to understand their contribution to minimizing the impacts of climate change. (iii) Delineation of Baseline Coastal Sediment Cell as a benchmark with coastal maps has been completed. The project divided the country's coast scientifically into 26 Coastal Sediment Cells - 10 on the West Coast and 16 on the East coast; and further divided each into sediment sub-cells to enable scientific CZM planning; (iv) Futuristic Research Framework with the output delivered on Offshore Renewable Energy potential assessment including computing the potential for Offshore Wind energy along the coast of India. High resolution (9 km) Advanced Research of Weather and Forecasting (ARW) model was used to predict offshore green energy potentials along the Indian Coast for 10 years (v) Coastal Cumulative EIA methodology - a five-step process that will lead to improved management planning as input to the adaptive management process - and CEIA guidelines have been developed under the project. This is an input for the planning to prepare an ICZM framework. *CEIA framework for the Gulf of Kachchh has also been prepared as a pilot.* In addition to these, knowledge products have also been developed by the three pilot States including Ecosystem report



cards (biannual) for Chilika Lake; Carrying Capacity Studies for various islands in India and Tourism Development (for Eg: Chilika), Paper on Spatial-temporal variation of phytoplankton concerning physicochemical parameters along Mahanadi estuary and inshore area of Paradeep Coast; and Health Status report of Garirmatha – Bhitarkanika stretch (submitted to IUCN). The project has established three coastal data centers -Survey of India office (Bangalore), Society of Integrated Coastal Management (SICOM - NPMU Delhi), and NCSCM (Chennai) hosting these critical coastal data and shared with all coastal and States/UTs. (Source: M&E report of ICZMP 2019, National ICR, <http://www.ncscm.res.in/cms/more/factsheets.php>).

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Implementation of demonstrable ICZM pilot activities carried out	Yes/No	N 15-Jun-2010	Y 31-Dec-2015	Y 29-Dec-2017	Y 30-Jun-2020

Comments (achievements against targets):

Substantially achieved (all except SWM in Odisha and Ecotourism in Gujarat). **a) Coastal Conservation and Protection pilots include:** (i) mangrove plantation totaling 199.41 sq km in Gujarat, Odisha, and West Bengal; (ii) infrastructure and research facilities established for coastal wildlife protection - including wildlife hatcheries, research and conservation centers in Gujarat and Odisha, Laboratory facilities for Gujarat and Odisha Pollution Control Boards (PCBs), Monitoring Vessel for Odisha PCB, Marine Aquarium in Digha (West Bengal); (iii) multipurpose cyclone shelters (14 in Odisha and 24 in West Bengal – totaling 38) benefitting 151,701 vulnerable persons during 5 cyclones, and utilized for community engagements during non-disaster period and as COVID 19 care centers; (iv) technology demonstration via geo-tube embankment for protection from coastal erosion in Pentha, Odisha benefitting 41,222 vulnerable persons, during weather disaster events; and (v) demonstration of transplantation & regeneration of degraded coral reefs in an area of 1050 sqm. in the Gulf of Kachchh (Gujarat) using experimental and innovative methodology; **b) Pollution Abatement pilots include:** (i) Sewerage system, consisting of piped network and treatment plant with capacity to service about 1 million population (71 MLD) with recycling potential for 60 MLD of treated water in coastal city of Jamnagar (Gujarat); and integrated sewerage (6.7 MLD) and storm water drainage and beach improvement for coastal tourism destination of Digha (West Bengal), (ii) Solid Waste Management for coastal town of Paradeep (Odisha) was not implemented; but facilitated appropriate land and access for treatment and disposal (landfill) facility including completion of DPR (with ESIA including public hearing)/Bid documents, thus enabling the State Government to construct the facility through private participation under the Swachh Bharat Mission or other government programs; (iii) 100% household electrification to minimize diesel (as diesel generators were being used for power) induced air emissions at Sagar Island (West Bengal) benefitting 206,844 residents and numerous local enterprises during normal days and the yearly Ganga Sagar Mela; (iv) In addition to these; under the project, SICOM



implemented Beach Environment & Aesthetic Management System (BEAMS) providing Infrastructure Facilities, Pollution Abatement & Safety/Surveillance Services for Pilot Beaches of India. Beaches improved under the project (8, in various (7) coastal States) have been awarded International Blue-Flag Certification. The project also delivered India’s own Eco-Label for Beaches -BEAMS and a flag to this effect called “I AM SAVING MY BEACH” across major beaches of the country; **c) Coastal Livelihood pilots** by establishing 4,400 SHGs/CBOs/EDCs in all three pilot States with improved income levels and facilitating long term sustenance by effectively integrating them in state-run programs by converging with Gujarat Livelihood Promotion Company, Odisha Livelihood Mission, West Bengal State Rural Livelihood Mission. (Source: M&E Report of ICZMP, 2019, National ICR, and other Evaluation Reports and studies in <https://www.iczmpwb.org/main/index.php>, <http://www.geciczmp.com/>, <http://www.iczmpodisha.org/>, <http://www.iczmpwb.org/main/pdf/pea/MOU-WBSRLM.pdf>).

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
National and State level technical capacity established for ICZM planning with supporting technical staffing according to defined criteria	Yes/No	N 15-Jun-2010	N 31-Dec-2015	Y 29-Dec-2017	Y 30-Jun-2020

Comments (achievements against targets):

Substantially achieved. a) National Centre for Sustainable Coastal Management (NCSCM) (ISO and NABL accredited) **established** with a state-of-the-art new building and facilities in the Anna University campus (Chennai), 7 dedicated laboratories, 132 advanced scientific equipment, 33 Scientists, and 76 Scientific Project Staff under ICZM Project, and 14 National consortium partner institutions. NCSCM has International scientific partnerships including with Belmont Forum Projects (DELTA & TRUC), Global Climate Research Fund, Global Partnership on Nutrient Management (GPNM) of UNEP-GPA, the University of Maryland Centre for Environmental Science, Maryland, USA, and Future Earth Coasts (Refer: <https://www.belmontforum.org/projects/> <http://gotw.nerc.ac.uk/>; <http://www.nutrientchallenge.org/>; <https://ian.umces.edu/>, <https://www.futureearthcoasts.org/fec-academy/>); **(b) Society of Integrated Coastal Management (SICOM)** established in MoEFCC with 8 experts (refer Letter from SICOM on staffing) as the NPMU for ICZMP and ENCORE MPA; though yet to be designated as technical secretariat of NCZMA (refer M&E Report of ICZMP, 2019: p.45); **(c) Enhanced coastal and marine pollution monitoring capability of Gujarat and Odisha State Pollution Control Boards:** the project established laboratories (in a LEED-certified scientific laboratory building at Paradeep) along with coastal pollution monitoring vessel with state-of-the-art instruments for analysis; and supported capacity building of staff



to facilitate regular and real-time monitoring of physical, chemical and biological parameters of sea/river water. Monitoring protocols have been prepared by respective State PCBs. With this increased capability, OSPCB has been monitoring 196 km of coastal stretch (Gopalpur to Chilika of high biodiversity, and Paradeep to Dhamra of high industrial activity) and has undertaken critical work in monitoring and assessing oil spills, mass fish killings in coastal areas, and furnishing health status report of the Gahirmatha-Bhitarkanika stretch to the Global conservation team of IUCN (*refer: http://ospcboard.org/wp-content/plugins/publication/uploads/files_1558941387_3177.pdf*). The project has improved GSPCB’s capacity to map the pollution levels in various industrial areas of Gujarat Industrial Development Corporation (GIDC) and to take enforcement actions against 245 polluting industrial units (*refer M&E Report of ICZMP, 2019*); **(d) Enhanced the scientific capacity of Chilika Development Authority (CDA-Odisha) and Gujarat Ecological Education & Research Foundation (GEER-Gujarat) for coastal and marine ecological monitoring and conservation:** CDA’s Wetland Research and Training Centre (with 15 scientific staff supported by the project) now can carry out critical research in the area of nutrient cycling, water quality, microbial ecology, macrophages; while real-time water quality monitoring data prepared under the project is used for modeling purpose and preparation of Chilika health report card (on the biannual frequency since 2012) (*refer: <http://www.nutrientchallenge.org/chilika-lake-ecosystem-health-report-card>*). GEER Foundation has (i) generated 8 years of comprehensive data on coastal water health for the Gulf of Kachchh, (ii) prepared the largest database on physicochemical and biological parameters, (iii) undertaken comprehensive coral reef assessment, and (iv) first time monitoring of phytoplankton and zooplankton and reporting on 100 new species which were earlier not reported on; **(e) Two of the three State SPMUs have been designated as technical secretariats of SCZMAs:** SPMUs of **Odisha and West Bengal** have been designated as technical secretariats of respective SCZMAs. (*Source: M&E Report of ICZMP, 2019*) and *respective Government Orders, Letters/email on explaining the Staffing&Designation as Technical Secretariats - from SPMUs, NPMU*).

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Direct project beneficiaries	Number	0	0	11,000,000	17,803,373
		15-Jun-2010	31-Dec-2015	29-Dec-2017	30-Jun-2020
Female beneficiaries	Percentage	0	0	51	48

Comments (achievements against targets):



Target exceeded (by 60%) in the case of Direct project Beneficiaries, and substantially achieved in the case of the percentage of women beneficiaries. This target was newly added during the project restructuring in 2015. The implementation of various interventions under the project has positively impacted the lives of the coastal population of India; including 17.8 million (cumulative) direct beneficiaries of which about 8.6 million are women (48.2 percent) (*Source: National ICR, 2020*). After discounting beneficiary overlaps, the total beneficiaries in 2020 is 11.9 million of which 50 % is women. Beneficiary estimation follows a methodology devised by NPMU/SPMU in 2019-20. However, the number of beneficiaries estimated following the methodology in PAD / NDPR is 21 million (*Source: National ICR, 2020, and Appendix 4 of this ICR*).

A.2 Intermediate Results Indicators

Component: National ICZM Capacity Building

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Plan for institutional structure at National, and State level supportive of integrated coastal zone management prepared and submitted to Government for approval	Yes/No	N 15-Jun-2010	Y 31-Dec-2015	Y 15-Dec-2015	N 30-Jun-2020

Comments (achievements against targets):

Target not achieved. No separate Plan for institutional structure at the National, State, and District level supportive of integrated coastal zone management has been prepared. Three institutional structures for National and State level ICZM have been prepared as part of the 3 Model ICZM plans for selected stretches of pilot states. (*Source: M&E Report of ICZMP, 2019 section 4.1.6 Page 51; also refer Pg 5 of AM Annex June 2020*)).



Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Skilled staff in ICZM planning and implementation at National level	Number	10	66	75	117
		15-Jun-2010	31-Dec-2015	29-Dec-2017	30-Jun-2020
<p>Comments (achievements against targets): Achieved. (Exceeded target by 156 percent). In June 2020, at project closure, skilled staff employed in ICZM planning and implementation at the National level included 33 Scientists and 76 Scientific Project Staff under ICZM Project at NCSCM, and 8 in SICOM (NPMU). (Source: https://www.ncscm.res.in/cms/about-us/staff.php, and Letter No: F.No. 22-6/2017-WB-ICZM/IA-III (95759) dt. 03.09.2020 SICOM).</p>					

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
ICZM knowledge outputs generated by National Center for Sustainable Coastal Management	Number	0	10	13	109
		15-Jun-2010	31-Dec-2015	29-Dec-2017	30-Jun-2020
<p>Comments (achievements against targets): Target exceeded (800 percent). (a) Research Papers: Against the target of 10, around 106 research papers have been peer-reviewed and published in internationally acclaimed publications (b) Database for baseline planning documents namely; (i) <i>coastal, marine biodiversity network</i> covering 11 types of ESAs, CVCAs and biodiversity database - CoMBINE is a unique coastal and marine biodiversity web portal that combines multiple databases on a single platform that allows searching a huge wealth of information from multiple, independent, heterogeneous datasets about Indian coastal and marine flora and fauna, housed in biological repositories, including all macro plants (seagrass, mangroves, seaweeds) and animals (Phylum Porifera to Chordata) inhabiting the coastal regulation zone; (refer: http://combine.ncscm.res.in/combine/) (ii) <i>National GHG emission database:</i> An assessment of GHG emissions from mangrove and seagrass ecosystems (estimated net GHG emission (in terms of CO2 equivalents)) along the mainland coast and the Islands</p>					



of India was undertaken to delineate natural and human-induced stress on these ecosystems; (iii) *Coastal Sediment Cell delineation with coastal erosion maps* including delineating 26 Coastal Sediment Cells (defined as length of the coastline and associated near-shore areas where movement of sediments is largely self-contained; with each cell containing a complete cycle of sedimentation including sources, transport paths, and sinks - 10 on the West coast and 16 on the East coast); iv) *ICZM guidelines* prepared and being revised by NCSCM after testing it for efficacy in West Bengal ICZM Plan preparation. (Source: *M&E Report of ICZMP, 2019; National ICR*). The project has established three coastal data centers at the Survey of India office (Bangalore), the Society of Integrated Coastal Management (SICOM - NPMU Delhi), and NCSCM (Chennai) hosting these critical coastal data which has also been shared with all coastal and States/UTs. These knowledge products, along with the High Tide Line, Low Tide Line, ESA/CVCA, and Hazard line serve as the most important data repository created with project support to strengthen ICZM regulatory aspects and has been recognized by the CRZ Rules, 2019. (Source: *CRZ Notification, 2019, Government of India*).

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Kilometer of mainland coastline for which coastal sediment cell, hazard line and ecologically sensitive areas are mapped and delineated	Number	0 15-Jun-2010	5,500 31-Dec-2015	5,500 29-Dec-2017	5,500 30-Jun-2020

Comments (achievements against targets):

Target achieved. (India’s mainland coastline is around 5,500 km. Coastal Sediment Cells, Hazard lines, and ESAs are mapped for the entire mainland coastline). a) *Completion of mapping the “Hazard Line”* (a combination of erosion, flood, tidal waves) of the coast of India (length of the entire coast for which hazard line is mapped: 5,500 km; length of the hazard line: 56,661 Km) in GIS platform, including digital stereo aerial photography of 80,000 Sq. Km; b) *Completion of mapping 11 categories of Ecologically Sensitive Areas (ESAs)* covering 34,160 Sq Km, including Critically Vulnerable Coastal Areas (CVCA); c) *Delineating 26 sediment cells* for the mainland coastline (10 in the West Coast, 16 in the East coast) and further into sediment sub-cells - a key input for the preparation of shoreline management plans. The Government of India has mandated the use of these products - Hazard line and vulnerability mapping by all coastal States and UTs in managing coastal vulnerability in the coming years and as a tool for preparation of all Disaster Management Plans



(Source: CRZ Notification, 2019, Government of India; http://sicom.nic.in/sites/default/files/Brochure_latest.pdf, https://ncscm.res.in/cms/more/pdf/factsheets/Hazard_line_GEO-3.PDF; <https://pib.gov.in/PressReleaseDetail.aspx?PRID=1596334>).

Component: Piloting ICZM Approaches in Gujarat

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
ICZM plan for Gulf of Kachchh prepared using the designed participatory process, and submitted for approval to Government of Gujarat	Number	0 15-Jun-2010	1 31-Dec-2015	1 29-Dec-2017	1 30-Jun-2020

Comments (achievements against targets):

Target achieved. A 'model' ICZM plan for the Gulf of Kachchh has been prepared under the project using the designed participatory process. It has been reviewed/finalized/approved by the State Level Steering Committees in March 2019 and submitted to MoEFCC. The Plan covers 750 km coastline with the ICZM planning area of 17578 sq.km delineated as: a) 13 coastal talukas surrounding the Gulf, including Little Rann of Kachchh, Abdasa, and Lakhpat talukas outside the Gulf of Kachchh; b) entire Gulf of Kachchh; c) up to the 12 nautical miles (nm) towards the seaward side. National and state-level experts (more than 100) and other stakeholders have been consulted from the inception stage (2014-15). Field trips and data acquisition were conducted in coordination with various government agencies in 2014 and 2015, while participatory rural consultations were held in mid-2016 at the village level (11 representative coastal villages with 30,317 inhabitants), to discuss issues and local perceptions. District level stakeholder dialogues were conducted in mid-2016 at Bhuj with 129 representatives (98 from Government, 17 from industries, 14 from NGOs); and in the coastal city of Jamnagar in mid-2016 with 80 representatives (58 from government, 7 from industries, and 15 from NGOs). More than 50 National and state-level experts and other stakeholders have been consulted in late 2016 for feedback on the Coastal Profile and ICZM Plan. The plan was also discussed with 10 International experts in various forums. (Source: Letter from GEC forwarding the ICZM Plan to SICOM, National ICR, M&E Report - ICZMP, 2019; ICZM Plan for Gulf of Kachchh, 2018)



Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
'Skilled staff in ICZM planning and implementation in Gujarat State	Number	0 15-Jun-2010	17 31-Dec-2015	20 29-Dec-2017	15 30-Jun-2020

Comments (achievements against targets):

Substantially achieved (75 percent). 15 skilled staff positions (currently 12 incumbents) are in place at Gujarat SPMU set up in Gujarat Ecology Commission (GEC). Nearly 200 Government of Gujarat (GoG) officials of different government departments were trained in the ICZM Practices and approaches. The capacity building of key officials of various departments of the GoG and 10 staff of GEC (SPMU) have been achieved through continuous involvement in the ICZM planning process, building the capacity for ICZM planning and implementation in the State. (Source: SPMU Gujarat - staff details report by email dated 11 Nov 2020 – as submitted to SICOM)

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Pilot investment projects in Gujarat ICZM	Number	0 15-Jun-2010	7 31-Dec-2015	6 29-Dec-2017	5 30-Jun-2020

Comments (achievements against targets):

Substantially Achieved. Five (5) of the 6 targets were fully achieved (84 percent of the revised target). (Ecotourism initiative was partially implemented). **a) Sewerage system and STP for Jamnagar:** 71MLD Sewage Treatment System with house connections for Jamnagar City completed, benefitting the entire city population. **b) Mangrove plantation:** community-managed mangrove plantation of 19,503 ha in Kachchh completed. An increase of 35 sq. km in the area under mangrove cover across the coastline of Gujarat is recognized by the Forest Survey of India (2019) report, with a 20 percent increment in biodiversity including seasonal avifaunal visitations, expanding fisheries-based livelihood opportunities; **c) Coral regeneration at Gulf of Kachchh:** Transplantation of



1050 sq. m (in 3 spatially distinct areas) of degraded coral reefs was completed; **d) Pollution Control Board laboratory capacity enhancement for marine and coastal pollution:** Before the project, Gujarat PCB had no facility for the analysis of heavy metals, pesticides, PAHs, TOC, and fingerprinting (GC-MS) analysis up to ppb level. An air quality monitoring station has also been installed at coastal Jamnagar near industrial areas, where Ambient air quality (around 17 parameters) is being measured. After project intervention GPCB with advanced monitoring and testing, capabilities have taken action on polluting units (425 nos.) under Water Act 1974 during the period 2017-20 and served 325 Closure notices to various industries under Air Act 1981. Seawater Monitoring is being carried out in 18 stations for physicochemical and bacteriological parameters. Monitoring protocols and SOPs for data analysis have been developed under the project; **e) Establishing CBOs/SHGs in 168 villages for livelihood improvements:** completion of entry-point activities for livelihood security through CBOs/SHGs in 168 coastal villages along the Gulf of Kachchh benefitting fisherfolks, farmers, livestock owners, salt pan workers, and agricultural laborers directly; **f) Eco-tourism interventions were not implemented except the Interpretation Centre at Narara.** Even though many initiatives were planned to include a mangrove walk and other interventions were planned at Narara along with the Interpretation Center; these were not implemented. The project prepared Ecotourism development and Master Plan prepared for Dandi along with community-based awareness activities; and bid documents with Environmental Management Plan for establishing Marine Research, Conservation, and Information Centre (MRCI) and Oceanarium (near Dwarka). (Source: M&E Report of ICZMP, 2019; National ICR; Letter No: GEC/ICZM/1494/2020 dt 03. Nov 2020 from SPMU Gujarat regarding Co-ordinates and area details on Mangrove Plantation)

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Area restored or re/afforested	Hectare(Ha)	0	0	12,000	19,503
		15-Jun-2010	31-Dec-2015	29-Dec-2017	30-Jun-2020
Area re/afforested	Hectare(Ha)	0	0	12,000	16,000
		15-Jun-2015	31-Dec-2015	29-Dec-2017	30-Jun-2020

Comments (achievements against targets):

Achieved. (Exceeded the target - 162 percent). This new core indicator was added during restructuring in 2015. The area under mangroves restored/reforested in Gujarat under the project exceeded the target, by completing a community-managed mangrove plantation in 19503 ha., among which area



reafforested is 16000 ha. (Source: Letter No: GEC/ICZM/1494/2020 dt 03.Nov 2020 from SPMU Gujarat regarding Co-ordinates and area details on Mangrove Plantation; International Journal of Geosciences January 2015; National ICR 2020, M&E Report of ICZMP, 2019).

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Industrial and municipal waste disposal capacity created under the project	Metric ton	0	0	80	71
		15-Jun-2010	31-Dec-2015	29-Dec-2017	30-Jun-2020

Comments (achievements against targets):

Achieved. The target of 1 million coastal population provided with sewerage with supporting wastewater treatment of 71 MLD (*estimated capacity for 1 million coastal population of Jamnagar as per Detailed Project Report for the subproject*) of which 60 MLD potential for industrial recycling has been achieved. The project has completed the implementation of a Design-Build-Operate and Transfer (DBOT) contract with a planned 15 years operation period for a 71 MLD sewage treatment plant (STP) at Jamnagar, Gujarat. As per the contract, the contractor was to sell recycled water for industrial use and thus manage the operation cost in addition to paying INR 20 million (around US\$ 0.27 million) annually to Jamnagar Municipal Corporation. Currently, treated sewage is disposed into the river Rangmati at the locations identified by the Gujarat PCB, meeting the standards specified in the tender conditions. The Gujarat Water Supply and Sewage Board (GSWSSB) has taken over the STP as the contractor (Essar group) is facing insolvency issues. GSWSSB will now lay the pipeline to take treated water (60 MLD) to industries. Based on this model, the State Government has declared that every industry shall use recycled/treated sewage (Source: GoG, May 2018, Policy for Reuse of Treated Wastewater, National ICR, M&E Report of ICZMP, 2019)

Component: Piloting ICZM Approaches in Odisha

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
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ICZM plan for Paradip-Dhamra and Gopalpur-Chilika prepared using the designed participatory process, and submitted to approval by Government of Odisha	Number	0 15-Jun-2010	1 31-Dec-2015	1 29-Dec-2017	1 30-Jun-2020
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Comments (achievements against targets):

Achieved. A ‘model’ ICZM plan for Paradeep-Dhamra (5,272 sq km area, 125.73 km coastline) and Gopalpur-Chilika (4458 sq km area; 122.99 km coastline) – together constituting 41 % of the Odisha coastline has been prepared using a participatory process. The plan was completed, sent to the State Steering Committee meeting (chaired by Chief Secretary to Government of Odisha) in November 2018. After finalization at the State Level, this has been sent to MoEFCC for further approval/adoption. Formulation of Regional coastal process studies (initiated in March 2012), year-long measurement of tides, waves, and current for the first time in the country, supported the preparation of the Plan. Shoreline Management Plan based on sediment cells, policy recommendations, and interventions based on sustainable solutions to issues like coastal erosion, flooding, and seawater inundation caused by natural forces and anthropogenic activities have been integrated into the Plan. A sample survey of 2,300 Households (11,500 people) and 36 Focus Group Discussions were conducted for the preparation of the ICZM Plan, in addition to many stakeholder consultations. District level consultation meetings were held with citizens/stakeholders (with special focus on women and disadvantaged groups) during preparation. The stakeholder consultations have been documented in a Stakeholder Consultation Report which forms part of the ICZM Plan document. *(Source: Letter from SPMU to Additional Chief Secretary to Forest & Environment Department & Chairman OCZMA, Govt of Odisha, Nov 2019; ICZM Plan for Odisha 2019).*

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Skilled staff in ICZM planning and implementation in Odisha State	Number	0 15-Jun-2015	16 31-Dec-2015	20 29-Dec-2017	17 30-Jun-2020

Comments (achievements against targets):



Substantially Achieved. In SPMU, 17 skilled staff positions are recognized (currently 11 incumbents). Skilled staff includes Oceanographer, Ecologist, Program Manager (Communication & Capacity Building), Rural Development Expert, Planner, Documentation Officer, Fishery Expert, MIS Expert, GIS Analyst with experience in ICZM, Two (2) Assistant Project Directors, Procurement Officer, and Accounts Officer. Other State departments with ICZM skilled staff (attended training and implemented pilots related to their sector) include the Wildlife Division of Department of Forests and Environment, Directorate of Fishery, Odisha Tourism Development Corporation, Water Resource Department, Odisha State Disaster Management Authority, Odisha State Pollution Control Board, Chilika Development Authority, and Odisha Remote Sensing Application Centre. *(Source: http://www.iczmpodisha.org/spmu_staff.htm, M&E Report - ICZMP, 2019, Letter from SPMU on number of staff engaged at SPMU Sep 2020, Outcome and Impact Assessment of ICMP Odisha, 2019)*

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Pilot investment projects in Odisha	Number	0 15-Jun-2010	8 31-Dec-2015	10 29-Dec-2017	9 26-Sep-2019

Comments (achievements against targets):

Substantially Achieved (90 percent of the revised target). All pilot activities were implemented, barring one (Solid Waste Management in Paradeep). **(a) Capacity building of Odisha Pollution Control Board (Odisha PCB) and (b) Chilika Development Authority (CDA):** (i) the project enhanced the monitoring and analysis capabilities of Odisha PCB along 196 km coastal stretch of Gopalpur to Chilika and Paradeep to Dhamra by setting up laboratories (including LEED-certified state-of-the-art laboratory at Paradeep) and purchasing and operationalizing a coastal pollution monitoring vessel, with monitoring protocol developed for regular and real-time monitoring of physical, chemical and biological parameters of sea/river water. With this, Odisha PCB has undertaken monitoring and assessing oil spills, mass fish killings in coastal areas, and furnishing of health status reports of Gahirmatha-Bhitarkanika stretch to the Global conservation team of IUCN. (ii) CDA established the first real-time lake water quality monitoring (for Chilika Lake – a Ramsar Site) in Asia outside Japan, which helped generate the Ecosystem Report Card for the Chilika Lagoon ecosystem (produced biannually since 2012). CDA’s Wetland Research and Training Centre (WRTC) has been upgraded to carry out critical research in the area of nutrient cycling, water quality, microbial ecology, and macrophytes, real-time water quality monitoring data used for modeling purpose, with research studies bridging the knowledge gaps, **(c) Monitoring and surveillance infrastructure and capacity enhancement of wildlife and forest division including research facilities in 5 locations and turtle and crocodile hatcheries established:** The project activities included Herbarium on mangrove and associate species, Researchers hostel (Gupti), renovation of hatchery and rearing complex for crocodile at Dangmal; sophisticated monitoring vessels/boats, Monitoring Centre at Chakradharpur and two permanent camp sheds at



Chinchiri & Dobandhi. This supported the protection (during mass congregation) and nesting of Olive Ridley Sea Turtle and other fauna/flora. **(d) Conservation of 6 out of 8 coastal archeological and heritage sites:** the project conserved and enhanced peripheral development of 6 dilapidated coastal heritage structures of high value for locals. All works have been completed, except chemical conservation of Ganjam Fort as the consultant, Indian National Trust for Culture and Heritage (INTACH) could not complete this specialized work due to a shortage of manpower. Department of Culture will complete renovation using its own fund. Preparation of training manual and skilling of 45 artisans/local masons in traditional stone carving has been undertaken under the project, as an important step in preserving local craftsmanship; **(e) Shoreline protection at Pentha village:** 505m of geo tube embankment along Pentha (village) coast successfully demonstrated an alternate technology in coastal erosion control, ensuring effective protection of life and property for 41,222 vulnerable community inhabiting in 58 villages particularly during cyclones (since Phailin - 12.10.2013). **(f) 14 multi-purpose cyclone shelters (MPCS):** construction of 14 MPCS with a sheltering capacity of 1000 persons each, has been completed. These serve as critical infrastructure safeguarding life and movable assets during cyclones while also regularly used for health, education, and other social activities (also as COVID 19 treatment facility); **(g) mangrove plantation (Target: 140 Ha):** Community-managed mangrove plantation over 323 Ha (exceeding the target by 60 percent) ensured the protection of the coastline; **(h) 600 SHGs established with sustainable income:** to release the pressure of overfishing and support income opportunities during the annual fishing ban, 600 Self Help Groups (SHGs) were successfully established in alternative livelihood activities and integrated with state-run programs for future sustenance. The project also supported the skilling 600 fisherwomen through 40 Self Help Groups (SHGs) in innovative coir craft production and providing alternative livelihood opportunities; **(i) Eco-tourism involving coastal communities (Target: 4 locations):** the project established innovative community-managed eco-tourism through Eco-Development Committees at 5 coastal sites along Chilika (Barkul, Kalijai, Banamalipurpatna, Gabakunda, Mirzapur); **(j) Integrated Solid Waste Management facility in Paradeep Municipality:** Project was not implemented. Land and access road for treatment and disposal (landfill) facility, DPR, and ESIA (including public hearing) for securing permits have been prepared. *(Source: Report on Outcome and Impact Assessment of the Integrated Coastal Zone Management Project (Odisha), 2019, National ICR, M&E Report of ICZM Project, 2019).*

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Coastline and freshwater under biodiversity protection (km)	Kilometers	0	0	400	196
		15-Jun-2010	31-Dec-2015	29-Dec-2017	30-Jun-2020
Comments (achievements against targets):					



Partially achieved (49 percent of the revised target). Ecologically Sensitive stretch of Odisha coast - 196 km (between Gopalpur to Chilika and Pardeep to Dhamara of Odisha Coast consisting three forest divisions namely Mangrove Forest Division (MFD-Wildlife), Rajnagar; Chilika Wildlife Division, Balugaon and Berhampur Forest Division (T), Berhampur including Bhitarkanika in MFD, Rajnagar, and Chilika Lagoon under Chillika Wildlife Division) (Source: https://forest.odisha.gov.in/activity/Data/AAR_2017-18_English.pdf Pg 32). The project enhanced monitoring and surveillance through investments in renovation of hatchery and rearing complex for crocodile at Dangmal; sophisticated monitoring vessels/boats, Monitoring Centre at Chakradharpur, and two permanent camp sheds at Chinchiri & Dobandhi all supported protection during mass congregation and nesting of Olive Ridley Sea Turtle and other species (mass nesting of Olive Ridley turtles increased from 900,000 during 2016-17 to 1,110,000 during 2017-18). During 2011-18, 255 vessels/ fishing boats and more than 889 persons who violated Odisha Marine Fishing Regulation (OMFRA) ACT, 1981 were marked as offenders and INR 7,422,285 (around US\$ 100,800) realized from the auction of fish seized. (Source: Report on the Outcome and Impact Assessment of the Integrated Coastal Zone Management Project (Odisha), 2019; June 2020 AM Annex- Page 73 & 155; Final Outcome Evaluation Report of Odisha SPMU; M&E Report - ICZMP, 2019 pages 26, 33, 86)

Component: Piloting ICZM Approaches in West Bengal

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
ICZM plan for West Bengal Coast prepared using the designed participatory process, and submitted for approval by Government of West Bengal	Number	0 15-Jun-2010	1 31-Dec-2015	1 29-Dec-2017	1 30-Jun-2020

Comments (achievements against targets):

Achieved. 'Model' ICZM Plans for the Digha-Shankarpur stretch of the coast, and Sagar Island have been prepared, submitted to the Department of Environment of the Government of West Bengal for approval, and was subsequently approved in September 2020. The Plan has been developed based on a framework of seven inter-linked management sub-plans addressing major coastal concerns, through a participatory process. Surveys/Consultations were conducted including a survey of 3,359 households in Digha and 2,151 households in Sagar Island were surveyed (nearly 30,000 people); focus group



discussions conducted with 14 stakeholder groups in Digha and 6 in Sagar; 9 Participatory Rural Appraisals conducted (5 for Digha and 4 for Sagar Island), consultations with State Government Line Departments and Block/Gram-Panchayat level staff (161 informant interviews in Digha, and 41 in Sagar Island). Participatory livelihood zoning involved 541 stakeholders in Digha and 41 in Sagar, while eight (8) stakeholder groups were represented in value chain analysis in Digha and one (1) in Sagar Island. Participatory Coastal Resource Assessment was carried out in five village clusters to understand the perspective of the villagers on the natural environment and ecosystems and a final stakeholder workshop was held to present the ICZM Plan and receive feedback which was then incorporated into the plan for its finalization. (Source: ICZM Plan for West Bengal, Letter from IESWM (SPMU, West Bengal) Ref: No: 055/ICZMP/17-1(L-1)/2018-19 dated 09.09.2020).

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Skilled staff in ICZM planning and implementation in West Bengal State	Number	0 15-Jun-2010	17 31-Dec-2015	15 29-Dec-2017	8 30-Jun-2020

Comments (achievements against targets):

Partially achieved (54 percent of the revised target). Eight (8) technical positions have been approved for SPMU. This includes Project Manager-Operations, Ecologist, Planner/Engineer, Oceanographer/Marine Scientist, Fishery Specialist, Rural Development Specialist, Technical Assistant, and General Assistants. Also, many government officials including those in PEAs have been trained in ICZM approaches in West Bengal State through various training sessions conducted as part of the project. (Source: Letter from IESWM (SPMU, West Bengal) Ref: No: 055/ICZMP/17-1(L-1)/2018-19 dated 09.09.2020).

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Pilot investment projects in	Number	0	9	10	10



West Bengal		15-Jun-2010	31-Dec-2015	29-Dec-2017	30-Jun-2020
<p>Comments (achievements against targets):</p> <p>Achieved (all except one of the 25 cyclone shelters targeted). a) Capacity building of Calcutta University and (b) Institute of Environmental Studies & Wetland Management (IESWM): Procurement of advanced scientific instruments and engagement of 14 research scholars at Calcutta University helped catalog and disseminate studies on microbial diversity in Sundarbans, and assessment of carbon sequestration through mangrove forest of Sundarbans. Enhanced the scientific capacity of Calcutta University for cataloging microbial diversity in coastal regions including Sundarbans has led to the publication of 15 research publications in peer-reviewed journals and a chapter in a book, submitted 1.37 GB DNA sequencing data submitted to NCBI, USA. While, procurement of scientific instruments and software (ArcGIS, ERDAS Imagine, Geomatica along with Leica photogrammetric suite) has strengthened IESWM’s laboratory and augmented its geospatial processing and modeling capabilities; (c) Sewerage and (d) stormwater drainage system in Digha: 6.7 MLD STP served by 12.696 km of sewage network and 26.135 km of stormwater drainage network connected to a phytoremediation facility were constructed in Digha, (e) Digha beach improvement including (f) Hawker relocation: Installation of beach infrastructure at Digha and rehabilitation of more than 1272 hawkers to regularize vending zones has facilitated the improvement in hawker livelihoods as well as a tourist experience, (g) Distribution of grid electricity in Sagar Island: Full electrification of Sagar Island covering 35,000 households, has facilitated transformational improvement in Sagar Island. The project laid 1219.898 km. length of the Transmission line (384.66 KM of HT line and 835.238 KM of LT line), 30466 poles (8740 HT poles and 21726 LT poles), distribution transformers (195 numbers of 16 KVA and 400 numbers of 25 KVA); (h) Multi-purpose cyclone shelters (MPCS): construction of 24 MPCS (out of the 25 targeted) completed in 5 coastal blocks with a sheltering capacity between 1150 to 1500 persons each serving as critical infrastructure in safeguarding life and property particularly during cyclones (Fani-May 2019, Bulbul-Nov 2019, Amphan-May 2020), COVID 19, and for other social engagements. (One MPCS was not implemented due to difficulty in transporting material/construction at the location. The community here was covered under another cyclone shelter constructed nearby by the Government of West Bengal); (i) Ecotourism infrastructure in Sagar Island: Facilities created include (i) Public Rain shelter cum Dala Arcade, (ii) Public Rain shelter cum Nat Mandir, (iii) Bus terminus with Waiting area, (iv) Food and Drink Facility, Toilet, and Tourist & information office (v) Toilets of 20 blocks, (vi) Solid Waste Management with one Permanent Compost plant and 3 Temporary Compost plant, (vii) 30 hut Eco- Camp Complex. Infrastructure created has improved the environment and is used regularly, specifically during the Ganga Sagar Mela. (j) Livelihood improvement for Sagar Island communities: 128 number of Entry Point Activities, and income generation activities through 3102 (all women) SHGs in 9 Gram Panchayats of Sagar Block (of this 1,178 were new SHGs formed during the project). Project contribution as loan/financial assistance of Rs. 54,575,500 (around US\$ 0.74 million) has resulted in an income generation of Rs. 141,775,915 (around US\$ 1.9 million) by the SHGs to date. For continued skill enhancement and technical support, convergence with various government departments has been established. To engage local participation and monitoring in forest areas with improved livelihoods, 20 Forest Protection Committees covering 11,613 members were also variously involved in plantation activities, Joint Forest Management, patrolling and rescue, fisheries, poultry, and mushroom cultivation. <i>(Source: M&E Report of ICZMP, 2019; National ICR, Reports by SPMU on (i) CBO coordinated livelihood development in Sagar Block under ICZM project</i></p>					



(http://www.iczmpwb.org/main/pdf/physical_progress/Livelihood%20Presentation%20-%20SPMU_Sep2016.pptx), (ii) Grid electricity and augmentation of healthcare facilitation in Sagar Island, <http://sicom.nic.in/milestones/environment-and-pollution-abatement/electrification-sagar-island>).



B. KEY OUTPUTS BY COMPONENT

Objective/Outcome 1: To assist GoI in building national capacity for implementation of a comprehensive coastal management approach in the country and piloting the integrated coastal zone management approach in the states of Gujarat, Orissa, and West Bengal	
Outcome Indicators 1	<p><i>Institutional structure at national and state-level supportive of integrated coastal zone management established according to defined criteria: (Revised Target: Yes) - Yes: Substantially Achieved</i></p> <p><i>Criteria:</i></p> <ol style="list-style-type: none"> 1. National Coastal Zone Management Authority (NCZMA) established and functional (Yes) 2. National Center for Sustainable Coastal Management (NCSCM) established and functional (Yes) 3. State Coastal Zone Management Authorities (SCZMAs) in three pilot states established and functional (Yes)
Intermediate Results Indicators	<ol style="list-style-type: none"> 1. Plan for institutional structure at national, state, and district-level supportive of integrated coastal zone management prepared and submitted to the state government for approval (Yes/No) (Component 1)
Key Outputs by Component (linked to the achievement of the Objective/Outcome 1)	<p><i>Criteria: Met</i></p> <ol style="list-style-type: none"> 1. NCZMA established and functional (Yes) (Component 1): Target Achieved: NCZMA established and functional since Nov 26, 1998. Reconstituted in 2012 and in 2015, including NCSCM and representatives of various agencies/departments involved in the coast. Completed 20 meetings by 2010 (appraisal) and more than 40 by 2019, taking decisions on regulatory aspects – CRZ violations and permissions as reported by UT/SCZMAs as per CRZ 2011 Rules. NCZMA (coordinated by CRZ division of MOEFCC) regularly evaluates proposals from SCZMAs and enforcing compliance with CRZ Notification. 2. NCSCM established and functional (Yes) (Component 1): Target Achieved: Established and functional since 2010 as an ISO 9001, ISO 45001 Certified Institution 3. SCZMAs in three pilot states established and functional (Yes) (Component 1): Target Achieved: SCZMAs were established in all States before the project (refer to PAD). These were reconstituted in 2012 and then in 2015 including representatives of agencies occupying the coast. SCZMAs (a) examine proposals in CRZ areas and make recommendations to NCZMA; (b) review and take actions on alleged violations of CRZ Notification; (c) identify ecologically sensitive and economically important areas in CRZ, and (d) provide annual reports to NCZMA. <p><i>Component 1: Target Not Achieved</i></p> <ol style="list-style-type: none"> 4. No separate plan was prepared for institutional structure at the national, state, or district level or submitted for approval. Institutional structures at the state level are prepared as part of Model ICZM Plans for the three pilot states (Refer Proposed Institutional Structure in respective ICZM Plans).
Outcome Indicator 2	<i>Knowledge and planning base in integrated coastal zone management established according to defined criteria: Substantially Achieved (Revised Target: Yes)</i>
Intermediate Results Indicators	<ol style="list-style-type: none"> 1. ICZM knowledge outputs generated by the NCSCM (Component 1) 2. Kilometer of mainland coastline for which coastal sediment cell, hazard line, and ecologically sensitive areas mapped and demarcated (Target: entire mainland coast) (Component 1)
Key Outputs by Component (linked to the achievement of the Objective/Outcome 1)	<p><i>Component 1: Substantially Achieved</i></p> <ol style="list-style-type: none"> 1. ICZM knowledge outputs by NCSCM <ol style="list-style-type: none"> (i) ICZM Plan preparation guidelines prepared in 2014 by NCSCM and used for ICZM Plan preparation in three states; being revised based on plan preparation experience in these three states but not yet presented for formal adoption by MoEFCC - (Revised Target: Yes) - Substantially Achieved (ii) Knowledge base (by NCSCM) to facilitate sustainable coastal development (Component 1): 109 research papers, 3 databases developed (Revised Target 13: 10 research papers and 3 databases): Achieved



Objective/Outcome 1: To assist GoI in building national capacity for implementation of a comprehensive coastal management approach in the country and piloting the integrated coastal zone management approach in the states of Gujarat, Orissa, and West Bengal	
	<ul style="list-style-type: none"> a. Databases (CoMBINE) for coastal, marine biodiversity network prepared: Coastal and marine biodiversity web portal managed by NCSCM combines multiple databases on a single platform about Indian coastal and marine flora and fauna, housed in biological repositories, including all macro plants (seagrass, mangroves, seaweeds) and animals (Phylum Porifera to Chordata) inhabiting the coastal regulation zone (I to IV). Species-level information added for about 4,000 of 11,000 species in the database. Floral species encoded per the grid system, with geo-coordinates of the place of collection given. Of 250 species screened, 39 species have been barcoded and sequences have been deposited with the National Center for Biotechnology Information (NCBI), USA. The barcoding includes two Scheduled Species. One species of coral <i>Truncatoflabellum madrasensis</i> (ahermatypic coral) is reported by NCSCM as new to science from the coast of Chennai. Knowledge products: 9 publications, 7 training events/workshops, 22 internships, 13 dissertations, 176 bacterial sequence submissions to the NCBI GenBank Database. b. National greenhouse gas (GHG) emission database for coastal ecosystems prepared: An assessment of GHG emissions from mangrove and seagrass ecosystems (net GHG emission estimated in CO₂ equivalent) along the mainland coast and islands of India was undertaken. The sequestration capacity by blue carbon ecosystems (mangrove and seagrass) of India has been reviewed and synthesized. Net GHG emission (in CO₂ equivalent) estimated from seagrass and mangrove ecosystems of India – for East Coast, West Coast, and islands. Knowledge products: 13 publications, 1 atlas, 2 factsheets, 3 book chapters, 2 policy documents. c. Baseline Coastal Sediment Cell delineation as a benchmark with coastal maps prepared: Baseline Coastal Sediment Cell delineation as a benchmark with coastal maps, including delineating 26 Coastal Sediment Cells - 10 on the West Coast and 16 on the East coast; and further divided into subcells. Knowledge products: 1 publication under review, 1 factsheet, 1 report, 2 atlases, 1 training workshop. d. Futuristic research framework with the output (assessment of offshore renewable energy potential) delivered: Offshore renewable energy potential assessment including computing potential for offshore wind energy along the coast of India. High-resolution (9 km) advanced research of weather research and forecasting model used to predict offshore wind energy (green energy) potentials along the Indian Coast for 10 years (2005–14) and gross annual electrical power estimated. Knowledge products: 1 book chapter, 1 factsheet, 2 atlases, 2 reports, 1 training workshop. e. Coastal Cumulative EIA methodologies: Preparation of Cumulative EIA Guidelines, and CEIA framework for the Gulf of Kachchh. Knowledge products: 2 report cards and factsheets, 2 reports, 12 publications. <p>2. Kilometers of mainland coastline for which coastal sediment cell, hazard line, and ecologically sensitive areas mapped and demarcated (Target: Coastal sediment cell, hazard line, and ecologically sensitive areas are mapped and demarcated for the entire mainland coast (Mainland coast of India: 5500 km).</p> <ul style="list-style-type: none"> a) Completed mapping the hazard line (combining data on erosion, flooding, and tidal waves) of the coast of India, including aerial photography of 80,000 km². b) Completed mapping of ESAs (11 categories) covering 34,160 km², including demarcating CVCAs. c) Delineated 26 sediment cells for the entire mainland coastline (10 on the West Coast, 16 on the East coast) and several subcells, a key input for the preparation of shoreline management plans. d) Determining relative levels and established levels for more than 150 major or minor ports in the country the first time, for an accurate understanding of relative sea-level rise all along the coast.
Outcome Indicator 3	Implementation of demonstrable ICZM pilot activities carried out: Substantially Achieved (Revised Target: Yes)
Intermediate Results Indicators	<ul style="list-style-type: none"> 1. Pilot investment projects in Gujarat (Component 2) 2. Area restored or re/afforested (ha. of mangroves) (Component 2)



Objective/Outcome 1: To assist GoI in building national capacity for implementation of a comprehensive coastal management approach in the country and piloting the integrated coastal zone management approach in the states of Gujarat, Orissa, and West Bengal		
	3. Industrial/municipal waste disposal capacity created under the project (Target: 1 million coastal population provided with sewerage with supporting wastewater treatment of 80 MLD of which 50–60 MLD potential for industrial recycling): (Component 2) 4. Pilot investment projects in Odisha (Component 3) 5. Coastline and freshwater under biodiversity protection (km) (Component 3) 6. Pilot investment projects in West Bengal (Component 4)	
Key Outputs by Component (linked to the achievement of the Objective/Outcome 2)	Component 2: <i>Substantially Achieved</i> 1. Pilot investment projects in Gujarat (Component 2) (Revised Target: 6): 5 pilots implemented fully, 1 partially implemented. Projects include: <ol style="list-style-type: none"> i. STP and sewerage system at Jamnagar: 71 MLD sewage treatment system with house connections for Jamnagar City (12 identified zones) completed; 109.38 km sewer network installed; 78.55% households of the city connected by the project (total 99494 households in Jamnagar City). Gandhinagar and Kalavad Gate Sewage Pumping Stations renovated, and Vhorana Hazira Sewage Pumping Station newly constructed. Treated sewage disposed into Rangmati River at locations identified by the State Pollution Control Board. ii. Mangrove plantation: Community-managed mangrove plantation of 19,503 ha completed. iii. Coral regeneration at Gulf of Kachchh: Transplantation (iron frame model, along with cemented paver block) of 1,050 m² (in 3 spatially distinct areas) of degraded coral reef was successfully restored by fragmenting and transplanting 1,200 coral branches, planted at a depth of 6–8 m in subtidal sites off Mithapur and Poshitra. iv. Pollution Control Board laboratory capacity enhancement for marine and coastal pollution: <ul style="list-style-type: none"> ▪ Environmental Analytical Laboratory was established at Central Laboratory, Gandhi Nagar; 64 sophisticated scientific instruments procured for Central Laboratory and regional laboratories (Rajkot, Jamnagar), which were refurbished and operationalized. Equipment procured include high-resolution gas chromatography, high-resolution mass spectroscopy, X-ray diffractometer, zero head space extractor, water purification system, accelerated solvent extractor system, gas chromatograph with nitrogen-phosphorous detector and flame photometric detector with electron capture detector, flame photometric detector, flame ionization detector, high-performance liquid chromatograph, UV-visible spectrophotometer, spectrofluorometer, total organic carbon analyzer, microwave digester, rotary vacuum evaporator, volatile organic compound analyzer (bench type), accelerated solvent extractor systems. ▪ 1 continuous ambient air quality monitoring station was installed at Jamnagar. Ambient air quality (around 17 parameters) was measured by the station. Data are available in the public domain, viewable by all residents of the nearby area for 24 hours. ▪ Biochemical monitoring of Gulf of Kachchh seawater: Seawater monitoring is carried out in 18 stations for physicochemical and bacteriological parameters, and analysis of those parameters is undertaken regularly for five years; scientific monitoring protocol and standard operating procedure (SOP) for physicochemical analysis developed by GPCB. v. Entry-point activities in the Gulf of Kachchh completed establishing CBOs/SHGs in 168 villages 	
	Components	Outputs
	Coastal Natural Resources Conservation and Management	No. of rainwater harvesting structures created: 2,350 rainwater harvesting structures established with 11,750,000 liters water storage capacity; 14 check dams; 15 rainwater harvesting structures with 30,000 liters water storage capacity No. of grass plots developed: 10 No. of soil improvement works carried out: 3



Objective/Outcome 1: To assist GoI in building national capacity for implementation of a comprehensive coastal management approach in the country and piloting the integrated coastal zone management approach in the states of Gujarat, Orissa, and West Bengal

Smart Village Initiative	No. of Green and Smart Schools developed:	28
	Closed-circuit television and public address system installed:	104
	Solar based streetlights:	110
	Solid and liquid waste management:	2
Green Space Development	No. of Gandhi Gardens developed, including green space:	10
MSME Development for livelihood enhancement	No. MSMEs developed in target villages:	75

- vi. Ecotourism projects: Refurbishment of Mangrove Interpretation Centre at Narara implemented, Ecotourism development and Master Plan prepared for Dandi, along with community-based awareness activities; bid documents with Environmental Management Plan prepared for establishing Marine Research, Conservation, and Information Centre (MRCI) and Oceanarium (near Dwarka); not implemented. **(Partially Implemented)**
- 2. Area restored or re/afforested (ha. of mangroves) (Revised Target: 12,000 Ha): Mangroves restored/re-afforested/restored on 19,503 ha. **(Exceeded Target)**
- 3. Industrial/municipal waste disposal capacity created under the project (Revised Target: 1 million coastal population provided with sewerage with supporting wastewater treatment of 80 MLD of which 50–60 MLD potential for industrial recycling): 71 MLD STP and municipal sewerage system constructed in Jamnagar City for the coastal population of 1 million. Around 50–60 MLD of treated water can be recycled for industrial use if pipelines are laid to take this recycled water to the industrial area. 109.38 km sewer network installed. **(Achieved)**

Component 3: Substantially Achieved

- 4. Pilot investment projects in Odisha (Target: 10): 9 pilot investment projects implemented in Odisha (1 not implemented). **(Substantially Achieved)**.
(Component 3) Projects include:
 - i. Capacity building of OPCB: Monitoring and analysis capabilities of OPCB along 196 km coastal stretch of Gopalpur to Chilika and Paradeep to Dhamra enhanced by **(Achieved)**
 - a. Improving Central Laboratory, Patia, Bhubaneswar, setting up Centre for Management of Coastal Ecosystem, Paradeep (green building with platinum-rated U.S. Green Building Council certification), Sagar Utkal (monitoring vessel), and monitoring protocols developed.
 - b. Total Involvement of personnel in ICZM Project work (51) including 20 scientists/engineers, 28 scientific staff.
 - c. OPCB created the “Coastal Management Cell” vide office order no.11889 dt. 22.7.2010.
 - d. Publications produced under the project: Monitoring Protocol for the coastal environment, Environmental Status Report 2013-2015, a brochure on LEED certification (Platinum) of CMCE building, Report Card of estuarine sea ecosystem of Paradeep 2015, Health Card of Gahirmatha Coastal stretch 2015, Health Card of Dhamra coastal ecosystem 2015, Paradeep-Gahirmatha Dhamra Ecosystem Report Card 2017, Success Story – ICZM Project, SPCB, Odisha 2010-2017, Environmental Status Report 2015-2017, Mangrove Atlas of Bhitarkanika (ISBN) – 2018, research paper on “Spatio-temporal variations of Phytoplankton in relation to physicochemical parameters” (*Indian Journal of Geo-Marine Sciences*, 2018), Status & Trends of Coastal Parameters, 2019.
 - ii. Capacity building of CDA: Upgrading the CDA Wetland Research and Training Centre - CDA established the first real-time lake water quality monitoring (for Chilika Lake – a Ramsar site) in Asia outside Japan; enabled critical research– Supported various ecological / pollution research studies in Chilika Lake. **(Achieved)**



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- iii. Monitoring and surveillance infrastructure capacity enhancement of wildlife and forest division in 5 locations, including turtle and crocodile hatcheries established: **(Achieved)** Investments in:
 - a. Renovation of hatchery and rearing complex for crocodile at Dangmal; monitoring vessels/boats (high speed – 2 no.), Monitoring Centre at Chakradharpur and two permanent camp sheds at Chinchiri and Dobandhi, for protection during mass congregation and nesting of Olive Ridley sea turtle and other species implemented. Herbarium on mangrove and associated species and researcher hostel (Gupti) established
 - b. Permanent camps for the protection of Olive Ridley sea turtles – 2
 - c. Monitoring Centre at Chakradharpur – 33 herbarium sheets with 500 mangroves and associated species sample: 1
 - d. 33 shallow tubewells constructed
 - e. 16 awareness programs conducted with 960 students of schools/colleges and 60 members from the local community
 - f. Researcher’s hostel – 1
 - g. 15 papers published, 5 conference/workshop abstracts
- iv. Conservation of 7 (one partial) (Target: 6) **Achieved** - coastal archeological and heritage sites: Bhabakundaleswar Temple at Manikapatna, Harachandi Temple at Baliharachandi, Harihardev Temple at Nairi, Jagannath Temple at Pentha, Bateswar Temple at Kantiagarh, Ganjam Fort and British Cemetery at Ganjam Town. **(Achieved)**
 - o Conservation (structural and chemical) and enhancement of peripheral development; handed over to temple trusts for management and maintenance. Peripheral development includes Yajna Mandap, kitchen block, temple premises paving work, toilet block, kerb wall, and pathway, parking. New shops opened due to peripheral development: Manikapatna – 2, Baliharachandi – 6, Kantiagarh – 8, Pentha – 3, Nairi – 4. 6 Heritage Management Committees formed for implementation co-ordination and O&M.
 - o Preparation of training manual on local craftsmanship
 - o Training workshop for “Capacity Building Programme of Artisans” - demonstration of 3 traditional temple styles (Khakra, Pidha, Rekha) during September - November 2013; for 45 artisans
- v. Shoreline protection at Pentha Village: 505 m of geo-tube embankment constructed along Pentha Village coast for shoreline protection **(Achieved)**
- vi. 14 multipurpose cyclone shelters: Constructed with more than 2000 sq ft area, each with a capacity to shelter 1,000 persons **(Achieved)**
 - a. Separate hall, toilets for men and women, ramp for persons with disabilities and other needy people
 - b. Drinking water supply through the submersible pump, blackboard for classroom purposes
 - c. Internal electrical wiring is done. 5 kVA generator set supplied for backup power supply.
 - d. About 32 types of shelter-level emergency equipment provided, including a 5 kVA DG set & 2 inflatable tower lights
 - e. An amount of US\$2,690 (INR 0.2 million) each provided from the project to all the cyclone shelters as corpus fund, to be topped by a matching grant from Odisha State Disaster Management Authority (OSDMA). This fund is kept in a fixed deposit and the interest generated is to be used for sustainable capacity building of the Cyclone Shelter Management and Maintenance Committees/shelter village and minimum maintenance of shelter building after a proper resolution by the Committee.
- vii. 323 ha (Target: 140 ha) of community-managed mangrove plantation; communities engaged in the plantation were paid daily wages from the project **(Achieved)**
- viii. 600 SHGs established with sustainable income benefitting more than 44,400 fisherpersons (28,980 women); additional skilling of 600 fisherwomen through 40 SHGs in innovative coir craft production **(Achieved)**



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- ix. Eco-tourism at 6 locations (Barkul, Rambha, Mirzapur, Gabakunda, Gangadharpur, Banamalipurpatna) (Target:4) involving coastal communities: **(Achieved)**
 - a. Barkul: tourist facilities developed: Amusement park, food court (bamboo structure), tourist guide center (bamboo structure), handicraft center (bamboo structure), development of the water sports complex, pathway, parking for 17 buses and 150 cars, picnic area, public convention center, sewage treatment plant-35 KLD, installation of pontoon jetty, sitting benches, installation of the visitor management system, installation of solar power plants and solar streetlights, landscaping, plantation, etc.
 - b. Rambha: tourist facilities at the site are: Development of jetty, approach pathway of the jetty, fixing of the gazebo, installation of pontoon jetty, Installation of solar streetlights and plantation
 - c. Gabakunda: tourist facilities at the site are: Public convenience center, food court (3), development of association hall, development of parking for 75 vehicles, pathway, entrance gate, shop (10), installation of solar streetlights and plantation
 - d. Mirzapur: facilities at the site are: Public convenience center, food court (3), development of the pond, development of parking for 70 vehicles, pathway, entrance gate, shops (12), installation of solar streetlights and plantation
 - e. Gangadharpur: tourist facilities at the site are: Public convenience center, development of parking for 60 vehicles, pathway, installation of solar streetlights and plantation
 - f. Banamalipurpatna: tourist facilities at the site are: Food courts (2), public convenience center, parking for 50 vehicles, tourist information center, RCC retaining wall, fencing, landscaping, and plantation, gazebos
- x. The integrated solid waste management facility in Paradeep Municipality was not implemented, but land secured, and project documents prepared for the government to take up the implementation under other schemes completed **(Not Achieved)**
- 5. Coastline and freshwater under biodiversity protection (km) (Target: 400 km): Achieved a monitoring facility for 196 km (Component 3): **(Partially Achieved)**. Through investments in renovation of hatchery and rearing complex for crocodile at Dangmal; monitoring vessels/boats (2 high-speed seagoing vessels and 2-speed boats), Monitoring Centre at Chakradharpur (33 herbarium sheets with 500 mangroves and 1 associated species sample; and 2 permanent camp sheds at Chinchiri and Dobandhi, protection during mass congregation and nesting of Olive Ridley sea turtle and other species - implemented. An herbarium sheet on mangrove and associated species and a researcher hostel (Gupti) established; 16 awareness programs conducted with 960 students of schools/colleges and 60 members from the local community; 15 papers published, 5 conference/workshop abstracts.
Component 4: (Target: 10) Achieved
- 6. Pilot investment projects in West Bengal (Target: 10 pilots): 10 pilots implemented - all except 1 cyclone shelter out of 25 targeted, as it was difficult to transport materials to the site. (Component 4) Pilots include:
 - i. Capacity building of Calcutta University: **(Achieved)**
 - Advanced scientific instruments purchased.
 - Engaged 14 research scholars at Calcutta University to catalog and disseminate studies (15 Nos. of publications in peer-reviewed journals and one Chapter in a Book) on microbial diversity in Sundarbans, and assessment of carbon sequestration through mangrove forest of Sundarbans. 1.37 GB DNA sequencing data generated and submitted to NCBI, USA
 - ii. Capacity building of IESWM: **(Achieved)**
 - Procurement of scientific instruments and software to upgrade IESWM laboratory - ArcGIS, ERDAS Imagine, Geomatica along with Leica photogrammetric suite to augment its geospatial processing capabilities and MIKE 21 to enhance its modeling capability. Also procured computers, topo-mouse, and allied materials along with the engagement of project scientists.



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- iii. Sewerage system for Digha: **(Achieved)** 6.7 MLD STP served by 12.696 km of the sewage network constructed, including sewage lifting station and sewage pumping station; office building and laboratory with equipment (e.g., spectrophotometer, BOD incubator, hot air oven, etc. to test the quality of water discharged to the sea)
- iv. The stormwater drainage system in Digha **(Achieved)**: 26.135 km of the stormwater drainage network connected to a phytoremediation facility in Digha
- v. Digha beach improvement and tourism: **(Achieved)** (a) Installation of beach infrastructure at Digha: 4 watchtowers, 4 beach amenities, 1 open-air theatre beach lighting, paving of the promenade, seating arrangements, garbage bins, and allied landscaping works implemented, (b) Marine Aquarium of Zoological Survey of India was renovated, and 10 training programs conducted (5 each for community and mid-level government officials) covering 337 trainees. Upgrading of the existing filtration system of the aquarium
- vi. Hawker relocation **(Achieved)**: Rehabilitation of more than 1,272 hawkers from beachfront and other interventions; 1,313 kiosks constructed (including 30 food kiosks)
- vii. Distribution of grid electricity in Sagar Island leading to full electrification: **(Achieved)**
 - Full electrification of Sagar Island covering 35,000 households
 - 1219.898 km of transmission line laid, which includes 384.66 km of high-tension line and 835.238 km of low-tension line
 - 30,466 poles erected, including 8,740 high-tension poles and 21,726 low-tension poles
 - Distribution transformers (595) installed on entire Sagar Island, including 195 16-kVA distribution transformers and 400 25-kVA distribution transformers
- viii. Multi-purpose cyclone shelters (MPCS): **(Achieved)** Construction of 24 MPCS (Target:25) which can withstand wind speed of 250 km with a sheltering capacity between 1,150-1,500 persons each with adequate water and power supply system (grid electricity, diesel and solar for emergencies), kitchen and washroom facilities, and provision for sheltering livestock. MPCSs are maintained through committees registered under the Societies Act. Each MPCS has a cattle shelter on the ground floor (raised plinth level with ramp facility) and kitchen and toilet facilities, with a separate facility for differently-abled persons.
- ix. Ecotourism infrastructure in Sagar Island. **(Achieved)**
 - (a) Public rain shelter cum Dala Arcade, (b) Public rain shelter cum Nat Mandir (rehoused 124 hawkers from unauthorized thatched shanties), (c) bus terminus with waiting area (with a food court, waiting area, toilet blocks, and tourist information center), (d) food and drink facility, toilet, and tourist and information office, (e) leach pit toilets of 20 blocks, (f) one permanent compost plant and 3 temporary compost plants for biodegradable waste treatment, (g) 30-hut eco-camp complex.
- x. Livelihood improvement for Sagar Island communities: **(Achieved)**
 - 128 entry point activities, and income generation activities through 3,102 (all women) SHGs in 9 Gram Panchayats of Sagar Block. Financial support from the project provided in the form of a revolving fund to SHGs and a community investment fund to Sangha-Samabay for the livelihood development of SHG members. Community investment fund provided to 2,336 SHGs, covering 9,137 women members, and disbursing US\$729,284 (INR53.7million). Revolving fund provided to 1,334 SHGs, disbursing US\$ 267,540 (INR19.7 million).
 - Constructed 19.88 km of brick-paved road, 75 tubewells with a raised platform, 4 culverts.
 - Livelihood enhancement activities: Total 3,102 SHGs formed, of which 1,178 were new SHGs formed during the project period. 1,739 SHGs received revolving fund, 11,497 SHG members covered under community investment fund loan, computer sets, and livelihood-enabling inputs provided to 9 Sangha-Samabayas (Federation of SHGs). 20 Forest Protection Committees were also involved in plantation activities, Joint Forest Management, patrolling and rescue, construction of animal rescue center, patrolling camp with boundary walls (2), forestry farm (705 ha), mangrove (110 ha), strip plantation (40 ha), gap plantation (390 ha), CSB plantation (100 ha), palisade (5,500 m), central nursery (1).
 - Project distributed/implemented:



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- Pump machines: 101
- Construction of rural concrete road: 300 m.
- Tubewells: 14
- Fertilizer for betel vine farming: 107 beneficiaries
- Van rickshaws: 136
- Paddy threshers: 142
- Submersible pump-based drinking water supply: 29
- Sewing machines: 175
- Fish insulator boxes with allied accessories: 84
- Spray machines: 64
- Distribution of piglings (3 per beneficiary): 20
- Distribution of fishlings: 121
- Distribution of ducklings (10 per beneficiary): 588
- Distribution of chickens (10 per beneficiary): 1,305
- Capacity-building activities/training to enhance their capabilities in livelihood advancement to 20,127 SHG members
- 14,327 inhabitants of Sagar Block trained through capacity-building programs, including bookkeeping and auditing (3,447 trainees); SHG and Sangha management (2,900 trainees); and livelihood training (3,672 trainees) on biofertilizer; vaccination and deworming of cattle; rearing of goats, poultry, and ducks; fishery, handicrafts, etc.; and other meetings, workshop, camps, exposure visits (4,308 trainees).

Additional activities under Component 1:

- In addition, SICOM implemented:
 - 1) BEAMS program as Pilot project in 7 States, with 8 beaches getting international Eco-label, Blue Flag Certification. Developing WASH facilities, safe swimming zone, waste, wastewater management, recreational facilities, plantation etc.
 - 2) Conservation and Development of Vedaranyam: Plan focusing on a) Restoration, conservation and development of coast and coastal resources, b) Integrated Village and Community Development, c) Salt Satyagraha memorial and community-based ecotourism, d) Capacity building and training. Mangrove & Non-mangrove plantation, Restoration of water bodies, Integrated Village and Community, Special Project - of salt farmers, Salt Satyagraha Memorial Genetic Garden of halophytes (29 halophytes in 2 acres), Training and capacity building (47 training, benefitting 1293 people), Health camps were organized; ponds de-siltation, rainwater harvesting system, new ponds, community wells rejuvenated, shallow bore wells, motor and pipe line connection, reverse osmosis system and mobile drinking water facility have been provided.
 - 3) The Green Action for National Dandi Heritage Initiative (GANDHI) Memorial Project in Dandi village of Navsari District Gujarat: Beach cleaning, biotoilets, study on conservation strategies for revival of Nani-Kakrad Wetland, 100 ha of mangrove plantation, 5 ha of shelterbelt plantation, Gandhi Van has been developed in 1.5 ha area, Gandhi Garden developed near Sultanpur Gram Panchayat; stone pitching around ponds in total 1,656.51 sqm area; 60 solar street lights have been installed at Dandi (24), Sampar (12), Matwad (12) and Onjal (12) benefitting 13,071 local people. A total of 25 KW solar roof top systems have also been installed at 11 sites spread over 6 villages; Solid waste management sheds have also been constructed in Dandi and Onjal, About 76 Paryavaran Choro, a common meeting place in village, have been developed in all 6 villages; approx. 8,628 kitchen garden kits have been distributed in the all 6 project villages between year 2012 to 2016 to promote kitchen garden (in collaboration with Krishi Vigyan Kendra); 47 household toilets, livelihood trainings, 7 SHGs formed linked to government schemes -Mission Mangalam Yojana.



<p>Objective/Outcome 1: To assist GoI in building national capacity for implementation of a comprehensive coastal management approach in the country and piloting the integrated coastal zone management approach in the states of Gujarat, Orissa, and West Bengal</p>	
<p>Outcome Indicator 4</p>	<p>National and State level technical capacity established for ICZM planning with supporting technical staffing according to defined criteria (Revised Target: Yes) Criteria Substantially met. Target: Yes. Substantially Achieved <i>Criteria: (a) NCSCM established with 'Centre of Technical Excellence' mandate with national and international scientific partnerships in place, and supported with scientific equipment and 50 scientists; (b) Society for Integrated Coastal Management established as technical secretariat for NCZMA/MoEFCC with 8 technical staff; (c) Enhanced coastal and marine pollution monitoring capability of Gujarat and Odisha State Pollution Control Boards including scientific equipment; (d) Enhanced scientific capacity of Chilika Development Authority, Odisha; and Gujarat Ecological Education & Research Foundation for coastal and marine ecological monitoring and conservation including 8 scientific staff; and (e) State SPMUs designated as technical secretariats of SCZMAs</i></p>
<p>Intermediate Results Indicators</p>	<ol style="list-style-type: none"> 1. Skilled staff in ICZM planning and implementation at the national level: Total: 117 (33 scientists and 76 scientific project staff under ICZM Project at NCSCM, and 8 in SICOM (NPMU) (Target: 75 numbers) (Component 1) 2. ICZM Plan for Gulf of Kachchh prepared using the designed participatory process and submitted for approval to the Government of Gujarat (Target: Yes) (Component 2) 3. Skilled staff in ICZM planning and implementation in Gujarat State (Target: 20) (Component 2) 4. ICZM Plan for Paradeep–Dhamra and Gopalpur–Chilika prepared using the designed participatory process and submitted for approval by the Government of Odisha (Target: Yes) (Component 3) 5. Skilled staff in ICZM planning and implementation in Odisha State (Target: 20 skilled staff) (Component 3) 6. ICZM Plan for West Bengal Coast prepared using the designed participatory process and submitted for approval by the Government of West Bengal (Target: Yes) (Component 4) 7. Skilled staff in ICZM planning and implementation in West Bengal State (Target: 15 numbers of skilled staff) (Component 4)
<p>Key Outputs by Component (linked to the achievement of the Objective/Outcome 2)</p>	<p>Criteria: Substantially met (a) National Centre for Sustainable Coastal Management (NCSCM) (ISO and NABL accredited) established with a state-of-the-art new building and facilities in the Anna University campus (Chennai), 7 dedicated laboratories, 132 advanced scientific equipment, 33 Scientists, and 76 Scientific Project Staff under ICZM Project, and 14 National consortium partner institutions. NCSCM has International scientific partnerships including with Belmont Forum Projects (DELTAS & TRUC), Global Climate Research Fund, Global Partnership on Nutrient Management (GPNM) of UNEP-GPA, the University of Maryland Centre for Environmental Science, Maryland, USA, and Future Earth Coasts: Criteria Met (b) Society for Integrated Coastal Management with 8 technical staff, not established as technical secretariat for NCZMA: Criteria Partially met (c) Enhanced coastal and marine pollution monitoring capability of Gujarat and Odisha State Pollution Control Boards including scientific equipment; established laboratories (in a LEED-certified scientific laboratory building at Paradeep), procured coastal pollution monitoring vessel with state-of-the-art instruments for analysis; and supported capacity building of staff to facilitate regular and real-time monitoring of physical, chemical and biological parameters of sea/river water. Monitoring protocols have been prepared by respective State PCBs. The project has improved GSPCB's capacity to map the pollution levels in various industrial areas of Gujarat Industrial Development Corporation (GIDC) and to take enforcement actions against 245 polluting industrial units. Upgraded 1 ecological research laboratory at Gandhinagar & regional labs of GPCB 4 training events funded during 2011-14): Criteria Met (d) Enhanced the scientific capacity of Chilika Development Authority (CDA-Odisha) and Gujarat Ecological Education & Research Foundation (GEER-Gujarat) for coastal and marine ecological monitoring and conservation: CDA's Wetland Research and Training Centre (with 15 scientific staff supported by the project); real-time water quality monitoring data prepared under the project. GEER Foundation (upgraded with new equipment) – 5 field stations- Mandvi, Jamnagar,</p>



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	<p>Mangrol, Bhavanagar, and Surat; development of online Decision Support System (DSS) for ecological and pollution monitoring of coastal water health of GoK with the assistance of GEER; GPCB and BISAG also supported: Criteria Met</p> <p>(e) State SPMUs designated as technical secretariats of SCZMAs: SPMUs of West Bengal (IESWM) and Odisha have been designated as technical secretariats of respective SCZMAs. SPMU Gujarat (GEC) has not been designated as technical secretariat of SCZMA. Criteria Partially Met</p> <p>Component 1: (Achieved)</p> <p>1. Skilled staff in ICZM planning and implementation at the national level (Target: 75) Achieved (exceeded target): Total: 117 (33 scientists and 76 scientific project staff funded by ICZM Project at NCSCM up to June 2020, and 8 in SICOM (NPMU).</p> <p>Component 2: (Substantially Achieved)</p> <p>2. ICZM Plan for Gulf of Kachchh prepared using the designed participatory process; approved by State Level Steering Committee and submitted to MoEFCC: (Target: Yes) Target Achieved</p> <p>3. Skilled staff in ICZM planning and implementation in Gujarat State: 14 (Target: 20 skilled staff persons): Substantially Achieved</p> <p>Component 3: (Substantially Achieved)</p> <p>4. ICZM Plan for Paradeep–Dhamra and Gopalpur–Chilika prepared using the designed participatory process; approved by State Level Steering Committee and submitted to MoEFCC: (Target: Yes) Target Achieved</p> <p>5. Skilled staff in ICZM planning and implementation in Odisha State: 17 supported by ICZM Project (Target: 20 skilled staff persons) Substantially Achieved</p> <p>Component 4: (Substantially Achieved)</p> <p>6. ICZM Plan for West Bengal Coast – Digha Sankarpur and Sagar Island - prepared using the designed participatory process, submitted for approval to Department of Environment, Government of West Bengal: Yes (Target: Yes) Target Achieved</p> <p>7. Skilled staff in ICZM planning and implementation in West Bengal State: 8 (Target: 15 skilled staff persons): Target Partially Achieved SPMU has financed 40 training events/workshops and 7 seminars/conferences, attended by 75 officials from SPMU, PEAs, other line departments, and other institutes.</p>
Outcome Indicator 5	Direct project beneficiaries (Target: 11 million, of which female (51%)) (Components 2, 3, 4): Achieved in terms of Direct Beneficiaries, Substantially Achieved in case of Female Beneficiaries
Intermediate Results Indicators	
Key Outputs by Component (linked to the achievement of the Objective/Outcome 2)	The implementation of various interventions under the project has positively impacted the lives of the coastal population of India, including 17.8 million (cumulative) direct beneficiaries, of whom about 8.6 million are women (48.2%). After discounting beneficiary overlaps, the total number of beneficiaries in 2020 is 11.9 million, of whom 50% are women. Beneficiary numbers are estimated using a methodology devised by NPMU/SPMU in 2019–20. Total beneficiaries estimated following the methodology in the PAD/NDPR is 21 million (source: National ICR, 2020 and Annex 9 of this ICR). This target was added during the project restructuring in 2015.

ANNEX 2. BANK LENDING AND IMPLEMENTATION SUPPORT/SUPERVISION

A. TASK TEAM MEMBERS

Name	Role
Preparation (from PAD)	
Tapas Paul	Task Team Leader (TTL)
Sonia Chand Sandhu	Co- TTL
G V Abhyankar	Senior Operations Consultant
Jack Ruitenbeek Consultant	Economic & Financial Analysis
Jane T. Nishida	Senior Environment Institutions Specialist
Prof. John Pethick	Consultant – Coastal Geomorphology & ICZM
Kishor Uprety	Senior Counsel
Khwaja Minnatullah	Senior Water & Sanitation Specialist
Nagaraju Dotaluri	Senior Procurement Specialist
Parthapriya Ghosh	Social Development Specialist
S. Krishnamurthy	Financial Management Specialist
Shankar Narayanan	Senior Social Development Specialist
Santhanam Krishnan	Consultant: Senior Procurement Specialist
Siet Meijer	Knowledge Management Analyst
Sona Thakur	Communications Specialist
Soumya Kapoor	Social Development Specialist
Surbhi Goel	Financial Analyst (Energy)
Rachel Susan Palmer	Program Assistant
Roshni Sarah John	Program Assistant
Arun Kumar Kolsur	Procurement Specialist
Atul Deshpande	Financial Management Specialist
Binny Varma	Program Assistant
Charles E. Di Leva	Chief Counsel
D J Baxi	Senior Procurement Specialist
Damanjit Singh Minhas	Consultant: Environment Specialist
Debabrata Chakraborty	Senior Procurement Consultant
Dhruba Purakayastha	Senior Private Sector Development Specialist
Jeffery Balkind	Consultant
Jonathan Mills Lindsey	Senior Counsel
Katherin George Goltzen	Consultant
Kumar Amarendra Narayan Singh	Social Development Specialist
G. Muralidharan	Consultant: Coastal Community Livelihood
Guenter Heidenhof	Governance Advisor



Name	Role
Ramola Bhuyan	Senior Financial Management Specialist
Indumathie Hewawasam	Peer Reviewer; Senior Coastal Specialist
Marea Hatziolos	Peer Reviewer; Senior Coastal & Marine Specialist
Richard Damania	Peer Reviewer; Lead Environmental Economist
Sofia Bettencourt	Peer Reviewer; Lead Operations Officer
Warren Waters	Peer Reviewer; Regional Safeguard Advisor
William Kingdom	Peer Reviewer; Lead Water Specialist
Laura Tlaiye	QER Reviewer- Chair; Sector Manager
Steven Lintner	QER Reviewer; Senior Advisor
Prof. Biliانا Cecin-Sain	External QER Reviewer
Prof. Damodaran	External QER Reviewer
Prof. M. S. Swaminathan	External QER Reviewer
Supervision/ICR	
Milen F. Dyoulgerov Vollen, Sitarama Krishna Addepalli	Task Team Leader(s)
Sanjeet Kumar	Procurement Specialist(s)
Krishnamurthy Sankaranarayanan	Financial Management Specialist
Poonam Rohatgi	Team Member
Lucy S. Lotha	Team Member
Payal Malik Madan	Procurement Team
Om Prakash	Team Member
Parthapriya Ghosh	Social Specialist
Swayamsiddha Mohanty	Procurement Team
Sivaramkrishnan Kumar	Procurement Team
Deepa Balakrishnan	Environmental Specialist

B. STAFF TIME AND COST

Stage of Project Cycle	Staff Time and Cost	
	No. of staff weeks	US\$ (including travel and consultant costs)
Preparation		
FY07	37.223	212,392.92
FY08	40.839	387,107.05
FY09	59.162	229,712.83
FY10	59.666	353,156.94
FY11	0	223,389.42
FY12	0	8,764.41
FY13	0	- 596.44
Total	196.89	1,413,927.13
Supervision/ICR		
FY11	39.380	246,405.38
FY12	59.838	541,015.71
FY13	77.317	381,046.38
FY14	37.872	156,353.15
FY15	4.852	43,769.33
FY16	47.793	223,722.79
FY17	35.453	138,445.93
FY18	33.869	151,350.87
FY19	24.416	143,339.54
FY20	56.260	452,314.04
Total	417.05	2,477,763.12



ANNEX 3. PROJECT COST BY COMPONENT

Components	Amount at Approval (US\$M)	Actual at Project Closing (US\$M)	Percentage of Approval (%)
National ICZM Capacity Building	87.30	77.44	89%
Piloting ICZM Approaches in Gujarat	74.1	58.18	79%
Piloting ICZM Approaches in Odisha	49.3	44.56	90%
Piloting ICZM Approaches in West Bengal	75.00	48.77	65%
Total	285.70	228.95	80%



ANNEX 4. EFFICIENCY ANALYSIS

Background

1. Implementing the ICZM in India was challenging because many of the coastal management concepts and tools were relatively new to the public sector, private sector, NGOs, and civil society. At the central and state level, the project would need to introduce, refine, and promote the internalization of legislation, institutional structures, checks and balances, knowledge related to land use, mapping, monitoring, enforcement, tools, participation, and other elements of ICZM. The project adopted a dual approach to accomplish those tasks. On the one hand, it established an enabling environment for ICZM at the national level and in the three pilot states. On the other hand, it supported investments and financial incentives to encourage stakeholders from the public sector, private sector, and civil society to work in a coordinated, sequenced manner to showcase the benefits of ICZM. Ultimately the project built a foundation for the holistic, integrated, and sustainable management of coastal and marine resources in the pilot areas, improved the resilience of coastal zones, and unlocked the benefits of their environmental goods and services. This successful experience will be scaled up through the ENCORE MPA.
2. As discussed in the main text of this ICR, the investment in an enabling environment for ICZM was essential for the pilot activities to succeed. At the same time, although the pilot activities yield quantifiable benefits, the development of an enabling environment yields intangible assets, with benefits that are difficult to quantify. For that reason, the benefit-cost analysis (BCA) (Box A4.1) for this ICR considers only the more quantifiable benefits from pilot activities. The results are compared with results of the BCA carried out at appraisal.

Box A4.1: The purpose and criteria of benefit-cost analysis

Commercial profitability analysis seeks to assess the net financial results of a project from the investor's point of view, while national viability analysis aims to identify and measure the net economic benefits of a project from a social perspective. The financial and economic analysis usually looks at three main indicators to determine the viability of a project:

- Net present value (NPV), which is the difference between the discounted total benefits and cost.
- Internal rate of return (IRR), which is the discount rate that zeroes out the NPV (in other words, the interest rate that makes the NPV of all cash flows equal to zero). The IRR estimates the actual return on the project, expressed as a percentage interest rate. IRR can be used for a financial analysis (FIRR) when private goods and/or services are considered and for an economic analysis (EIRR) when public goods and/or services are considered.
- Benefit-cost ratio, which is the ratio of the present value (PVBCR) of benefits over the present value of costs over the lifetime of the project. In other words, the ratio allows showing the benefits accruing from each currency unit spent. Sometimes the benefit-cost ratio is expressed as the ratio of undiscounted benefits to costs, but this is a less useful measure.

3. The ex-ante and ex-post BCAs consider largely the same benefits (Table A4.1), with one exception: the present BCA assesses the value of carbon emissions averted, whereas the ex-ante BCA examined the project's potential financial profitability and fiscal impact. This ex-post BCA does not assess financial profitability, for reasons discussed later.



Table A4.1: Benefits considered in the ex-ante and ex-post economic analyses, ICZM Project

Ex-ante analysis	Ex-post analysis
Conservation and protection of coastal resources	Conservation and protection of coastal resources
Environment and pollution management	Environment and pollution management
Livelihood security for coastal communities	Livelihood security for coastal communities
Fiscal impacts and long-term operational cost requirements	Carbon emission averted

The Ex-Ante Economic and Financial Analyses: Methods and Results

- Total project costs, including the International Development Association (IDA), government, state, and other parallel funding, were US\$285 million at appraisal. The ex-ante analysis included only costs that would be supported with IDA funds (US\$251 million at appraisal), including fixed and variable operating costs (only for activities initiated under the project; the analysis did not consider their replication), monitoring costs, knowledge management costs, and associated overhead costs that facilitated adaptive management during project execution. The project timeframe was assumed to encompass the useful economic life of the investments.
- The analysis used several methods to value the benefits listed in Table A4.1. Some of the benefits are direct financial flows from revenues generated by the subprojects—for example, tariffs are levied, community subprojects generate saleable output, or there are direct cost savings because the project results in more efficient processes. These direct financial benefits were estimated to represent 36% of the flow of quantifiable project benefits. The remaining benefits are quantifiable but do not pass through any markets. Most are associated with coastal protection created by bio-shields such as mangroves and reefs, and they are estimated using environmental economic valuation methods (Box A4.2). As noted in the box, a mean estimate of about US\$0.4 million/km of coastline per year was used in the ex-ante analysis (but not in the ex-post analysis, as discussed later).

Box A4.2: Determining the economic value of environmental benefits of the ICZM Project

Many of the coastal systems protected under the ICZM Project have ecological functions that provide economic benefits, even though they do not directly generate revenues. These benefits have been estimated in India for various ecosystems. The actual range of estimates varies considerably depending on the ecosystem and methodology. For example, an opportunity cost approach finds that building coastal protection systems generates an estimated US\$0.39 million/km/year in benefits, while an approach that values the likely impact on local incomes generates an estimate of US\$0.24–0.56 million/km/year in rural and peri-urban areas. The ex-ante analysis relied on a mean estimate of about US\$0.4 million/km of coastline per year.

Source: India ICZM PAD (2011).

Dropping the Ex-post Financial Analysis

- The ex-ante Financial IRR (FIRR) for the entire project at appraisal was less than 5% when not accounting for the loan interest. This amount fell to 1% when accounting for the loan interest. It is important to mention that the rate on a commercial bank loan in India was 8% at appraisal (and it approached 10% in June 2020 at closing). In other words, the project appeared unprofitable at



appraisal when the loan repayment was considered against the commercial lending rate of 8%. With the 70% depreciation of the Indian rupee against the US dollar between project effectiveness⁸⁰ and closing, and considering that the loan interest was to be paid in US dollars, any ex-post calculation of the FIRR would show the project to be unprofitable and quite possibly even in negative territory. For this main reason, the ex-post financial analysis was not carried out.⁸¹

7. At the same time, it is important to mention that the ex-ante Economic IRR (EIRR) estimated for the entire project at appraisal was 20.2% over 30 years at a discount rate of 10%, which is a substantial return. In fact, the EIRR was likely to be higher, considering that most of the investments also yielded intangible benefits that are difficult to value but likely to be very significant.

Ex-Post Economic Analysis Methodology and Assumptions

8. The IDA funding of US\$251 million at appraisal was reduced to US\$175 million at restructuring in 2015 due to cost savings from the depreciation of the rupee, while 80% of the earmarked contributions from GoI (US\$34 million equivalent) did not materialize. The ex-post economic analysis uses actual disbursed project costs, based on the final allocations of funds across project components following restructuring. Table A4.2 summarizes the disbursement of IDA funds by component and year for the ICZM Project.
9. The analysis assumes that the project will deliver the four types of benefits listed earlier in Table A4.1, and it estimates benefit flows with the methods used for the ex-ante analysis, substituting more recent and robust data when they are available. The ex-post analysis, like the ex-ante analysis, considers benefit flows spanning 10, 20, and 30 years. In line with the 2016 World Bank Note, which stipulates that discount rates for BCA of development projects should range between 3% and 6%, the ex-post economic analysis uses discount rates of 4%, 6%, and 10%.
10. The benefits are broken down into two categories to reflect the dual aims of the project, described earlier: establishing an enabling environment (which mainly yields “soft” or intangible benefits) and conducting the pilot activities (which mainly yield “hard” or tangible benefits). The analysis focuses on estimating returns from the tangible benefits produced by the pilots. It does not attempt to quantify the soft benefits flowing from the ICZM enabling environment developed through the project, although they are expected to resemble the benefits arising from the ecosystem-based Blue Economy approach adopted in the European Union (EU). Box A4.3 describes the EU experience and efforts to place a value on the benefits of ICZM and a Blue Economy.

⁸⁰ IDA-47650 was effective on September 22, 2010, while TF-91901 was effective on August 12, 2008. Hence the Data Sheet shows the Effectiveness date (under Key Dates) to be August 12, 2008 (the earlier of the two).

⁸¹ Other reasons include delays in the provision of central government funds, the lack of information on the overall fiscal space in terms of improved tax (although penalties were accounted for in the analysis), as well as the collection of fees and tariffs (many water resource-related, wastewater management, and electrification activities were carried out, and utility companies collect revenue for these services, but they lie outside the purview of the project).



Table A4.2: Disbursement of IDA funds by component, project year, and fiscal year, ICZM Project (US\$ million)

Item	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Total Cum.	13.9	19.3	40.6	62.2	95.8	116.5	137.3	153.7	166.8	178.9	
Comp 1 National	4.4	6.2	13.4	20.7	32.0	39.1	46.1	51.6	56.0	59.1	
Comp 2 Gujarat	3.1	4.5	9.6	14.9	23.1	28.1	33.1	37.1	40.3	45.9	
Comp 3 Odisha	2.7	3.8	8.3	12.8	19.8	24.2	28.5	32.0	34.7	35.2	
Comp 4 West Bengal	2.7	3.8	8.3	12.8	19.9	24.2	28.5	32.0	34.7	37.7	
PPA	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Total Yearly	13.89	5.46	21.26	21.63	33.59	20.73	20.73	16.46	13.10	12.09	178.92
Comp 1 National	4.35	1.84	7.19	7.31	11.35	7.01	7.01	5.56	4.43	3.05	59.10
Comp 2 Gujarat	3.13	1.33	5.17	5.26	8.17	5.04	5.04	4.00	3.19	5.53	45.86
Comp 3 Odisha	2.70	1.14	4.45	4.53	7.03	4.34	4.34	3.45	2.74	0.51	35.23
Comp 4 West Bengal	2.70	1.14	4.45	4.53	7.04	4.34	4.34	3.45	2.74	2.99	37.72
PPA	1.00										1.00

Note: Funds disbursed in the second semester of 2010, including the project preparation advance (PPA), are added to the year 2011.

Box A4.3: Valuing the “soft” benefits of ICZM: The experience in Europe

Several regions and countries have adopted ICZM, but it has probably been most closely monitored and assessed in the EU, which has moved rapidly in recent years to adopt a Blue Economy approach. In the Blue Economy, human activity is planned and managed across the coastal and maritime space to ensure that the natural marine environment is protected and nurtured for present and future generations.

Even before embarking on the Blue Economy approach, however, EU countries were reporting positive results from adopting ICZM. In the highly developed countries of Scandinavia and in Germany, habitat retention and enhancement accounted for most of the benefits of ICZM, whereas industry and tourism accounted for most of the benefits of ICZM in the Baltic Sea states (Poland, Estonia, Latvia, Lithuania) and Black Sea states (Bulgaria and Romania). Although the benefits associated with organizational and planning efficiency gains, improved resource use, and greater economic and environmental sustainability of coastal communities, the European Union annual value of the net benefits (for the benefits that could be quantified) generated by ICZM initiatives showed that low-level initiatives reaped much higher benefits (benefit-cost ratio of 13.6 : 1) than high-level ICZM initiatives (8.6 : 1) per year. The value of ecosystem benefits generated by the EU coastal zone indicates that the investment in ICZM policy initiatives has a comparatively high rate of return compared to investment in projects in other (non-coastal) areas of the EU.

Under the Blue Economy approach, considerable net benefits have flowed from concerted action across the EU to introduce ICZM for coastal member states. These results make the case for the value of better coordination within and across states, as introduced in India by the ICZMP.

Source: EU (2000, 2006) and van Williams et al. (2006).



11. The methods used to value the hard benefits of ICZM under the project are based on changes in production, state, and behavior (Box A4.4). Coastal and marine goods and services can contribute to social welfare through different avenues referred to as the total economic value (TEV), which is often decomposed into direct, indirect, option, and non-use values (for details, see TEEB 2013). Table A4.3 lists methods for deriving the TEV of ecosystem services.

Box A4.4: Valuing the hard benefits associated with ICZM

The hard benefits of ICZM—in this case, the impacts of the pilot activities supported under the ICZM Project—can be estimated using three main methods:

- **Change in production**, assessed by determining:
 - The value of changes in productivity—such as reduced fishery productivity due to overfishing.
 - The opportunity cost—such as the opportunity cost of not using treated wastewater.
 - The replacement cost—for example, the cost of restoring coastal damage from erosion.
- **Change in state**, assessed with a dose-response function, in which a change in the level of pressure—such as the intensity and time scale of flooding, disease, pollution, or some other agent—is weighed against its effects on coastal zones in terms of loss of life, lost opportunities, medical costs, or damages incurred:
 - The value associated with mortality, calculated as the future shortfall due to premature death, or the willingness to pay to reduce the risk of premature death.
 - The medical costs—such as the costs associated with an injury.
 - Damage functions for incidents of flooding and erosion, where the intensity and frequency are considered.
- **Change in behavior**, assessed by:
 - Revealed preference methods for identifying the costs associated with a behavior (costs for national and international tourists to travel to a specific place such as the Ganga, or hedonic pricing to derive the lower value of land in flood-prone areas). Revealed preferences can also be assessed in terms of preventive behavior or avoided cost, such as investments in mangrove restoration to reduce erosion.
 - Stated preference methods (a survey, for example) to derive a contingent valuation, such as willingness to pay to improve the quality of economic, environmental, or social goods and services—for example, willingness to pay for the direct or indirect use of wastewater treatment in the Ganga.
 - Choice modeling, in which a respondent chooses a preferred option from a set of alternatives with particular attributes (a variation on willingness to pay, without a monetary value). Contingent-choice experiments are a fairly recent development, so evidence on their performance is rather thin, but current research in environmental-damage assessment is heading in that direction (see the NAP website: <www.nap.edu/read/9589/chapter/7#97>).
 - Deliberative group valuation, which addresses the shortcomings of revealed preference methods, such as preference construction during the survey, or respondents' lack of knowledge about the things that they are being asked to value.

Where data are not available, a **benefit transfer method** can be used, in which values estimated for a similar good or service in another location/context (using the methods listed above) are transferred to the current location/context and adjusted for differences in income, education, and other variables. The benefit transfer method is useful for accommodating budget and time constraints. There are two main approaches:

1. **Unit value transfer (simple unit value transfer, or unit value transfer with adjustment for income differences):** The unit value at the study site (which is mainly used in the ICZM economic analysis), is assumed to be representative for the policy site, either without (a) or with (b) adjustment for differences in income levels between the two sites (using GDP per capita) and/or differences in the costs of living, using Purchasing Power Parity (PPP) indices.



2. **Function transfer (benefit function transfer, or meta-analysis):** A benefit function is estimated at the study site and transferred to the policy site (a), or a benefit function is estimated from several study sites using meta-analysis (b).

Although the function transfer method is more robust, the unit value transfer method is the most commonly used, with the unit value adjusted for differences in income value as follows:

$$VAP_p = VAP_s \times (Y_p / Y_s)^\beta,$$

where:

- VAP_p = willingness to pay by household in policy country;
- VAP_s = willingness to pay by household in study country;
- Y_p = income in the country policy, denominated in PPP\$;
- Y_s = income in the country of study, denominated in PPP\$; and
- β = income elasticity for different environmental goods and services (typically around 1, ranging between 0.4 and 1.2 for high-income to low-income countries, respectively).

Table A4.3: Techniques to determine total economic value (TEV)

Approach		Method	Value
Market valuation	Price-based	Market prices	Direct and indirect use
	Cost-based	Avoided cost	Direct and indirect use
		Replacement cost	Direct and indirect use
		Mitigation/restoration cost	Direct and indirect use
	Production-based	Production function	Indirect use
		Factor Income	Indirect use
Revealed preference		Travel cost method	Direct (indirect) use
		Hedonic pricing	Direct and indirect use
Stated preference		Contingent valuation	Use and non-use including option value
		Choice modelling/conjoint analysis	Use and non-use
		Contingent ranking	Use and non-use
		Deliberative group valuation	Use and non-use

Source: TEEB (2013).

12. Table A4.4 summarizes the methods and assumptions used to estimate the value of the following benefits from the project:

- **Benefit 1: Conservation and protection of coastal resources**
 - The TEV is based on a worldwide meta-analysis that was adapted for India. The results of the TEV are illustrated in Appendix 1 (De Groot, et al. 2012).
 - Poacher penalties, which were introduced through the ICZM process, were considered as preventive behavior to enforce fishing regulations, and therefore they help to increase the sustainability of the fish stock and its regeneration.
- **Benefit 2: Environmental and pollution management**
 - The contingent valuation for indirect use benefits from improved sewer and wastewater treatment plant services is based on the Project Appraisal Document for India - National Ganga River Basin Project (P119085).⁸²

⁸² Project Appraisal Document for India - National Ganga River Basin Project (English). Washington, D.C. : World Bank Group. <http://documents.worldbank.org/curated/en/710791468269101705/India-National-Ganga-River-Basin-Project: 2011>



- The local emissions averted (PM_x , SO_x , NO_x , and VOC)⁸³ from discarding diesel generators are based on the emission factor approach associated with criteria pollutants (Canada's National Pollutant Release Inventory Calculator) and a benefit transfer of results derived from the EU Ecosense. For the overall project, the 2019 social cost of carbon is used to value averted emissions (see *Appendix 3* for method).
- **Benefit 3: Livelihood security for coastal communities**
 - Considering that income-generating activities are expected to increase the value-added generated by households, the value-added generated by households in communities over 10 years was quantified.
 - The contingent valuation for household benefits from improved sewer and wastewater treatment plant services is based on the World Bank Ganga PAD 2011.
 - Rainwater harvesting was estimated to allow full storage capacity over 6 months per year, as the high-rainfall season runs from May to October. The state water tariff was used in water-scarce Gujarat.
 - The treated wastewater allocated to industries was valued at the opportunity cost of water in Gujarat, although only for the 20-year and 30-year BCAs, as industries do not yet use the treated wastewater.
 - The opportunity cost of electricity is based on an annual average consumption of 206.7 kWh and an INR5/kWh charge, as indicated on the utility company website.
 - The methodology for calculating the risk premium per capita associated with the construction of community shelters is detailed in *Appendix 2* and is based on storm events over the last 25 years (University of Louvain Disaster Database). The value of statistical life used in calculating the premium was based on OECD (2015) and Navrud (2009).
 - Tourism spending is based NCAER (2016), which provides data on daily spending by national tourists in every state. Only incremental tourist arrivals were considered, as they are assumed to be attracted specifically by project investments to support tourism.
- **Benefit 4: Carbon emission averted**
 - Yearly mangrove carbon sequestration is based on FAO (2016) and uses a very conservative carbon sink reference point for reforestation and rehabilitation—40,014 tons of carbon dioxide equivalent per hectare per year ($tCO_2eq/ha/year$). When mangroves reach maturity after 10 years, net primary productivity and carbon sequestration are assumed to be the same as for intact mangroves, although soil respiration (CO_2 efflux) is lower (Sidik et. al. 2019).
 - Averted diesel emissions are based on the emission factor approach associated with CO_2 equivalent and a benefit transfer of results derived from Jakhrani et al. (2012) (see *Appendix 3* for method).
 - The social cost of carbon for future years is denominated in 2019 prices and is based on Stiglitz and Stern (2017).

⁸³ PM is particulate matter, NO_x is nitrogen oxides, SO_x is sulfur oxides, and VOC is volatile organic compounds.



Table A4.4: Benefit assumptions and methods

Component/Subcomponent	Unit	Value†	Method
National			
Benefit in terms of service revenues	Consultancy	US\$6.27 mn	Market price
Gujarat			
Benefit 1: Conservation and protection of coastal resources			
Mangrove afforestation	19,500 ha	US\$3,724/ha	TEV indirect use
Mangrove rehabilitation	16,000 ha	US\$422/ha	TEV indirect use
Coral reef	0.105 ha	US\$184,387/ha	TEV indirect use
Benefit 2: Environment and pollution management			
Wastewater treatment plant (WWTP) ecological benefits with 4.4 members per household	80,000 m ³ /day	US\$23.04/hh	Contingent valuation indirect use
Benefit 3: Livelihood security for coastal communities			
WWTP household benefits with 4.4 members per household	80,000 m ³ /day	US\$23.65/hh	Contingent valuation direct use
Treated wastewater reused by industries although not yet reused and only considered for 20 and 30 years	55,000 m ³ /day	tariff in the State per m ³	Opportunity cost
Rural rainwater harvesting capacity	11,780 m ³	180 days x water tariff in the State per m ³	Market price
Population income-generating activities	500 hh	US\$/hh	Market price
Benefit 4: Carbon emission averted			
Carbon sequestration for mangrove afforestation	14 tCO ₂ e/ha/year	US\$59/ton	Restoration or offset
Carbon sequestration for mangrove rehabilitation	14 tCO ₂ e/ha/year	US\$59/ton	Restoration or offset
Odisha			
Benefit 1: Conservation and protection of coastal resources			
Mangrove afforestation	323 ha	US\$3,724/ha	TEV indirect use
Geotextile to prevent erosion	505m or 5ha	US\$12,639/ha	TEV indirect use
Poacher penalized	Auctioned boats	US\$121,173	Avoided cost
Benefit 2: Environment and pollution management			
Benefit 3: Livelihood security for coastal communities			
Construction of 14 multipurpose cyclone shelters (MPCS)	18,309 people	US\$29.2/capita	Avoided cost Risk premium
Fisher compensation for the fishing ban with 4.2 members per household	41,400 people	US\$/hh	Productivity in terms of Value added
Additional tourists	836,655 tourists	US\$40.7/day	The market price for direct and indirect use
Solid waste management in Paradeep not funded by IDA			Defensive spending and opportunity cost could be considered
Benefit 4: Carbon emission averted			
Carbon sequestration for mangrove afforestation	14 tCO ₂ e/ha/year	US\$59/ton	Restoration or offset
West Bengal			
Benefit 1: Conservation and protection of coastal resources			
Benefit 2: Environment and pollution management			



Component/Subcomponent	Unit	Value†	Method
Diesel emission averted using emission factors	17,500 liters/month	US\$4,679/year	Dose response
Digha WWTP ecological benefits with 4.2 members per household	8,159 hh	US\$23.04/hh	Contingent valuation indirect use
Benefit 3: Livelihood security for coastal communities			
Construction of 25 MPCs in 5 villages	133,392 people	US\$29.2/capita	Avoided cost Risk premium
Digha WWTP commerce	600	US\$23.65/establishment	Contingent valuation direct use
Digha WWTP household benefits with 4.2 members per household	8,159 hh	US\$23.65/hh	Contingent valuation direct use
Electrification with a consumption of 206 kWh per capita/year	35,000 hh	US\$0.07/kWh	Opportunity cost
Population income-generating activities	213,037 people	US\$/hh	Productivity in terms of Value added
Benefit 4: Carbon emission averted			
Carbon emission averted from diesel generator	525 tCO ₂ e/year	US\$30,791/year	Restoration or offset

† All values are denominated in 2019 prices.

13. Not all benefits were considered, partly because data on some activities are not yet available for the BCA or would be challenging to collect. Examples include the benefits of some activities to improve livelihood security (Benefit 3), such as the ecotourism infrastructure on Sagar Island, conservation of archaeological sites, waste management improvement, and stormwater drainage.

Ex-Post Economic Analysis Results

14. The analysis finds that the overall project is viable for the three discount rates (4%, 6%, and 10%), the three lifespans (10, 20, and 30 years), and with and without accounting for carbon, as illustrated in Tables A4.5–A4.7. The results for the overall project without carbon discounted at 10% over 30 years are: an NPV of US\$303 million, with an EIRR of 32% and a PVBCR of 4.1 (Table A4.5), against an EIRR of 20.1% for the ex-ante BCA. When carbon sequestration is considered, the results are even more impressive, although the benefits accrue at the global level: NPV of US\$472 million, with an EIRR of 41% and a PVBCR of 5.8 (Table A4.5).

Table A4.5: India ICZM Project overall benefit-cost analysis results over 10 years

Indicator	10y, without carbon, discounted at:			10y, with carbon, discounted at:			Criteria
	4%	6%	10%	4%	6%	10%	
NPV (US\$ million)	31.8	19.9	3.8	223.0	175.0	107.0	>0
EIRR (%)	11%	11%	11%	31%	31%	31%	≥ discount rate considered
PVBCR	1.2	1.2	1.0	2.6	2.4	2.1	>1
PVBCR of Ben 1 (%)	39%	38%	36%				Benefit 1 relative % PVBCR
PVBCR of Ben 2 (%)	12%	12%	12%				Benefit 2 relative % PVBCR
PVBCR of Ben 3 (%)	49%	50%	52%				Benefit 3 relative % PVBCR



Table A4.6: India ICZM Project overall benefit-cost analysis results over 20 years

Indicator	20y, without carbon, discounted at:			20y, with carbon, discounted at:			Criteria
	4%	6%	10%	4%	6%	10%	
NPV (US\$ million)	560.1	408.7	219.8	909.7	680.9	388.6	>0
EIRR (%)	31%	31%	31%	41%	41%	41%	≥ discount rate considered
PVBCR	5.0	4.3	3.2	7.5	6.5	4.9	>1
PVBCR of Ben 1 (%)	70%	69%	66%				Benefit 1 relative % PVBCR
PVBCR of Ben 2 (%)	7%	7%	8%				Benefit 2 relative % PVBCR
PVBCR of Ben 3 (%)	23%	24%	27%				Benefit 3 relative % PVBCR

Table A4.7: India ICZM Project overall benefit-cost analysis results over 30 years

Indicator	30y, without carbon, discounted at:			30y, with carbon, discounted at:			Criteria
	4%	6%	10%	4%	6%	10%	
NPV (US\$ million)	916.8	625.7	303.0	1,266.4	897.9	471.8	>0
EIRR (%)	32%	32%	32%	41%	41%	41%	≥ discount rate considered
PVBCR	7.6	6.1	4.1	10.1	8.3	5.8	>1
PVBCR of Ben 1 (%)	74%	73%	69%				Benefit 1 relative % PVBCR
PVBCR of Ben 2 (%)	6%	7%	7%				Benefit 2 relative % PVBCR
PVBCR of Ben 3 (%)	20%	21%	24%				Benefit 3 relative % PVBCR

15. A sensitivity analysis derived the benefit weights in the BCA in terms of benefit/cost ratio (PVBCR) for all three types of benefits except carbon sequestration. Interestingly, the shares of benefits change with time. At a discount rate of 10% over a 10-year period, Benefit 3 has the largest share of benefits (about 52%), followed by Benefit 1 (36%) and Benefit 2 (12%). These rankings and relative shares change over 20 and 30 years. At 30 years, Benefit 1 yields about 70% of the benefits, followed by Benefit 3 (24%) and Benefit 2 (7%). In other words, communities benefit the most in the earlier years of the project (about 50% over the first 10 years), whereas ecosystem services account for the largest share of benefits in the long run (about 70%).

16. All state-level interventions are viable for the three discount rates (4%, 6%, and 10%) and three lifespans (10, 20, and 30 years), without accounting for carbon (Tables A4.8–A4.10). The only exception is Odisha, when financial flows are discounted at 4% over 10 years (cells highlighted in red). The results for each state at 10% over 30 years without discounting for carbon are: Gujarat (NPV US\$289 million, EIRR 49%, and PVBCR 12.6); Odisha (NPV US\$4.3 million, EIRR 14%, and PVBCR 1.2); and West Bengal (NPV US\$32.5 million, EIRR 56%, and PVBCR 2.6) (Tables A4.8–A4.10). The results show significant additional benefits when carbon sequestration is considered, although they would accrue at the global level.

Table A4.8: Benefit-cost analysis results over 10, 20, and 30 years, Gujarat, ICZM Project

Indicator	10y, w/o carbon, discounted at:			20y, w/o carbon, discounted at:			30y, w/o carbon, discounted at:		
	4%	6%	10%	4%	6%	10%	4%	6%	10%
NPV (US\$ million)	54.9	43.4	26.9	517.1	383.5	215.8	829.4	573.4	288.6
EIRR (%)	32%	32%	32%	49%	49%	49%	49%	49%	49%
PVBCR	2.6	2.4	2.1	15.6	13.3	9.7	24.5	19.3	12.6



Table A4.9: Benefit-cost analysis results over 10, 20, and 30 years, Odisha, ICZM Project

Indicator	10y, w/o carbon, discounted at:			20y, w/o carbon, discounted at:			30y, w/o carbon, discounted at:		
	4%	6%	10%	4%	6%	10%	4%	6%	10%
NPV (US\$ million)	3.4	1.3	-1.5	13.6	8.8	2.7	20.5	13.0	4.3
EIRR (%)	8%	8%	8%	13%	13%	13%	14%	14%	14%
PVBCR	1.1	1.1	0.9	1.5	1.4	1.1	1.7	1.5	1.2

Table A4.10: Benefit-cost analysis results over 10, 20, and 30 years, West Bengal, ICZM Project

Indicator	10y w/o Carbon discounted at:			20y w/o Carbon discounted at:			30y w/o Carbon discounted at:		
	4%	6%	10%	4%	6%	10%	4%	6%	10%
NPV (US\$ million)	16.3	13.8	9.8	56.5	43.3	26.2	83.5	59.7	32.5
EIRR (%)	53%	53%	53%	56%	56%	56%	56%	56%	56%
PVBCR	1.6	1.5	1.5	2.9	2.7	2.3	3.8	3.3	2.6

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Appendix 1: Ecosystem Benefits

The meta-analysis of the monetary values of ecosystem services relied on data for 10 main biomes (Open oceans, Coral reefs, Coastal systems, Coastal wetlands, Inland wetlands, Lakes, Tropical forests, Temperate forests, Woodlands, and Grasslands) obtained from local case studies across the world. For each biome, 22 ecosystem services were taken into account, following the TEEB⁸⁴ classification, while approximately 320 publications were screened, and more than 1,350 data-points were drawn from over 300 case study locations. To make the information from all studies comparable and accessible, the collected data were systematically entered into an Ecosystem Services Value Database. Values were converted to a common set of units, namely 2007 “International” \$/ha/year (that is, they were translated into international dollar values or the Purchasing Power Parity –PPP\$). These values were adjusted for India in 2019 prices per hectare (*Appendix Table 1.1*). A selection of 665 of the value data points was used for the meta-analysis.

Appendix Table 1.1: Ecosystem annual benefit meta-analysis (adjusted for India in 2019 prices per hectare)

India US\$ 2019 price/ha	Marine	Coral reefs	Coastal systems	Coastal wetlands
Provisioning services	56	30,800	1,324	1,657
Food	51	374	1,318	614
Water	-	-	-	673
Raw materials	4	11,899	7	198
Genetic resources	-	18,266	-	6
Medicinal resources	-	-	-	166
Ornamental resources	-	261	-	-
Regulating services	36	94,780	14,286	94,800
Air quality regulation	-	-	-	-
Climate regulation	36	657	265	36
Disturbance moderation	-	9,391	-	2,958
Regulation of water flows	-	-	-	-
Waste treatment	-	47	-	89,610
Erosion prevention	-	84,685	14,021	2,172
Nutrient cycling	-	-	-	25
Pollination	-	-	-	-
Biological control	-	-	-	-
Habitat services	3	8,960	207	9,473
Nursery service	-	-	107	5,885
Genetic diversity	3	8,960	99	3,587
Cultural services	176	60,157	165	1,212
Esthetic information	-	6,296	-	-
Recreation	176	53,228	141	1,212
Inspiration	-	-	-	-
Spiritual experience	-	-	12	-
Cognitive development	-	633	12	-
TEV	271	194,697	15,983	107,142

Source: Author based on de Groot et al. (2012).

⁸⁴ The Economics of Ecosystems and Biodiversity (TEEB).



Appendix 2: Shelter Benefits

Based on data from the past 25 years, the risk premium on investments in shelters to reduce the effects of a storm in India was calculated. Although damages are difficult to calculate (the historic data series is crude and unreliable), reductions in the risk of death, injuries, socioeconomic activity foregone immediately after the event, and damages will be considered as benefits.

In this example, the risk is the likelihood (percentage chance) that a particular phenomenon—a weather hazard in the form of a storm—will affect a particular region in a state over a certain period (25 years). The risk premium or risk in monetary terms is the likelihood *multiplied* by the cost. The value of statistical life (VSL) is used to calculate the cost of premature death; 10% of the VSL is used to calculate the cost of injuries (World Bank 2016); GDP per capita equivalent for 6 days is used to calculate costs for the population affected by the event; and “underreported” historic damage data series are used to calculate damages. The data are from the University of Louvain EM-DAT international disasters database.

VSL. To calculate premature death and injuries, a benefit transfer was applied to derive the VSL in India. The transfer of the unit to adjust for differences in income value is as follows:

$$WP_p = WPs \times (Y_p / Y_s)^\beta,$$

where: WP_p = willingness to pay in policy country; WPs = willingness to pay in study country, Y_p = income in the country policy, denominated in PPP\$, Y_s = income in the country of study, denominated in PPP\$; and β = income elasticity for different environmental goods and services, which are considered normal goods, and are typically greater than 0 (perfectly inelastic, which would have meant that β is set at 1.2).

In this particular case, income elasticity is conservatively assumed to be more inelastic, which means that the percentage responsiveness of quantity demanded is significantly and slightly lower than the percentage change in income. The VSL for India is US\$142,310 in 2019 which is the value associated with reducing the risk of premature death.

Forgone economic activity. Over a 365-day period, after every event (storm) the affected population is assumed to lose an average of 3.23 days of economic activity (per type of activity—harvesting, caregiving, eating, schooling, health, coping, and so on), and to require 3 additional days to recover (a conservative estimate). The project intervention (cyclone shelters) could avert or reduce these disruptions. The calculation of socioeconomic benefits from averting or reducing the disruptions from each event is based on GDP per capita (US\$2,104 in 2019).⁸⁵

Damages. Although underreported, damages are based on previous “underreported” monetized damages over the last 25 years, taken from the University of Louvain disaster database.

Risk premium. The likelihood of a storm occurring and the associated risk premium from constructing shelters were calculated for India over the last 25 years (1995–2020) (*Appendix Table 2.1*). All 47 storms occurring in India over that period are accounted for in the analysis. Those events affected 90.1 million

⁸⁵ Usually disposal income is used, but the data were not readily available by state for 2019.



people (note that the same population could be affected more than once), and 17,874 people died. The return period (or years between events) amounts to 0.53 (about twice per year), while the probability of the event occurring is a staggering 188%. The total risk valuation over the period is US\$1.7 billion, which includes US\$1.4 billion for damages and US\$0.1 billion for premature death. These figures are adjusted per capita and per year to apply to the targeted areas of the project. In sum, an insurance policy against the risk of death, injury, socioeconomic activity forgone, and damages could be in the vicinity of US\$30.11 per capita per year. Bear in mind that this figure is very conservative. Note also that this risk premium *does not include direct effects*, such as loss of livelihood or long-term impairment, or *indirect effects*, such as the spread of disease.

Appendix Table 2.1: Likelihood of storm event in India for the last 25 years and risk premium

Category	Unit	Last 25 years: 1995–2020				
		Event	Affected	Injured	Death	Damages
25-year period mid-population considered	#	1,171,963,486				
Storm data	# or US\$	47	90,197,225	9,819	17,894	36,082,594,929
Return period (years between events)	Years	0.53				
Average injured and death per event	#			208.91	381	
Average people affected and damages per event	# or US\$		1,919,090			767,714,786
Event likelihood per year over the period	%	188%				
VSL ₂₀₁₉ per capita	US\$			14,231	142,310	
GDP ₂₀₁₉ per capita	US\$		2,104			
Yearly people affected risk valuation for 6.23 days over the period	US\$		111,516,424			
Yearly risk over period in 2019 prices	US\$		111,516,424	5,589,380	101,860,030	1,443,303,797
Yearly risk premium per capita	US\$/capita		2.02	0.10	1.85	26.15

Note: Mid-year is considered for 1995 and 2020.

Source: Author, from EM-DAT (www.emdat.be/database), Navrud (2009), World Bank (2016), and WDI (2020).

Appendix 3: Emission Valuation

The EU EcoSense model, which derived emission cost per pollutant in Europe, was used and adjusted for the emissions generated from the diesel power generators replaced in Sagar. The initial analysis considered the reduction in NO_x, PM₁₀, SO₂, and CO₂ parameters (*Appendix Table 3.1*). Unfortunately, the Eco-Sense model does not include CO and PM_{2.5}, which could have increased the direct benefits of replacing the diesel generator.

The air quality model produces unit damage cost values in terms of euros (€) per ton of pollutant, which was converted into €PPP, \$PPP, deflated, and then converted to US dollars from Indian rupees. The income differential between Europe and India is reflected by adjusting for PPP, with an elasticity of 1.2 to account for the difference of environmental improvement preferences between high-income and middle/low-income economies. The mean values are used in the economic analysis, however, because it is not the current market price of CO₂ but rather the global CO₂ mean cost that society will bear during the century. The mean global CO₂ value was taken from the *High-Level Commission on Carbon Prices (2017)*. *Appendix Table 3.1* shows the calculations and total benefit flows.

Emissions from the diesel power generators in Sagar were calculated using an emission factor approach, based on Canada’s National Pollutant Release Inventory Calculator. The grams of criteria air pollutant (such as NO_x, PM₁₀, SO_x, VOCs) are estimated for every kilogram of diesel burnt in a medium power generator (several power generators were used in Sagar, and for the analysis they are assumed to have



the same productivity and emissions per liter of diesel). For the CO₂ equivalent emissions, recent literature provides a range from 1–5 kg of CO₂ per liter of diesel used to generate energy, so the analysis used the mid-point (2.5 kg of CO₂ per liter) (Jakhrani et al., 2012). *Appendix Table 3.1* shows the results, annualized over 6 years in the BCA.

Appendix Table 3.1: Air quality unit values: Benefit per ton of pollutant

	Rate adjustments	Unit	VOC	NOx	PM ₁₀	SO ₂	CO ₂
EU 2008 €PPP							
PPP€/t (Low)		1.00	280	1,900	8,300	3,300	
PPP€/t (High)		1.00	710	11,600	78,600	14,600	
PPP€/t (Mean)		1.00	30	4,700	32,400	9,500	
EU 2019 €PPP							
PPP€/t (Low)	EU GDP Deflator	1.164	326	2,211	9,660	3,841	
PPP€/t (High)	EU GDP Deflator	1.164	826	13,501	91,482	16,993	
PPP€/t (Mean)	EU GDP Deflator	1.164	35	5,470	37,710	11,057	
EU 2018 \$PPP							
PPP\$/t (Low)	EU PPP\$	1.12	365	2,477	10,821	4,303	
PPP\$/t (High)	EU PPP\$	1.12	926	15,124	102,478	19,035	
PPP\$/t (Mean)	EU PPP\$	1.12	39	6,128	42,243	12,386	
GDP differential							
EU GDP/capita	PPP\$	46,467					
India GDP/capita	PPP\$	7,034					
India GDP/capita	US\$	2,104					
India INR/US\$ exchange rate	India PPP\$/US\$ rate	3.34					
India INR/US\$ exchange rate	INR/US\$	71.34					
India 2019 benefit transfer with 1.20 elasticity							
US\$/ton (Low)	INR denominated in US\$	1.20	11	77	336	134	39
US\$/ton (High)	INR denominated in US\$	1.20	29	469	3,181	591	78
US\$/ton (Mean)	INR denominated in US\$	1.20	1	190	1,311	384	59
Total emissions over 6 years	Tons		7	91	6	6	3,150
Total emission averted	US\$		9	17,351	8,408	2,306	184,748

Source: European Commission, Joint Research Centre (JRC)/Netherlands Environmental Assessment Agency (PBL). Emission Database for Global Atmospheric Research (EDGAR), release version 4.1. <http://edgar.jrc.ec.europa.eu> (2010); Megapoli, contributed by TNO (2010); Canada National Pollutant Release Inventory Calculator <<https://ec.gc.ca/inrp-npri/default.asp?lang=En&n=2E31368E-1&offset=2>>; World Bank (2016); High-Level Commission on Carbon Prices (2017); and World Development Indicators (2020).

The general equation for estimating emission factors is:

$$E = A \times EF,$$

where: E = emissions; A = activity rate; and EF = emissions factor x B,
with input data: A = Amount of diesel burned, in cubic meters (m³) or liters, and B = Heating value—in Giga Joules (GJ)/m³—set at 38.184 GJ/m³



ANNEX 5. BORROWER, CO-FINANCIER AND OTHER PARTNER/STAKEHOLDER COMMENTS

Comments provided by SICOM, MOEFCC, in a letter to the World Bank dated December 16, 2020:

* * *

Dear Sir/Madam

With great pleasure, SICOM have reviewed the Implementation Completion and Results Report (ICRR) for the India Integrated Coastal Zone management Project (ICZMP: P097985). We find the document to be succinct, candid and of good quality, describing in detail the projects achievements, lessons learned and areas of improvement. However, the project team suggests the following.

- (a) SICOMs achievements and role as National Project Management Unit (NPMU) for the project need more highlight including:
 - (i) Co-ordination of ICZM activities and dissemination of the concept of ICZM across all coastal states; including numerous trainings, workshops and capacity building exercises for ICZM spreading along the entire Indian coastline.
 - (ii) Successful implementation of BEAMS program across 7 coastal states of India, and award of international Blue Flag certification for the beaches. Standardized the techniques of beach management in South East Asia got SICOM the coveted Golden Peacock award. The project also delivered India's own Eco-Label⁵⁰ for Beaches -BEAMS and a flag to this effect called "I AM SAVING MY BEACH" in 2020 across 10 major beaches of the country. India was also awarded 3rd prize on best international practices on pollution abatement by International Jury comprising of UNEP, UNWTO, UNESCO, EUCC, ILS, FEE etc.
- (b) While the team appreciates extensive and effective supervision provided by the Bank, we feel that routing of inputs through SICOM as NPMU would have been more effective rather than direct inputs to Project Executing Agencies in the States.
- (c) We feel that the Efficiency Rating for this innovative project shall be 'high' instead of the current 'substantial' rating.
- (d) It is also required to highlight in Procurement and Financial Management section that SICOM as a NPMU took the lead and trained and helped all SPMUs and their PEAs (40+ accounting centers) in preparing timely accounts, reports, budgeting, tendering, EFC/CCEA etc.

Detailed edits or comments and typographical errors in the document are presented in Appendix A [to this letter] for incorporation in the ICR.

* * *

SICOM's detailed comments as referenced above are provided in [Appendix E](#) of the ICR Part 2/ Appendices.



ANNEX 6. SUPPORTING DOCUMENTS (IF ANY)

1. *Project Documents for ICZMP (PAD, Restructuring PAD: 2015, ISR, AMs)*
2. MoEFCC. 1991, 2011, 2019. *Coastal Regulation Zone Notification*
3. MoEFCC, NCSCM. 2014. *ICZMP: Strategies and Guidelines for National Implementation of Integrated Coastal Zone Management*
4. SPMU Odisha. 2019. *ICZMP: Outcome and Impact Assessment of the Integrated Coastal Zone Management Project*
5. SICOM. 2020. *ICZMP: National & State ICRs*
6. SICOM. 2019. *Final Report: Monitoring and Evaluation of Integrated Coastal Zone Management Project*
7. World Bank. 2018. *Country partnership framework for India for the period Fy18–Fy22*
8. World Bank India Country Assistance Strategy (2009-12)
9. World Bank India Country Partnership Strategy (2013–17)
10. World Bank India Country Partnership Framework (2018-22)
11. Letter No: GEC/ICZM/1494/2020 dt 03.Nov 2020 from SPMU Gujarat regarding Co-ordinates and area details on Mangrove Plantation

Video Links:

World Bank:

<https://worldbankgroup.sharepoint.com/:f:/r/sites/INDELFiles/Shared%20Documents/Operations/SASDS/GSURR%20Townhall%20with%20President%20Kim%20January%2026%202017%20Presentations?csf=1&web=1&e=NWBaXg>

SICOM Video Gallery on ICZMP

<http://sicom.nic.in/public-information/media-gallery/video-gallery>

http://sicom.nic.in/sites/default/files/Press_release.pdf

NCSCM Video Gallery

<https://ncscm.res.in/cms/events/videos.php>

ODISHA ICZMP

Transforming Odisha Coast Part 1 & 2, Securing Livelihood, Managing Coasts:

https://www.youtube.com/channel/UCTdcGbzkuaH37z80HAGC_ZA

Gujarat OCZMP

<http://www.geciczmp.com/videos.aspx>

West Bengal

https://www.icmpwb.org/main/video_clippings_download.php



Additional supporting information is presented in the ICR Part 2/Appendices document, at:

<https://operationsportalws.worldbank.org/Pages/WorkingDocuments.aspx?ProjectID=P097985&DocId=130#files>

Appendix A. Detailed List of Supporting Documents

Appendix B. Details on Project Restructuring and Revision of Indicators

Appendix C. Project Activities: A Walk Through

Appendix D. Estimate of Project Beneficiaries

Appendix E. Detailed Comments from the Borrower

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