UNEP

Lessons Learned on Mainstreaming Pilot Projects into Larger Projects

LESSONS LEARNED ON MAINSTREAMING PILOT PROJECTS INTO LARGER PROJECTS

United Nations Environment Programme

Division of Technology, Industry and Economics

International Environmental Technology Centre

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Section 1: Introduction

Objectives and overview

Mainstreaming, or broad adoption, of Environmentally Sound Technologies (ESTs) is critical to achieving sustainable development, and pilot projects are often a key step towards this goal. However, successful scaling-up and mainstreaming of pilot EST efforts is rarely straightforward.

This document is intended to assist decision makers in governments as well as those involved in international technical cooperation who seek to scale up and mainstream EST pilot projects.

It summarizes key lessons learned from three EST implementation pilot projects undertaken by the International Environmental Technology Centre of UNEP's Division of Technology, Industry and Economics (UNEP-DTIE-IETC). The projects are drawn from all of IETC's three pillars (work areas)—water and sanitation, waste management, and disaster management:

1. Water and sanitation: Support for Environmental Management of the Iraqi Marshlands project
2. Waste management: Integrated Solid Waste Management project in China, India and Lesotho
3. Disaster management: Demonstrating ESTs for Building waste Reduction in Indonesia (the DEBRI Project)

While implemented in different fields and socio-political context, the projects nevertheless share key common characteristics such as promotion of EST applications, extensive local level engagement, as well as a focus on capacity building and information sharing.

Each project is presented as a case study; the report concludes with cross-cutting lessons learned. The analysis focuses on six critical aspects of project design and implementation. They are: project management structure; governance; capacity building; EST implementation; financing; and local conditions and infrastructure. Within these areas, the key questions addressed are:

- What specific features impacted the progress and results of these projects?
- What are the key lessons learned that may be useful for future project and programme formulation?
- What measures have been effective in facilitating the mainstreaming of pilot projects and their replication?

Mission of UNEP-DTIE-IETC

IETC's mission is to promote and implement environmentally sound technologies (ESTs) with application to disaster management and prevention, production and consumption (including waste), and water and sanitation.

IETC's comparative advantages among international organisations include the following:

1. IETC identifies and promotes innovative approaches and technologies that can generate concrete environmental and economic benefits;

2. IETC assists countries and municipalities in selecting and adopting best-available, locally-feasible, economical technologies and practices;
3. IETC facilitates the sharing of information on technologies, their application and management systems

Section 2: Water and Sanitation

IETC's water and sanitation pillar

Water and sanitation continues to be a major environmental and developmental priority in developing countries. There is a strong need to improve access to water and sanitation, to manage water quality, and to minimize ecosystem deterioration. There is also a need to identify policies and tools that promote the adoption of innovative water management practices on a wider scale. To address these needs, IETC's Water and Sanitation Programme supports pilot demonstrations of promising ESTs and approaches, data collection and analysis, network and capacity building for implementation and replication, dissemination of tools to support decision making, and longer-term strategy development.

Featured project: Iraqi Marshlands project

As part of the United Nations assistance for Iraq's reconstruction, IETC implemented a US$14 million project titled "Support for Environmental Management of the Iraqi Marshlands" from 2004 to 2009. The project demonstrated ESTs for wetland and water quality management. It also provided drinking water to residents in seven rural communities in addition to pilot sanitation services, bringing immediate relief to Marshlands communities.

Project objective

The development goal of this project was to support the sustainable management and restoration of the Iraqi Marshlands, with the following immediate objectives:

- To monitor and assess marshland conditions, to provide objective and up-to-date information, and to disseminate tools needed for assessment and management.
- To build capacity of Iraqi decision makers and community representatives on aspects of marshland management, including: policy and institutional aspects, technical subjects, and analytical tools.
- To identify EST options that are, in the marshland context, suitable for immediate provision of drinking water and sanitation, as well as wetland management, and to implement them on a pilot basis.
- To identify needs for additional strategy formulation and coordination for the development of a longer term marshland management plan, based on pilot results and cross-sectoral dialogue.

The line ministry for this project was the Ministry of Environment, which coordinated with the Ministry of Water Resources and the Ministry of Municipalities and Public Works. Other main actors included Governorate Councils, local groups, and non-governmental organisations (NGOs). Phase I of this project was implemented with contributions from the United Nations Development Group (UNDP) Iraq Trust Fund, with earmarked funding from the Government of Japan. Additional project phases, namely Phases II-A, II-B and III, were carried out with bilateral contributions from Italy and Japan.

Results

The project generated the following results:

1. Living conditions in local communities were improved, with up to 25,000 people gaining access to safe drinking water. Sanitation and wetland management practices were demonstrated in partnership with Iraqi institutions with the mandate to replicate those practices which proved feasible under Iraq's conditions.
2. Scientific and policy-relevant data were collected and analyzed through water quality and biodiversity monitoring, socioeconomic surveys, and marshland water and vegetation recovery assessments, to generate a better idea of what is happening in the Marshlands. An internet-based mechanism was established to share data necessary for marshland management plan and policy formulation.
3. Working cooperation with Iraqi institutions was established at local, governorate, national, and water basin levels, utilizing concepts of stakeholder involvement and consensus building.
4. The UNEP-Iraqi partnership generated positive results inside Iraq (a rare case of "good news")
5. The pilot drinking water project contributed to re-development of local communities. According to a third-party evaluation, the project reduced "anxiety" of the local population towards rebuilding life in the Marshlands. Availability of safe drinking water in the pilot communities encouraged the displaced population to return to the Marshlands. Their resettlement contributed to an increase in cattle, dairy production and supply, and reed craft development, which in turn resulted in an increase in income and employment opportunities, and thus to community re-development.
6. Donor coordination efforts by the project improved communication among bilateral and multilateral organizations and Iraqi institutions and enhanced cooperation.
7. Capacity building enhanced expertise of personnel to involve them in project activities: many trained personnel contributed to project planning and implementation.
8. More than 35,000 person-days of employment were generated, with linkages to capacity building and pilot project implementation.
9. Follow-up initiatives were identified and initiated to mainstream environmental management for longer-term development.
10. UNEP's track record on implementation was bolstered: the Minister of Environment of Iraq described the project as "…a model of international environmental cooperation…" and community groups have indicated that "UNEP is one of the few organizations that has made a real effort at engaging the local communities…"
11. UNEP's institutional capacity was enhanced in the fields of ecosystem management, resource efficiency and technology support.

Key features impacting progress and results

The key positive and negative features that have impacted progress and results are summarized in six areas below.

1. Project management structure

- Reflecting the cross-cutting nature of marshland management, the project management structure included various government and civil institutions with relevant mandates at the national and local level. At the ministerial level, the Ministry of Environment was the line ministry. The Ministry of Water Resources was involved due to its responsibility of national hydrological management and mandate to manage the restoration of the Iraqi Marshlands through the Centre for the Restoration of Iraqi Marshlands (CRIM). The Ministry of Municipalities and Public Works was also engaged, reflecting its role in the provision of basic services, such as water and sanitation. At the local level, Governorate Councils and the local Marsh Arab Forum were engaged to identify pilot locations for which they could provide access and security, and were

supported with capacity building and community level initiatives. These institutions were extensively involved in activity design and execution. During the course of the project, stakeholder needs were discussed and incorporated in the project decisions as much as possible. For example, there was an overwhelming need for drinking water provision, which was expressed during a technical meeting to discuss EST pilot project implementation as well as in follow-up discussions. The project responded to this need by allocating additional resources to provide drinking water to seven communities.

- The project featured multiple components, addressing both urgent basic needs and mid- to long-term management needs. The project included five activity components, namely: support for strategy development and coordination; data collection and baseline analysis; capacity building; pilot implementation; and awareness raising and follow-up. In particular, the pilot implementation on drinking water provision has addressed the immediate needs of the local communities and has generated local support and stakeholder trust. Such support and trust-building has facilitated other field activities involving data collection and monitoring necessary for natural resource management. Immediate as well as mid-term needs were addressed through capacity building, awareness raising and other initiatives.

- From the onset of the project, dialogue with stakeholders and partner institutions as well as donors has revealed the need to address critical needs on the ground in the post-conflict period while taking steps towards establishing longer-term redevelopment management structures. To address these needs, the project developed extension proposals; reflecting both short-term and longer-term perspectives for sustainable management of the Marshland area. The project also sought to engage additional bilateral and multilateral partners for the purpose of joint programming, and to make available project data and results for programming by other agencies.

2. Governance

- The project was articulated by the Government of Iraq as a national environmental and humanitarian priority within the context of the reconstruction process. There was also significant political will and prioritization demonstrated by the two Ministers of Environment. Under their leadership, the Ministry of Environment facilitated the allocation of human and technical resources to support the project, undertook various key activities such as water quality and biodiversity monitoring and pilot project implementation, and performed inter-ministerial and local coordination. UNEP and the aforementioned ministries also pushed to include relevant issues and support measures in national development strategies and national priority listing so that continuation and replication measures could be more readily supported as part of official development assistance (ODA). Accession to Multilateral Environmental Agreements (MEAs) was also identified as a priority along with UNEP assistance, particularly the UNEP Regional Office for West Asia (ROWA), for enhancing national environmental governance in line with international commitments.

- The project implementation period coincided with a period of significant changes to Iraq's governance and institutional landscapes. While the re-establishment of democracy and participatory governance is positive and necessary, the emergence of and changes to multiple institutions at national and local levels and their respective mandates made it difficult at times to know which institution was responsible for what. Frequent changes in personnel, including senior level managers, created challenges to sustaining institutional knowledge about the project. Constant communication with local partners and the National Coordinator was necessary to keep abreast of such changes. Also, the bureaucracy which remained as a legacy of the old system was subsequently combined with new safeguards for financial control after the Oil-for-Food scandal. These measures, while necessary, made it difficult to administer contracts and agreements with ministries, and complicated financial transactions.

3. *Capacity building*

- The availability of human and institutional capacity was constrained, in part reflecting the decade-long sanctions imposed on Iraq that limited the exposure of Iraqi experts to international practices and eroded the human and technical infrastructure. Kidnapping, assassinations, threats and bombings within ministry premises resulted in the injury and death of some partners, forced others to leave their official positions, and compelled some to flee Iraq altogether. As a result, many Iraqi government institutions experienced a very high staff turnover which also led to the departure of personnel who underwent training and capacity building for this project. The project partially compensated for this turnover by providing summaries of the project and key issues in latter training courses, and by supporting in-country training sessions taught by Iraqi professionals.

4. *EST implementation*

- EST implementation had immediate direct impacts and enhanced the visibility of the project. Many local residents have continued to suffer in the post-conflict period and their leaders have expressed concerns of insufficient help from international organisations or domestic sources, resulting in resentment among those on the ground. UNEP expedited EST implementation initiatives, particularly for drinking water provision, that were visible on the ground and had direct beneficial impacts. Such actions were essential to mobilize and sustain community support.

- EST implementation faced procurement and custom clearance difficulties. Equipment was procured by international competitive bidding and transported to Iraq for installation and operations. Customs clearance procedures and associated release arrangements become quite complex and time-consuming, resulting in significant delays in the equipment's clearance and subsequent installation. These issues also impacted upon subsequent procurement, as vendors voiced reluctance towards potential clearance difficulties and additional stowage charges.

5. *Financing*

- Project implementation in the post-conflict environment presented various financial challenges. Security risks limited the number of available and willing contractors, and restricted the goods and services able to be procured. Procurement and personnel costs increased considerably during the project period, reflecting the higher costs of doing business in an increasingly dangerous environment. Curfews and border closings rendered transport of goods quite difficult, incurring costs associated with storage fees, contract extensions and other associated tasks. Carjacking and other terrorism incidents restricted the use of ground transportation for meeting participants, resulting in additional costs for air travel.

- The project financing level decreased significantly from US$11 million from Phase I to US$900,000 for Phase III. While there were reasons for this decrease, the phase-out of financial resources was also seen by national partners as decreasing interest and support from the international community to help Iraq in the post-conflict period. The anticipation of self-financing from Iraqi domestic sources and introduction of economic instruments were at times viewed by Iraqi partners as unrealistic, as some ministries experienced more fundamental financial difficulties with salary payments and other obligations as a result of lower petroleum prices and production volumes. Also, the donor-requested project approach, with its limited duration and financial commitment, was at times viewed as contradictory to the need for longer-term sustainability and programmatic management.

6. *Local conditions and infrastructure*

- Continued terrorism and worsening security at the local level presented unprecedented security and accountability challenges for all actors, including UNEP. For example, UN staff could not enter the country or directly oversee activities on the ground. Ensuring the safety of Iraqi personnel became an overwhelming priority.

- While the worsening security situation restricted movement and increased the need for telecommunications, fragile and unreliable communication infrastructure as well as limited electricity supply hampered their utilisation more than originally anticipated.

Lessons learned from water and sanitation EST pilot implementation

The Iraq project generated the following lessons learned for EST pilot implementation:

1. *Project management structure*
- *Establishing a local presence and management structure for project implementation:*
  Such local structure is essential to build local ownership of the concept and the project, and will serve to further support and enhance a successful and promising structure in the eventual mainstreaming and replication phases.
- *Engaging stakeholders, especially involvement and buy-in of local groups:*
  Stakeholder engagement and support is essential to assess real needs, provide security and maintain initiatives on the ground.
- *Understanding that mainstreaming requires relevant information on the EST applications to be accepted by a large portion of the local population*:
  Local language use and formulation of appropriate messages are recommended to improve learning and communication, especially for training and for consultation with local communities.

2. *Governance*
- *Recognizing the project's potential to serve as a foundation for MEA accession, which can lead to additional support for EST implementation:*
  The Marshlands project supported Iraq's accession to key MEAs, including the Biodiversity Convention, Ramsar Convention, Desertification Convention and Framework Convention on Climate Change, by introducing MEA concepts and practical support, by building capacity of national government officials, and by clarifying the potential for management support through the MEA financing mechanism.

3. *Capacity building*
- *Understanding the role of different types of capacity building for mainstreaming:*
  Mainstreaming of pilot project results and EST approaches requires a certain critical mass of human resources within a country, a sufficient number of similar applications under different conditions to determine key principles, adjustments to meet local conditions, supportive policy and regulatory frameworks, as well as the existence of potential replicating institutions. In Iraq, each element required extensive and long-term support.

4. *EST implementation*
- *Recognizing the priority for immediate basic needs and meeting such needs through ESTs:*
  In a post-conflict situation where the affected population suffers disruption to basic services such as drinking water, EST interventions for immediate basic needs should be prioritized and carried out as soon as it is feasible. Such interventions, when successful, have the additional benefit of building a solid foundation for trust and partnership to work towards longer-term management needs. In other words, well-intentioned interventions may fail to garner community support for long-term support if the immediate basic needs of the communities are not adequately addressed first.
- *Developing comprehensive programming towards wider EST adoption:*
  Comprehensive programming encompassing data collection, training and implementation is effective in facilitating wider EST adoption on the ground.

5. *Financing*

- *Articulating the need for long-term support and financing assistance:*
  Donors and national partners need to recognize that long-term reconstruction and development efforts require long-term support and sustained programmatic assistance. EST-relevant activities also need to be prioritised by both national partners and UNEP in the United Nations Development Assistance Framework Common Country Assessment (UNDAF CCA) process.

6. *Local conditions and infrastructure*

- *Addressing post-conflict needs by careful selection of ESTs:*
  EST implementation can be carried out in a post-conflict environment by selecting options that address infrastructure limitations and security concerns. For example, modular container units which can be expanded as required with minimal construction were implemented successfully in Iraq.
- *Evaluating the constraints upon institutional frameworks for goal setting:*
  Constraints upon institutional frameworks should be evaluated and recognized by programme frameworks wherever possible to enable setting of realistic goals and timelines.
- *Recognizing the possibility of significant deterioration of conditions:*
  National and local conditions can jeopardize project results if they deteriorate beyond original expectations during and after the project period. For this project, deteriorating security during project implementation as well as unprecedented drought and climate change after the project period are two such examples. It is important to maintain communication with local partners to ensure that reasonable measures can be taken to provide continued support, and to request additional intervention from the international community as the need arises.

The project also highlighted UNEP's dilemma as a non-resident agency. While the UN Country Team operated out of Amman, Jordan, UNEP's lack of a permanent presence restricted formal and informal communications and partnership opportunities with other agencies. Budget constraints also limited direct engagement opportunities to discuss and build cooperative programming. UNEP's involvement and internal coordination, particularly with ROWA, merit further strengthening in terms of the Country Team programming and particularly the ongoing UNDAF CCA process. Despite such institutional constraints, the project gave credence to the fact that UNEP can carry out technology support and implementation projects provided there is sufficient personnel, administrative responsiveness and senior level leadership within the organisation.

Section 3: Waste Management

IETC's waste management pillar

Urbanisation and economic growth has resulted in a rapid increase in waste generation as well as the emergence and re-emergence of various waste streams including different types of hazardous wastes. The management of waste has therefore become one of the most crucial areas of sustainable development, covering environmental, economic and social dimensions. On the one hand, all waste has to be properly managed to prevent its impact on public health, natural resources and climate change. On the other hand, most waste could be diverted for material and energy recovery based on the 3R (reduce, reuse and recycle) approach so as to reduce its negative externalities and improve its positive externalities. The urgency of the issue is visible from the UNEP Governing Council decision 25/8 on waste management, wherein countries have requested increased efforts and assistance from the Executive Director to address this issue. In line with these requests from member countries, IETC has formulated a comprehensive programme on waste management to promote integrated solid waste management (ISWM). IETC is also paying special attention to specific waste streams such as waste electrical and electronic equipment/electronic waste (WEEE/E-waste), hazardous waste, waste biomass and waste plastics.

Featured project: Integrated Solid Waste Management (ISWM) project in China, India and Lesotho

This project was launched to address the waste management challenges faced by the local/city governments by assisting them to develop ISWM Plans for their cities.

Project objectives

The project had the aim to:
 – demonstrate the applicability of ISWM approach
 – demonstrate the technical, economic and social benefits of ISWM
 – build capacity of partner institutions to develop ISWM Plans based on a real case study of their cities and thus enable them to replicate the development of ISWM Plans for other cities within the country
 – support local governments in tackling waste management
 – raise awareness on ISWM
 – gather baseline data on quantification and characterization of waste from all sources
 – assess the present waste management system
 – identify issues of concern to all local stakeholders
 – develop ISWM Plan including identification of technologies and policy instruments for three cities in Asia and Africa (Wuxi New District in People's Republic of China, Pune City in India and Maseru City in Lesotho)

Project activities

The following project activities were undertaken:

1. Building local capacity to carry out the activities required to develop the ISWM Plan. These activities included waste characterization and quantification, assessment of existing waste management systems and identification of their shortcomings, target setting for ISWM,

identification of issues of concern to stakeholders, and preparation of ISWM Plan with implementation roadmap.
2. Baseline study on waste characterization and quantification with future projections
3. Baseline study on assessment of current waste management systems including policies/regulations, institutional arrangements, financing mechanisms, technology and infrastructure, and stakeholders participation
4. Setting targets for ISWM
5. Identifying stakeholders' concerns for ISWM with respect to environmental, economic, social and technical issues which might affect different stakeholders such as waste generators, service providers, regulators, recyclers and community
6. Formulating ISWM Plan covering indicative policy and technical and voluntary measures
7. Preparing implementation roadmap of ISWM Plan with identified actions/projects
8. Dissemination workshops

Results

The following results were obtained:

1. The applicability of the ISWM approach was demonstrated through plan development for target project cities.
2. The potential for application of the 3R approach was demonstrated.
3. Environmental, economic and social benefits of ISWM approach were demonstrated. For example, in Maseru it was demonstrated that implementing the actions defined in ISWM Plan could have the following results with regards to the 210,000 tons of waste that is estimated to be generated annually by 2020:
   a   Avoiding 40,000 tons of waste through waste reduction measures
   b   Reusing another 45,000 tons (as animal feed or composting)
   c   Recycling 55,000 tons
The 'real' waste which will have to go into landfill will therefore be reduced by 70% to 70,000 tons. Presently, landfill costs about US$6.50 per ton so the reduction in landfill quantity alone will deliver an annual economic benefit of about US$900,000.
The Community Sorting Centres (CSC) scheme proposed at Pune will, when implemented even in 50% of households, provide jobs to 2,500 rag pickers with an average income of US$75 per month. Furthermore, even 50% recycling of dry waste (i.e. paper, plastic, metal, glass, etc.) will curtail annual greenhouse gas emissions by 40,000 metric ton carbon dioxide equivalent.
4. Partner institutions built capacity to develop and manage ISWM Plans.
5. Identification of technologies for waste management was conducted.

Key features impacting progress and results

The key positive and negative features that have impacted progress and results are summarized below into six areas.

1. *Project management structure*

The project was built on a tripartite participatory approach comprising UNEP, local governments (municipalities) and partner institutions. As an expert institution, UNEP did not engage directly in developing the ISWM plan. Instead it built capacity in the partners and enabled them to carry out different activities and develop ISWM plans. Local capacity was an important factor affecting the progress and results. Although this project aimed to build local capacity, some inherent institutional capacity was also required. For example, in Lesotho, local institutions were not available so the University of Cape Town in South Africa was involved.

Moreover, internet access and use was limited so it took time for partners to collect various types of information to support the baseline studies, to learn from policies, information on technology. The capacity of governments to undertake technical tasks such as data analysis, and policy-related tasks such as reviewing policies and analysing their relevance to local conditions, were also important factors.

UNEP provided the necessary technical support, review and expert advice. This approach allowed capacity building while simultaneously enabling hands-on experience. However, it also posed several problems. Firstly, additional time was required to make the partners understand and appreciate the approach. Even at this early stage, the rigid organisational structure of local governments did not provide the much-needed flexibility to divert their human resources to work on the project. Personnel assigned to the project were still required to perform their routine work, thus leaving them with little time to work on the project. Moreover, it took time for expert institutions and government staff to learn how to work together on a project, especially in terms of understanding each others' work attitudes. However, in the end, the twin objectives of developing a locally-owned ISWM Plan and capacity building were both achieved.

New approaches such as ISWM could pose unforeseen problems during implementation and thus require long-term ongoing support. Moreover, the need to complete the project within a stipulated timeframe restricted such support, thus adversely affecting implementation over the long term.

2. *Governance*

Many countries do not have comprehensive policies and laws on waste management to cover all types of waste streams and waste generating sectors. The implementation of existing laws and policies is another challenge. These issues were the major factors affecting the smooth implementation of the project in the beginning. However, awareness of laws and the capacity for their implementation both increased as the project progressed.

Continuous political and policy-level support was the key to effectively managing these projects. For example, a change of focus both in Wuxi and Pune effectively relegated the ISWM project to a secondary level and adversely affected its progress and implementation. Furthermore, a genuine and definitive political commitment was essential to ensure the serious engagement of the partners. In all of the projects, there was a high level of political will of local governments which resulted in the active involvement of the partners. Last but not the least was the difficulty in engaging national governments to participate in local projects, except in the case of Maseru where the national government was also involved. Attracting the attention of national governments proved difficult, and this adversely affected the replication of the concept within these three countries.

3. *Capacity building*

The continued involvement of partner institutions was typically phased out following the withdrawal of UNEP support and it became difficult for governments to continue the scaling-up and replication of projects when this support was no longer there. Furthermore, the government officials were not initially keen to undergo training and carry out field activities. However, this changed for the better over time. Moreover, the project team was comprised of stakeholders with diverse backgrounds in terms of their affiliation and focus. It therefore took some time and effort to establish trust and confidence before the capacity building exercise could begin.

4. *EST implementation*

In China's Wuxi New District, local stakeholders played an important role in identifying ESTs as they were keen to use incineration instead of composting and landfill for their waste which

contained about 60% organic matter. This required intensive awareness raising and negotiations. Identification of ESTs was also affected by local misconceptions based on previous experiences; the stakeholders were not in favour of composting their 60% organic waste based on previous experiences.

In some instances, the size of the city was a major consideration. For example, Pune is a city of approximately 6 million residents. It was difficult in Pune to apply centralized ESTs to the solid waste management chain (segregation, collection, transfer stations, and treatment), which was divided in terms of its components as well as its geographic coverage. Decentralized systems were therefore deemed preferable. This coordination of decentralized systems posed a major challenge, and a great deal of time and effort was consumed by the development of an holistic ISWM Plan.

5. *Financing*
   The availability of funds to move from planning to implementation was a major challenge. The impact of the project could be significantly enhanced if funds were available to support the implementation of various schemes identified in the project. In some cases, although the local government may have been relatively self-sufficient, decision-making on the allocation of funds could be quite unpredictable and time consuming. Competition for funding of other areas such as health, education and water could also be quite fierce, making it difficult for waste management to achieve priority. Sufficient preparation was therefore essential in obtaining commitments. In other areas where the local government did not have sufficient finances, they instead had to rely on project funding to carry out all activities including workshops, data collection and consultation. This meant that any delay in the transfer of funds could affect the progress and quality of the project. The local banking system was not well established in one of the target countries, so it took a long time to obtain funds transferred from UNEP. At one point during the project, this caused a delay of more than six months.

6. *Local conditions and infrastructure*
   Local holidays, festivals and major events were not taken into account during the planning of field activities. However, after a few initial delays, this lesson was learned and the remainder of the activities were planned accordingly to ensure maximum attendance by the project team, less traffic congestion and maximum stakeholder participation at consultation workshops. Furthermore, information on local conditions was not initially available when the project was designed as the officers did not visit most of these cities before the project was launched. For instance, field activities in one case took almost twice the scheduled time, as narrow, crowded roads were not considered during the project design. One lesson learnt as a result of this is that an activity anticipated to take one day should in fact be planned to take two days.

Lessons learned from waste management EST pilot implementation

1. *Project management structure*
- *Building political will to motivate project involvement:*
  Political will at a national level motivated the local governments to actively manage the projects. Meanwhile, the organisational frameworks of local government including representatives of central government and especially the Ministry of Environment were helpful in implementing projects which required support from all levels of government.
- *Leveraging cooperative relationships among institutions:*
  The relationship between government and expert institutions such as universities played a useful part in the management of this project, as the latter provided all of the technical support to manage this project.

2. Governance

- *Recognizing impacts of changing priorities and personnel on project importance and schedule:*
Political leaders set their priorities according to local conditions. This means that when the time comes to implement the ISWM Plan using local capacity, a new issue may be given priority, while the ISWM Plan is put on the back burner. The transfer of high level officials during the project life may have caused delays, as it took some time before the new administrators could commit to prioritising the project.

- *Making efforts to streamline the interests and priorities of different organisations:*
Countries where the major part/majority of the project is supported by international organisations face the challenge of streamlining the different interests and priorities of different organisations working on waste management. This proved to be the case in Lesotho, where it took a great deal of time and effort to turn this challenge into an opportunity, and the project's completion was delayed significantly as a result

3. Capacity building

- *Selecting the right partner institutions:*
One of IETC's key objectives is to build local capacity so that similar efforts can be replicated at national and sub-regional levels. Therefore, instead of using consultants to develop baseline reports and prepare ISWM Plans, local project teams were comprised of government officials and personnel from universities and expert organisations. In this regard, the selection of Partner Institutions is crucial and should consider whether the subject is of key interest to the institutions and whether they can provide basic technical capacity and dedicated staff.

- *Repeating training programmes to address personnel turn-over:*
Capacity building was carried out in different phases covering waste characterization, assessment of waste management systems, target setting for ISWM, identification of issues of concern to stakeholders and development of the ISWM Plan. However, the university students who were involved in the initial phases were replaced with new students upon graduation. This led to disparities as the new students had to undergo training in order to understand the entire project cycle.

- *Generating additional benefits:*
The positive externality of involving the students was that most went on to secure good jobs in the waste management sector. Furthermore, the major local institutions proved very useful as they could assist other cities and countries in the region to replicate ISWM Plans.

4. EST implementation

- *Helping local and national governments to implement ESTs*:
These projects were basically intended to develop ISWM Plans and did not include the actual implementation of ESTs. The projects thus ended with EST identification. Instead, the job of implementing ESTs was expected to be undertaken by local or national governments in the follow-up phase. The lessons described in this section therefore pertain to the identification of ESTs.

- *Clarifying the misunderstanding of common solutions:*
Identification of ESTs depended on local socio-economic, technical and environmental characteristics. These characteristics varied both within large countries such as China and India, and across different countries such as India and Lesotho. As such, a generalized set of criteria was not developed, and each project took time and effort to develop criteria based on local conditions. This experience also helped to clarify the misunderstanding that it is possible to find a common recipe for all countries or cities. Moreover, the availability of local ESTs helped to expedite the ISWM Plan as EST costs, technical requirements and information on operation and maintenance could be readily incorporated into the plan.

5. *Financing*

- *Matching funds with local conditions and needs:*
  These projects all had very low budgets. In fact, two of the local governments did not receive any funding whatsoever, and performed all activities including data collection and organisation of workshops using their own resources. However, this equation cannot be applied across the board as some local governments face serious funding issues and even small amounts of funding can have a significant impact on the success of project activities. Even when some funding is available, its smooth transfer is important to avoid delays and generate results. One of the projects was delayed due to a considerable lag in the transfer of funds caused by banking system constraints.

- *Developing detailed plans in advance:*
  In countries with decentralized local governments, seeking finance for the project did not constitute a major challenge. However, in order to secure sufficient funds it is important to prepare detailed plans well in advance. This lesson proved very important in translating the project concept into a comprehensive project without having to wait for funds to arrive.

6. *Local conditions and infrastructure*

- *Being cognisant of local conditions and infrastructure in planning and implementation:*
  Managing projects in remote locations (i.e. those with limitations on travel and frequency of interaction), local security issues and language/interpretation issues (i.e. delays in translation of materials into the local language and mistakes in interpretation during training and meetings) all have an impact on project progress and outcomes. It is also important to consider the climate and road conditions when planning field activities in order to save a considerable amount of time and effort.

- *Involving external institutions while addressing coordination challenges:*
  Limited availability of local institutions necessitates the involvement of external institutions, which may in turn create major challenges in coordinating different project actors in different countries. The Lesotho project, for example, required the coordination of staff from the UNEP Regional Office for Africa (ROA) located in Nairobi, the University of Cape Town (UCT) in South Africa, and IETC in Japan, making it difficult to arrange a schedule of activities where all three parties could be present in country. Long-term planning of project activities was therefore essential in these situations.

Section 4: Disaster Management

IETC's disaster pillar

Environmental management is critical in order to prevent disasters and reduce the risks/vulnerabilities of disaster-prone countries and communities. However, there is a lack of understanding of the linkages between significant environmental changes and the frequency and magnitude of natural disasters which need to be closely monitored, mapped and communicated to vulnerable communities and disaster management teams at the local and national levels. With this in mind, IETC's programmes and projects highlight the cyclical relationships between sound environmental management and disaster preparedness by: identifying the causes and effects of disaster risks and vulnerabilities with specific reference to the environment; developing environmental management strategies to help reduce the vulnerability of high-risk communities; and advocating the mainstreaming of environmental management practices for disaster mitigation.

Featured project: Demonstrating ESTs for Building waste Reduction in Indonesia – DEBRI Project

The "Demonstrating ESTs for Building waste Reduction in Indonesia - DEBRI" Project was set up to support reconstruction and rehabilitation efforts in Banda Aceh city through partnerships for the application of ESTs to the treatment, reuse and recycling of post-disaster waste, as well as for construction and demolition waste generated on a day-to-day basis. The project took a three-pronged approach by looking at technology support, capacity building and economic instruments. The project also developed a waste management mechanism for the treatment, reuse and recycling of post-disaster waste using ESTs for debris management, and built the capacity of local government officials to process debris.

Project objective

The main objective of the project was to support reconstruction/rehabilitation efforts in Banda Aceh by developing partnerships for the application of ESTs to the treatment, reuse and recycling of (a) debris waste generated by the Indian Ocean Tsunami, and (b) construction/ demolition waste generated on a day-to-day basis.

Results

The following results were achieved over the project period:

1. A waste management mechanism was established for the treatment, re-use and recycling of debris generated by the tsunami.
2. Suitable new ESTs for various aspects of debris management (crushing, sorting, shredding of different types of wastes), particularly reuse/recycle technologies, were successfully identified, assessed and procured for use in handling tsunami-generated debris in Banda Aceh.
3. The capacity of local government officials was enhanced in terms of debris handling and processing, technology assessment methodologies, and reuse/recycling as well as other related issues. This ensured the sustained application of ESTs to waste management not only in the post-tsunami programmes, but also to everyday municipal waste and future disasters as well.

4. A number of economic instruments to foster the long-term viability of ESTs were identified and recommended to the national government, including the development of suitable tax structures and subsidies to promote the use of aggregates generated from waste processing.

Key features impacting progress and results

1. Project management structure
The DEBRI project involved local authorities and relevant bodies delivering urban services right from the outset (e.g. the Municipality of Banda Aceh and its Cleansing Department) in order to build long-term capacities for future disasters and challenges. It also partnered with the national government (the Ministry of Environment) to upstream and replicate issues identified at the municipal level. This was also important to develop laws and regulations related to debris management and to handle project issues which had to be tackled at the national level.

DEBRI attempted to put in place a clear management system that enabled actions to be taken and capacities to be built at the local level. This ensured that benefits arising from the project also benefited communities in the long-term. The DEBRI Project developed a 'Waste Management Mechanism' that provided guidelines and management options for the collection, treatment, reuse/recycling and disposal of debris.

2. Governance
In order to ensure that proper decisions were taken by the appropriate entities in debris management, DEBRI included components for developing and building awareness of the importance of debris management among local authorities, NGOs and other overseas organisations working in Banda Aceh. Avoiding overlap with other programmes and projects involved in rehabilitation and reconstruction was also important in order to maximize benefits for the local communities and to synergize on outcomes that augment longer-term capacities.

3. Capacity building
The DEBRI project focussed on building capacities at the local level in order to adopt and use ESTs within a broader context of waste and debris management. While there was awareness of the problems faced, the capacities to identify, assess and select technologies; particularly those with reduced environmental impacts, was lacking. The DEBRI project leveraged the expertise of its partner; the International Solid Waste Management Association (ISWA), to carry out training and capacity building exercises for debris management.

4. EST implementation
The DEBRI Project sought inputs from professionals and experts through its project partner, ISWA, in order to ensure that technical capacities for cataloguing, assessing and selecting ESTs were also used for their implementation. ISWA also assisted in identifying and adopting state-of-the-art management practices.

The project also highlighted the need for technology adoption. In order to ensure that appropriate and environmentally sound technologies are used, it is critical to ring-fence such technologies with financial and knowledge support. As an integral part of its activities, the DEBRI project identified pertinent economic instruments suited to debris management and the context wherein this debris was generated. Providing knowledge support to local and national partners was also an important part of the project's deliverables.

As a critical starting point, DEBRI ensured that proper baseline data for proper decision-making and project implementation/management (covering the type and volumes of debris generated)

were developed in order to ensure that appropriate technologies were identified, assessed and selected. Such baselines were also important to monitor and evaluate the progress of the project itself, and to guide follow-up actions.

5. *Financing*

The DEBRI project benefited from direct and full financing from the EU as a part of its Tsunami Response Programme. This was critical in ensuring that all components of the project were fully implemented as envisaged. However, while post-disaster financing is usually readily available, it is more difficult to find funding for pre-disaster preparedness and prevention by national and local governments.

In hindsight, DEBRI could have been implemented more smoothly if it had ensured that appropriate partners and procedures were clearly identified and brought on board for complex and time-consuming actions such as procurement and customs clearance. This was particularly the case for the procurement and importation of waste management machines from overseas manufacturers.

6. *Local conditions and infrastructure*

From its inception, the DEBRI project involved both national and local public agencies. These partners are important to ensure broader replication and upstreaming of the project's advantages and outcomes. Such actions may prove difficult for civil entities or external agencies. The DEBRI project's major national partner was the Ministry of Environment of Indonesia, while its main local partner was the Municipality of Banda Aceh and its Cleansing Department. Several other national and local agencies including BAPEDA and BAPEDALDA also provided inputs and advice.

Everyday community issues such as employment and income generation sometimes take priority over the project objectives, especially in developing countries. Through its economic instruments activity, the DEBRI project also made recommendations on how to ensure the creation of jobs and income through proper debris management.

Disaster management and routine urban management are mutually complementary. The key lies in capacitating urban authorities to handle not only everyday urban management issues but also service delivery challenges during the aftermath of a disaster. This was a core element around which the DEBRI project was developed and implemented – enabling the Banda Aceh Municipality and its Cleansing Department to handle not only its everyday waste but also the increased volume of debris resulting from a disaster.

Lessons learned from disaster management EST pilot implementation

1. *Management structure*

- *Understanding the need for clear subsidiarity of decision-making and implementation:*
  The project's goals and objectives were divided into tasks that were undertaken by the respective partner, depending on the level of implementation. For example, all international-level tasks and activities were undertaken by UNEP-IETC, national level tasks by the Ministry of Environment, and municipal-level tasks by the Banda Aceh Municipality or its Cleansing Department. Hiring of project staff was also done on this basis, with Indonesian nationals hired at national and local levels undertaking national and local tasks respectively.

2. *Governance*

- *Clarifying responsibility and reporting:*

Project responsibilities and reporting lines for DEBRI were complicated. Different partners had to provide different types and sequences of information to be consolidated and reported back to the donor agency, namely the EU. This created problems as reporting formats were different for UNEP and the EU.

- *Considering the different governance systems of partners:*
  Systems of governance and management within the partner institutions, particularly large entities such as the Ministry of Environment, created further complications in terms of decision making and providing necessary documentary evidence such as audit documents.

- *Recognizing that staff turnovers necessitate training of newly-assigned personnel:*
  Turnover of staff members who left the organisation or were transferred to other sections also created problems as new staff members had to be trained in project governance.

3. Capacity building

- *Understanding that different partners require different capacities for different purposes:*
  Capacity building was an integral component of all project activities. The involvement of different entities at different levels of project implementation meant that different capacities had to be created for each stakeholder.

- *Building capacities for long-term use, not only for the project period:*
  While the necessary capacities and resources were created and delivered, not all stakeholders were fully covered by the process. For example, technology assessment capacities were delivered in a general manner to ministry and municipal officials, but the "Sustainability Assessment of Technologies (SAT)" assessment tool was only provided to the respective consultants due to the fact that SAT was itself still in the development phase.

- *Utilizing local languages:*
  Providing and delivering the capacity building exercises in the local language was an important element, even if the printed resources were in English.

4. EST implementation

- *Taking local conditions and priorities into consideration*:
  The implementation of technologies with a minimal impact on the local environment was a critical element of the DEBRI project. In most cases, however, the environmental impact of the technologies is not usually considered, and is not a priority in itself. This creates dilemmas for the assessment criteria, particularly in the case of the SAT tool, where local conditions, expectations and the extent of knowledge on environmental criticality have to be scoped into the assessment. The implications of introducing technology to other developmental priorities such as job creation or income generation (especially in a post-disaster situation) also need to be considered.

- *Incorporating 'non-technology' aspects into the implementation of ESTs:*
  Particularly at the local level, actions to implement ESTs have to be based on the realities on the ground such as legal and regulatory compliance, the capacities and skills of the local population, localized assessments and financial performance.

5. Financing

- *Incorporating financial mechanisms for long-term sustainability of action:*
  The key here lies in incorporating financial mechanisms and economic instruments that will ensure the longer-term sustainability of activities and resources implemented on the ground. Incorporating economic instruments for debris management in post-disaster situations was therefore one of the key activities of the DEBRI project. However, due to the sensitive nature of the financial sector and the time required to implement such instruments, the project could only make recommendations which were submitted to the national government for potential use in future disasters. For this reason, relevant ministry officials and development planning agencies were involved in the drafting and detailing of appropriate economic instruments for the project.

6. Local conditions and infrastructure

- *Being sensitive to local conditions and situations:*
  In planning, managing and implementing the DEBRI project, the intrinsic nature of local conditions and infrastructure status were taken into consideration. In a post-disaster situation, the trauma of the disaster – particularly for a large disaster such as the Indian Ocean Tsunami addressed by DEBRI – is very real and immense. Constant 'reminders' of this tragedy would have been considered by some as unnecessary. DEBRI took due cognisance of this by:
    - (a) focussing on technologies and capacities for future disasters while addressing immediate needs
    - (b) focussing on day-to-day needs of waste management while also dealing with debris from the tsunami disaster
    - (c) focussing on broad-based issues (such as economic instruments) with the potential to benefit the local area in aspects other than debris management
    - (d) focussing on the tasks of debris management and clearance and infrastructure restoration (using the debris itself) to enable the local population to get back on its feet and rebuild/rehabilitate as quickly as possible.

Section 5: Cross-cutting Lessons Learned

The three projects highlighted in this document took place in different project locations, under specific socio-economic conditions, at varying levels of institutional capacity, and with different environmental focuses. Nevertheless, we have identified the cross-cutting lessons learned in six focal areas in order to inform the future formulation of environmental management programmes and mainstream pilot project results.

Project management structure

- *Involving appropriate institutions at the right level from the beginning:*
  Environmental management (and EST applications) rarely falls within the exclusive jurisdiction of national environmental authorities. For example, water management may encompass mandates of water resource ministries, land and natural resource ministries, and/or public utilities. Waste management may require coordination with health authorities as well as municipal institutions responsible for public and social services. At the very least, project implementation and mainstreaming require the agreement and active involvement/ownership of these entities. National-level coordination is also a prerequisite. Incorporating initiatives to strengthen local institutions into the project design serves to increase technical capacity as well as the number of personnel and partner institutions.
- *Formulating specific initiatives in support of project expansion, requesting support for domestic mainstreaming and replicating practices that have proved successful in other countries*:
  If these aspects have emerged as priorities during the project implementation period but are outside the original project scope, additional support needs to be secured to address them.
- *Incorporating efforts to support mainstreaming into the original project design such as the identification of sound practices, sharing of technical and economic data on EST implementation, involvement of relevant stakeholders and ministries, and partnership building:*
  Initiatives to support mainstreaming are more likely to be carried out if they are included in the project formulation and followed up.
- *Recognizing the different strengths and niches of bilateral and multilateral partners, and partnering with them in areas of strength and specific responsibility/mandate*:
  UNEP plays a strong role in pilot demonstrations and normative functions, while other institutions such as development banks play a role in larger-scale infrastructure programming and financing. UNEP can facilitate the transition from the pilot phase to large-scale implementation but in order for this to happen, it is important to maintain communication with these institutions and to inform national partners of UNEP's ability to provide guidance throughout the transition process.

Governance

- *Integrating analysis and recommendations for supportive policies and strategies into EST projects, and involving national staff, in order to identify the policy changes needed to create or sustain a more enabling environment*
- *Clarifying responsibilities and reporting lines for project management, and recognizing different governance systems of partner institutions:*
  IETC's experiences from DEBRI highlighted the necessity of addressing the different government systems and reporting structures which accompany the engagement of multiple institutions. As significant local governance reform could not be expected during the lifespan of

a post-disaster project, feasible measures to address this issue were limited to clarification of responsibilities and existing governance systems.

- *Identifying ways and means to incorporate project recommendations or follow-up needs into the national development or strategic planning processes:*
  This may imply participation of both planning-oriented and substantive/technical personnel in project management, and the regular sharing of information between planning and substantive/technical divisions at the very least. UNDAF, one UN initiative, or existing donor coordination mechanisms to propose mainstreaming efforts as national priorities can also be leveraged to provide support in addressing national development needs.

- *Investigating linkages with Multilateral Environmental Agreements (MEAs) for further support of EST implementation:*
  Many ESTs may have additional benefits in areas covered by MEAs, such as climate change, hazardous waste management, desertification and biodiversity. Further EST promotion may be eligible for support by financial mechanisms for MEAs, or MEA accession may enable the country to create favourable conditions for EST adoption.

- *Raising acceptance of EST-relevant concepts and practices to better engage various potentially replicating actors, both public and private, at the local and national levels:*
  Some projects (ISWM projects in particular) experienced challenges in engaging the national government to participate in local level projects, thereby compromising the potential for large-scale uptake through national government support. While limitations in governance and coordination are complex issues that cannot be adequately addressed by field projects alone, technical/practical perspectives may offer useful inputs for governance projects and initiatives.

- *Recognizing that UNEP needs to engage in close cooperation and coordination with implementing institutions in order to achieve direct replication:*
  While such replication tends to consume significant amounts of time as well as UNEP resources, there is a need for UNEP to undertake a select number of replication projects to gain a better understanding of the operationalisation of initiatives (implementation modalities and conditions differ in each location, even those within the same country) and to build credibility. Indirect replication through partnerships has the potential to reach a greater number with less hand-on guidance by UNEP control and less clear causal relationships. There is a need to undertake these replications to involve a larger number of institutions in EST implementation. Once replicated and mainstreamed beyond a certain point (i.e. reaching a critical mass), is it then time for the UNEP to carry out a phased withdrawal or to address other priorities.

Capacity building

- *Addressing capacity building needs in three specific areas, namely: (1) capacity to assess local conditions for EST implementation; (2) capacity to access information on ESTs and; (3) capacity to implement specific ESTs.*

- *Ensuring the institutional and administrative capacity of the executing agency:*
  Field implementation requires different sets of institutional capacity and response mechanisms that are geared more towards delivering goods and services at the local level. It is imperative that such capacity and mechanisms be built within national partners as well as within UNEP, with appropriate training for staff.

EST implementation

- *Considering EST implementation in the post-conflict and post-disaster period to address the priority issues of stakeholders for basic service provision and environmental management, and fostering longer-term and wider adoption in the re-development phase:*

IETC's examples in Iraq and Indonesia demonstrated that ESTs can be effective and suitable options in addressing immediate environmental priorities in post-conflict and post-disaster situations for water services and waste management, in addition to addressing non-emergency needs.

- *Recognizing ESTs as a "package" with a system that includes equipment, management, governance, capacity building and financing:*
  Successful implementation of ESTs and their replication requires the adoption of this systemic approach, as done in all three examples featured in this document.

- *Being realistic about piloting objective*:
  Pilot initiatives are carried out to evaluate the effectiveness of their implementation and to analyse performance. They may not always work as well as expected or may produce different results in different locations. Such findings are also deemed to be useful and relevant, and are regarded as legitimate outcomes of the pilot implementation.

- *Not expecting mainstreaming and replication to occur automatically after one successful EST implementation experience – additional demonstrations under different operating conditions are necessary, with adjustments for scale/scope:*
  Each country needs to build the critical mass of human resources for EST assessment, implementation, and management; implement a sufficient number of similar applications under different conditions to determine key principles; make adjustments to meet local conditions; have supportive policy and regulatory frameworks; and support and utilize potential replicating institutions.

Financing

- *Evaluating and articulating the financial competitiveness of ESTs relative to conventional options:*
  Compared to conventional options, ESTs for water/sanitation and waste management may often be financially competitive and deliver the additional potential benefits of labour and income generation and the avoidance of large-scale infrastructure needs. Recognition of EST viability in terms of financial and other benefits can enhance opportunities for technology support and technology transfer initiatives supported both from within the country and with international assistance.

- *Utilizing supportive economic and financial instruments for EST adoption, such as revolving funds for EST implementation and incentives for recycling and other supporting industries:*
  For example, the DEBRI project made recommendations for economic instruments to be used in future disaster situations with the engagement of pertinent ministries and development planning agencies.

- *Establishing and maintaining ongoing support for longer-term implementation:*
  Projects may have specific implementation deadlines imposed by donors or by the executing agency. These time constraints highlight the need for local management structures as well as the continuous involvement of partner institutions after the conclusion of UNEP engagement.

Local conditions and infrastructure

- *Utilizing ESTs that can function under the constraints of local infrastructure and other limiting conditions:*
  ESTs have been implemented in difficult conditions with very limited infrastructure with IETC's support. Examples include mobile instruments, modular container units with simple set-up, maintenance and up-scaling to meet increasing needs, and alternative energy supplementation. With careful analysis, selection and management, ESTs can function under

challenging implementation environments. In addition, the range of potential ESTs becomes much wider with proper infrastructure and favourable local conditions.

- *Recognizing the possibility that project results may be impacted by unanticipated changes in local conditions and emerging threats and emergencies.*

  In the case of Iraq, security conditions worsened during project implementation beyond the level anticipated during the initiation period. After the project's completion, the impact of severe drought and climate change began to place additional strain on the local environment, again in an unprecedented fashion. It is important for UNEP and local partners to maintain close communication to discuss and realistically assess the situation, and to develop options to address any issues as far as possible. Funds also need to be raised for any extensive interventions that are beyond the original project scope.

About the UNEP Division of Technology, Industry and Economics

The UNEP Division of Technology, Industry and Economics (DTIE) helps governments, local authorities and decision-makers in business and industry to develop and implement policies and practices focusing on sustainable development.

The Division works to promote:
> sustainable consumption and production,
> the efficient use of renewable energy,
> adequate management of chemicals,
> the integration of environmental costs in development policies.

The Office of the Director, located in Paris, coordinates activities through:

> **The International Environmental Technology Centre** - IETC (Osaka, Shiga), which implements integrated waste, water and disaster management programmes, focusing in particular on Asia.

> **Sustainable Consumption and Production** (Paris), which promotes sustainable consumption and production patterns as a contribution to human development through global markets.

> **Chemicals** (Geneva), which catalyzes global actions to bring about the sound management of chemicals and the improvement of chemical safety worldwide.

> **Energy** (Paris), which fosters energy and transport policies for sustainable development and encourages investment in renewable energy and energy efficiency.

> **OzonAction** (Paris), which supports the phase-out of ozone depleting substances in developing countries and countries with economies in transition to ensure implementation of the Montreal Protocol.

> **Economics and Trade** (Geneva), which helps countries to integrate environmental considerations into economic and trade policies, and works with the finance sector to incorporate sustainable development policies.

UNEP DTIE activities focus on raising awareness, improving the transfer of knowledge and information, fostering technological cooperation and partnerships, and implementing international conventions and agreements.

For more information,
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This report summarizes lessons learned from implementing Environmentally Sound Technology (EST) pilot projects by the International Environmental Technology Centre of UNEP Division of Technology, Industry and Economics (UNEP-DTIE-IETC). The document aims to inform national level mainstreaming of the EST pilot project results, and provides lessons learned for decision makers in national governments and for international technical cooperation personnel.

The featured projects were conducted within three pillars of IETC's focal areas. They are: Support for Environmental Management of the Iraqi Marshlands project in the water-sanitation pillar; Integrated Solid Waste Management project in China, India and Lesotho under the waste management pillar; and ESTs for Building waste Reduction in Indonesia (DEBRI) project under the disaster management pillar.

Each project and cross-cutting lessons learned focus on six areas, which are project management structure, governance, capacity building, EST implementation, financing, and local conditions/ infrastructure.

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