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Enabling Frameworks for Promotion of 3R Science and Technologies and Technology Transfer

(Background Paper for Plenary Session 2 of the Programme)

Final Draft

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Enabling Frameworks for Promotion of 3R Science and Technologies and Technology Transfer

UNEP IETC

Context

The United Nations is in the process of defining a post-2015 development agenda. This agenda will be launched at a Summit in September 2015, which is the target date for realizing the MDGs. It is currently being elaborated through informal consultations of the UN General Assembly. The President of the General Assembly has appointed two Co-facilitators to lead those informal consultations.

One of the key areas for Post 2015 Agenda is "technology facilitation." This is in continuity with Rio 1992 under the Local Agenda 21 – "The importance of Science, Technology and Innovation (STI) for sustainable development was emphasized in the Earth Summit (1992), with Agenda 21 containing chapters 34 and 35 on "Transfer of environmentally sound technology, cooperation and capacity building" and "Science for sustainable development", respectively.

During Rio+20, the emphasis on the technology transfer was further strengthened as the outcome document, "The Future We Want" suggests under the Means of Implementation section that the Rio+20 Conference stresses "the importance of access by all countries to environmentally sound technologies, new knowledge, know-how and expertise" (para 270), underlines "the need for enabling environments for the development, adaptation, dissemination and transfer of environmentally sound technologies" (para 271), recognizes "the importance of national, scientific and technological capacities for sustainable development" (para 272), and requests "relevant United Nations agencies to identify options for a facilitation mechanism that promotes the development, transfer and dissemination of clean and environmentally.

Background

For technology facilitation in line with Rio 1992 (Local Agenda 21) and Bali Strategic Plan for Capacity Building and Technology Support, the United Nations Environment Programme (UNEP), with an active support from the Government of Japan, established International Environmental Technology Centre (UNEP IETC). The mandate for IETC is to promote environmentally sound technologies (ESTs).

Environmentally sound technologies (ESTs) encompass technologies that have the potential for significantly improved environmental performance relative to other technologies.

Broadly speaking, ESTs are to:

- protect the environment
- are less polluting

- use resources in a sustainable manner
- recycle more of their wastes and products
- handle all residual wastes in a more environmentally acceptable way than the technologies for which they are substitutes

Furthermore, environmentally sound technologies are not just "individual technologies", but total systems which include know-how, procedures, goods and services, equipment as well as organizational and managerial procedures. This requires both the human resource development (including gender relevant issues) and local capacity building aspects of technology choices. There is also the need to ensure that ESTs are compatible with nationally determined socio-economic, cultural and environmental priorities and development goals.

In the complex relationship between development and the environment, technology provides a link between human action and the natural resource base. Faced with limited global natural resources, the people of the world must seek to achieve more sustainable forms of development. As a result, the application of new, resource efficient ESTs has become crucial for both development and the environment. Technology cannot compensate for or mitigate the deep-rooted social causes of environmental problems or the short-comings of political and social policies, but the need for sustainable development in the world today is real. The availability of ESTs via cooperative technology transfer depends largely on political willingness at the international level to pursue an innovative environmental agenda.

The dynamics of technological change will not be limited to one technology for developed countries and another for developing countries. Instead, cutting-edge and traditional technologies will coexist across the globe. In order for developing countries to make the best use of ESTs, however, they must increase their ability to assess, analyse and choose technologies based on their own needs and development priorities, and then adapt these technologies to specific local conditions. Technology in its new role, will be an essential factor on the path towards sustainability.

The paradigm of sustainability has evolved through various global deliberations and conferences within the past few years; most notably the Rio Earth Summit of 1992/ Agenda 21 and World Summit on Sustainable Development in Johannesburg in 2002. The concept of sustainability emphasizes integration of economic, environmental and social interests and concerns.

When it comes to making decisions on investments, economic aspects often govern. Decisions that imply least costs are thus preferred without explicitly factoring environmental aspects and social preference. Thus, environmental and social concerns have invariably taken a backseat, and in turn, led to unsustainable decisions and investments.

To fill in such a gap, the need for promotion of Environmentally Sound Technologies (ESTs) in the context of sustainability was recognized in the early 1990s. In particular, at the United Nations Conference on Environment and Development (UNCED) in 1992, the need to promote ESTs was highlighted in Agenda 21. Chapter 34 of Agenda 21 defines ESTs as those technologies that protect the environment, are less polluting, use all resources in a more

sustainable manner, recycle more of their waste and products and handle residual waste in a more sustainable manner than the technologies for which they are substitutes. ESTs include a variety of cleaner production process and pollution prevention technologies, as well as end-of-pipe and monitoring technologies. Apart from just technologies, they can be considered as total 'systems' that may include knowledge and skills transfer, operating procedures, goods, services and equipment, and also organizational and managerial procedures[1]. Many initiatives have been developed in relation to promotion of ESTs in developing countries and countries with economies in transition.

Sustainability Assessment of Technologies (SAT) Framework

In parallel to the promotion of ESTs, there was a need to evolve Technology Assessment (TA) framework to assess and evaluate environmental technologies to facilitate identification and selection of the 'best possible technology option'. Accordingly, the International Environmental Technology Centre of the United Nations Environment Program (IETC-UNEP) initiated the development of a methodology for Environmental Technology Assessment (EnTA). EnTA was defined as a systematic procedure whereby a proposed technology intervention is described and appraised in terms of its potential influence on the environment, the implications for sustainable development and the likely cultural and socio-economic consequences. The scope of EnTA was outlined with a focus on identifying specific and broader environmental impacts of technologies. EnTA was primarily qualitative and comparative and it looks at broader processes over technology's entire life cycle.

More recently, further improvements to the approach in TA under the concept of sustainability have been introduced and a new methodology known as Sustainable Assessment of Technologies (SAT) was developed, which received commendation internationally[2]. The focus of this methodology is both on the process as well as outcome, with an interest towards informed and participatory decision making. The SAT methodology is expected to be used by a varied group of stakeholders in different situations and at different levels of decision making (see Figure 1.1).

At the policy/ government level, SAT can be applied for strategic decision-making. These strategic level decisions are often made by planners, civic body officials and mayors/elected representatives. Once decisions at the strategic level are taken, SAT could be applied at the financing institution level. Target users could also include developmental as well as commercial financing institutions that often play a key role in funding projects and programmes that make use of various technologies.

[1] DTIE-UNEP. EST Assessment Methodology and Implementation - Training Kit prepared for the support of the project on Environmental Management of the Iraqi Marshlands. Funded by International Environmental Technology Centre (IETC) DTIE, UNEP.

[2] Chandak, S.P. (2009). Sustainable Assessment of Technologies: Making the Right Choices. IETC-UNEP. Presented at the 1st Stakeholder Consultative Workshop / Training Program of the Project on Converting Waste Agricultural Biomass to a Fuel/Resources in Moneragala District, Sri Lanka funded by UNEP and coordinated by the National Cleaner Production Centre, 21 August 2009.

The methodology can also be applied at the operational level – primarily by the technical/ engineering staff, designers, and consultants – to assess alternate technology systems. Communities and industrial clusters can use the SAT methodology as well - for instance, when they are building a centralized water or wastewater treatment system, or a recycling facility. Last but not the least, individual hamlets/villages and enterprises can also use the SAT methodology for comparing a number of available options for sanitation, water supply, waste treatment or manufacturing technologies.

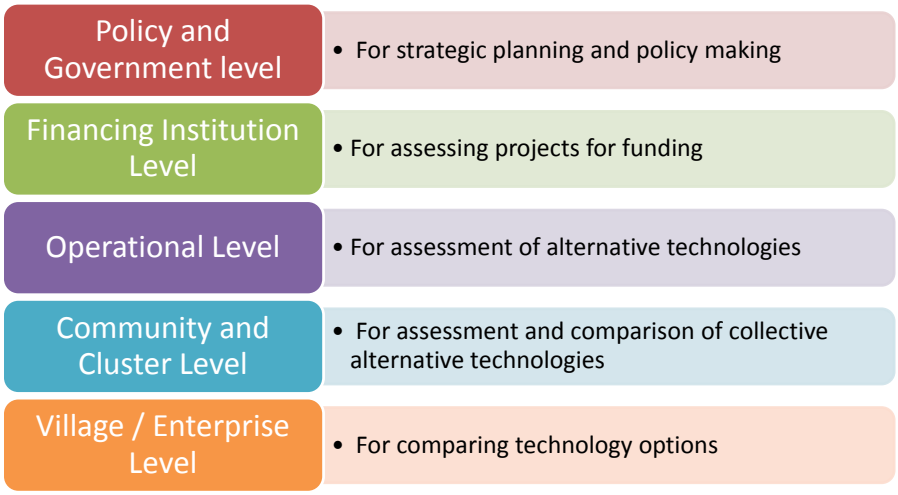

Figure 1.1: Proposed Levels of Use for the SAT Methodology

The above mentioned stakeholder groups could apply the SAT methodology towards the selection of suitable technology systems in a variety of situations. These situations and interests for instance, can include:

- End-of-pipe or waste management technologies;
- Programs related to environmental health;
- Provision of basic services/ infrastructure such as roads, power, water etc.;
- Biodiversity management;
- Remediation/ land reclamation;
- Process technology modernization (at shop floors/ in industrial clusters);
- Recycling programs and so on.

In short, the SAT methodology can be applied in any / all scenarios such as those listed above, involving technology interventions in the context of sustainable socio-economic development.

The SAT methodology has a specific focus on the following features. Each of these features is explained below:

Addressing strategic as well as operational levels;

Addressing sustainability (integration of environmental soundness, social/ cultural acceptability, and technical and economic feasibility) through a specially designed methodology and criteria;

Employing a progressive assessment procedure, through tiers on screening, scoping and detailed assessment (thus) allowing entry points for diverse stakeholders and optimizing information requirements;

Employing quantitative procedures that allow more objective assessment, sensitivity analyses and incorporation of scenarios;

Ensuring application to technology "systems" as opposed to individual technologies; and Stressing on information expertise and stakeholder participation.

A tiered approach is both effective as well as efficient, as it does not require exhaustive data collection for all technology systems under consideration. Users can eliminate the obviously non-feasible options at an early stage (screening) and then focus on select qualified technology systems. In this way, detailed information collection becomes essential only for short-listed technology systems, thereby saving a substantial time and effort. Briefly, arriving at the final choice from a number of available options can be done through the following steps or tiers:

Tier 1 - Screening: Firstly, technology systems are screened against logical operators (i.e. Yes/ No type) for EST criteria. This is essentially the Screening Tier.

Tier 2 - Scoping: The ESTs that pass through the screening stage are then subjected to a second round of elimination through the scoping tier. Scoping uses select criteria that require more of qualitative or readily available quantitative information. In doing so, a number of less competitive options are likely to be discarded, thus leaving stakeholders with a more limited and more relevant number of technology system options.

Tier 3 – Detailed Assessment: Technology systems shortlisted from the scoping tier are then subjected to a more rigorous evaluation, using additional criteria, specially drafted for the purpose, and that demand a greater extent of quantitative information. This is the Detailed Assessment Tier. At the end of the detailed assessment, the stakeholders would understand which technology systems are the most sustainable for their situation, in an order of ranking.

The SAT methodology is shown in Figure 1.2. The methodology follows typical Plan-Do-Check-Act cycle of continuous improvement as recommended by systems like Quality/ Environmental Management Systems (ISO[3] 9000/ 14000).

[3] ISO stands for International Organization for Standardization.

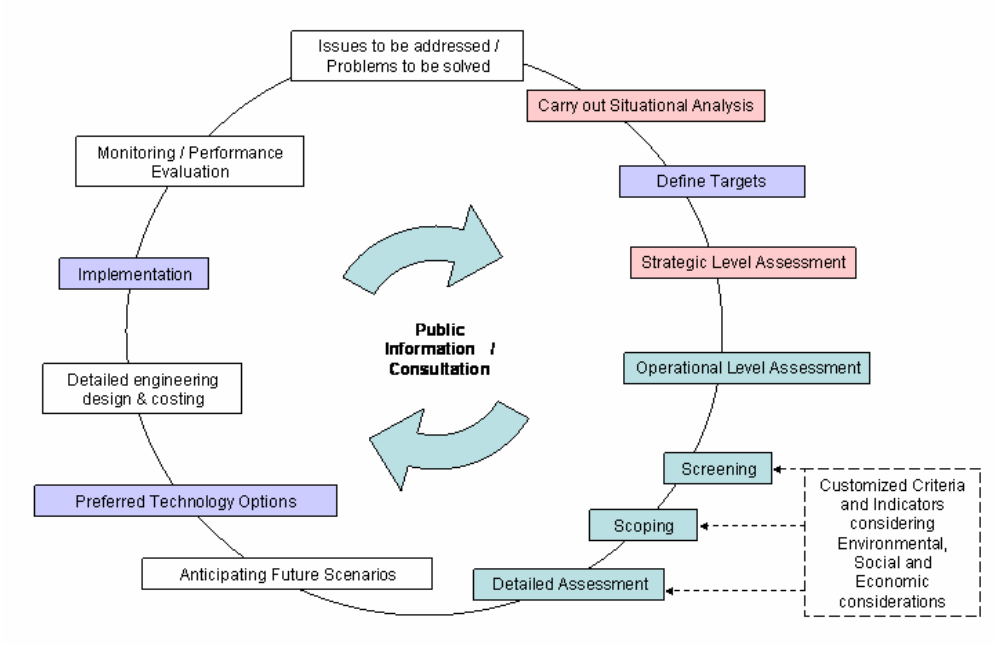

Figure 1.2: The SAT Methodology

Strategic Level and Operation Level SAT

At the strategic level assessment, planners, decision-makers, mayors/elected representatives should brainstorm and study various options at the policy and plan levels. The outcomes of strategic level assessment are very important for the following reasons:

The decision at the strategic level is the critical factor in the subsequent identification of technology system options. These technology elements are then combined to produce appropriate situation-specific technology systems. These system options will then undergo assessment at the operational level.

Strategic decisions may help to develop customized criteria and indicators (possibly with weights across criteria) from a generic list, for the decisions to be taken at operation level. The objectives and targets of the technology system intervention must also be considered while developing new customized criteria and indicators.

The outcomes of the strategic level assessment can also provide some leads about the possible future scenario building, which can influence the decision regarding the technology choice. These future scenarios, for instance, may include future population growth, changing waste composition, tightened legal requirements requiring higher efficiency of waste treatment; or changes in production requirement at the enterprise level, due to specific quality or capacity requirements for the products requiring technology upgrade.

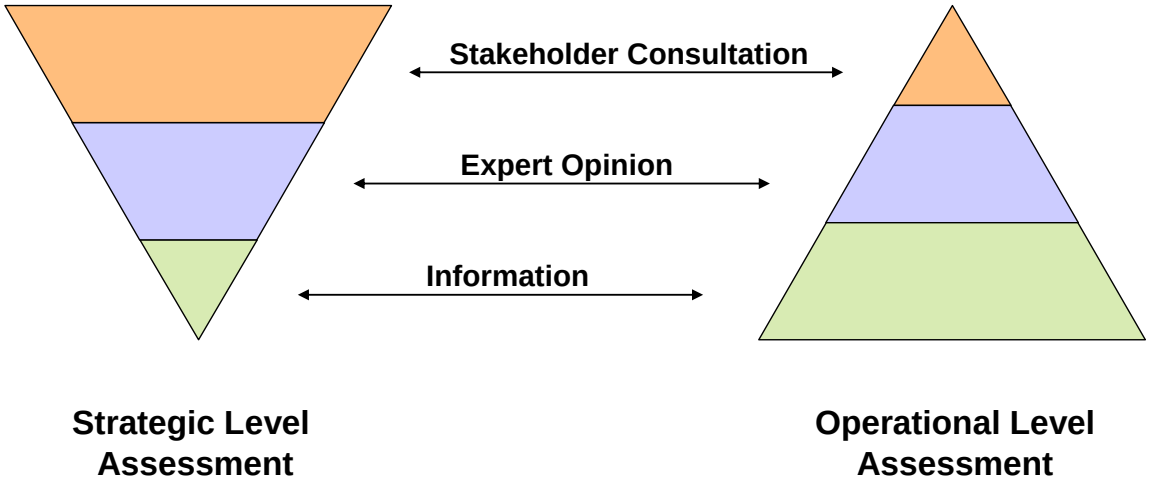

Figure 1.3: The SAT Methodology for Strategic Level and Operational Level

Once the macro-level or strategic level options are finalized, the process moves on to an operational level where engineers, technical staff etc., take over to assess the available EST systems. In case the SAT methodology is to be applied only at a community or enterprise level, the earlier stage of strategic assessment may be skipped and stakeholders can start with the operational level SAT as the first step. It may be noted that the levels of expert opinion and technology information are the highest for this level.

Based on the problem definition, situation analysis and the outcomes of strategic level assessment, a basket of potential technology systems is finalized for this stage. These are then subjected to further rigorous three-tiered assessment. This exercise must be done with the help of expert opinion.

Depending upon the specific situation and needs, the stakeholder group may like to adopt the proposed set of generic and/or sector specific criteria and indicators without any changes. As noted earlier, in some situation-specific cases, it may be essential to revisit the generic set of criteria-cum-indicators, and modify or add some specific criteria. The criteria and indicators are then finalized through stakeholder consultation.

Compendium of Technologies

To apply the SAT methodology, access to information on the technologies is crucial. To facilitate access to the technology information and also to raise awareness on various technical routes available for managing various waste streams, IETC compiles compendium of technologies. So far, the compendiums are developed for solid waste, waste agricultural biomass, waste plastics, healthcare waste and waste oils. These publications are available online at IETC website www.unep.org/ietc.

These compendiums of technologies are aimed to raise awareness on the available options vis-à-vis technologies as well as to assist the policy –makers and managers in the identification of

appropriate technologies with respect to local economic, environmental, social and technical characteristics. These compendiums can also be of interest to the interested parties/organizations that aim at supporting decision-makers on technologies. They may be:

- consultants working on urban services, recycling, or waste management;
- representatives or staff of other local stakeholders including community groups, NGOs, and the private sector;
- entrepreneurs wishing to expand or strengthen their solid waste portfolios;
- academicians and scholars in urban environmental management;
- the press, especially when seeking background materials;
- donors interested in supporting future waste management activities;
- local experts interested in using or replicating the ESTs

Conclusion

Technology facilitation is key for sustainable development and UNEP IETC has been working for more than two decades to promote ESTs. The decision makers require user friendly tools and access to information for the technologies to identify appropriate technologies based on the local characteristics. The demonstration of ESTs in partnership with international and local organizations and stakeholder will support the capacity building and confidence in the technologies.

The 21st century is witnessing an enormous increase in demand for environmentally sound technologies in every sector including urban services, manufacturing, agriculture, and so on. A proactive leadership is needed to accelerate the pace of ESTs for sustainable development. Some of the key actions needed by this leadership include: a framework legislation; a priority in the national development plan; a strategy and a plan with full engagement of stakeholders; and a strong networked research and development programme taking full advantage of the data revolution. Environmentally sound management in each sector as a key component of the circular economy. ESTs will make a significant contribution to the Post-2015 Development Agenda.