GEF/C.40/Inf.16
May 19, 2011

GEF Council Meeting
May 24-26, 2011
Washington, D.C

SELECTION OF PERSISTENT ORGANIC POLLUTANT DISPOSAL TECHNOLOGY FOR GEF PROJECTS

(Prepared by STAP)

The Scientific and Technical Advisory Panel, administered by UNEP, advises the Global Environment Facility

A STAP ADVISORY DOCUMENT[1]

Selection of Persistent Organic Pollutant Disposal Technology for GEF Projects

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[1] The Information Paper is an Executive Summary of the STAP Advisory Document to be published soon after the 40th GEF Council meeting.

Parties to the Stockholm Convention under Article 6 are obligated to provide for the environmentally sound disposal of POPs stockpiles and wastes. Such disposal[2] is fundamental to achieving the Convention's objective of protecting human health and the environment by permanently eliminating persistent organic pollutants (POPs) that might otherwise be distributed into the global ecosystem. As a consequence, the disposal of POPs stockpiles and waste is a priority component of National Implementation Plans (NIPs) developed by Parties to the Convention.

Much previous and ongoing discussion centers on what constitutes environmentally sound disposal of POPs, and what disposal technologies can achieve it. The Global Environmental Facility (GEF) through the Scientific and Technical Advisory Panel (STAP) contributed to this discussion in 2003/2004 in relation to available non-combustion technologies for POPs disposal. The Basel Convention, acting in concert with the Stockholm Convention, has issued and periodically updates technical guidelines on POPs management including disposal requirements and listings of technologies that may be applicable. To date, these guidelines have been generally adopted by the Stockholm Convention as the standard reference. Additionally, comprehensive reviews of technologies are periodically published, and on-line libraries of technology data sheets are maintained by the Basel Convention and supporting organizations. Most recently, the Fifth Conference of the Parties (COP-5) to the Stockholm Convention invited the Basel Convention to continue this work, specifically with respect to establishing the levels of destruction and irreversible transformation of chemicals to ensure POPs characteristics are not exhibited; considering methods that constitute environmentally sound disposal; defining low POP-content in wastes; and updating general technical guidelines as well as preparing or updating specific technical guidelines for environmentally sound waste management (UNEP/POPS/COP.5/CRP.29). Likewise, in its decision UNEP/POPS/COP.5/CRP.32, COP-5 further encourages the GEF and parties in a position to do so to facilitate the transfer of appropriate technologies to developing countries and countries with economies in transition (CEITs).

GEF is the Convention's principal financial mechanism in developing countries and CEITs. It has a strong interest in the process of selecting and implementing POPs disposal technologies in light of the increasing demand for funding of POPs disposal as countries implement NIPs. To the end of GEF-4, over half of the US$ 412 million allocated to the POPs focal area was directly or

[2] Throughout the study, the term "disposal" is used for consistency with the wording in Article 6 of the Stockholm Convention and applicable Basel Convention Guidelines, but should be generally equated to other commonly used terms such as "destruction" and "elimination"

indirectly related to stockpile and waste disposal. It is already apparent that funding and project demand is expanding under the current GEF-5 Chemicals focal area. Therefore, it is an appropriate time for the STAP to provide updated high-level guidance on the selection of POPs disposal technologies for GEF financed projects. This advisory document builds on the original 2004 STAP study and utilizes experience gained during GEF-4. Developments related to technology availability are updated and issues associated with their application in the context of GEF financing in developing countries and CEITs are discussed.

This advisory document is specifically directed to recipient countries, implementing agencies and the GEF Secretariat but may also serve as guidance to technology developers and proponents. With a view to providing a consistent overall framework for the application of GEF funding in this area, it aims to address general requirements and considerations applicable for selection of POPs disposal technologies. It also places disposal of POPs stockpiles and waste within the broader context of the POPs management process and sound chemicals management.

However, the document is not intended to duplicate or supersede technology evaluations provided by the Basel Convention or other groups which, along with the evolving technical literature on the subject, should remain the principal source of information for comparative assessment of technology options. Therefore, it is emphasized that the document should not be interpreted as excluding or advocating any type or particular technology. Rather, it should be seen as guidance on the attributes that technologies should demonstrate when GEF funding is involved.

This guidance on selection of POPs disposal technology can be summarized as follows:

- Ensure any technology chosen meets accepted and consistent environmental performance requirements;
- Apply minimum standards and performance requirements to developing countries and CEITs that do not exceed those accepted applied in developed countries;
- Assure that POPs disposal is integrated with the overall POPs management process employed;

- Provide safeguards to assure environmentally sound management throughout the POPs management process, and
- Integrate commercial viability with technical feasibility and environmental performance in technology selection.

In general, the destruction or irreversible transformation of POPs in an environmentally sound manner is not limited by the availability of appropriate technology—there are a number of such technologies. Rather, it is limited by the practical ability to assemble and apply them--particularly in developing countries and CEIT's - in a manner that is environmentally effective, timely, and cost effective.

Destruction cannot be addressed in isolation. The application of POPs disposal technology should be viewed as one part of an overall POPs management process or system. This system includes steps taken in advance of the actual disposal or destruction to identify, capture, secure, and prepare POPs stockpiles and wastes for disposal. It also includes post-destruction steps to manage emissions, by-products and residuals. The management process depends upon high-quality information regarding POPs stockpiles and waste, and the effectiveness of the institutional and regulatory framework under which POPs management is undertaken.

Steps taken in advance of destruction: Characterization, prioritization, capture, containment and pretreatment

A prerequisite for organizing and implementing POPs disposal is an effective legislative and regulatory framework for POPs identification and control. Such a framework allows the assembly of accurate and sufficiently complete inventories of

(i) POPs stockpiles and waste in terms of quantity, identity and potency, location, owner/custody, and current storage and containment status;
(ii) POPs-containing equipment in service linked to a general plan for its retirement;
(iii) POPs-contaminated sites—known and potential--with assessment of risks and potential remediation requirements, and
(iv) Analytical capacity to characterize and monitor current and future POPs stockpiles and wastes.

Based on inventories, stockpiles that are high in POPs volume, with high POPs content, or those that present the greatest risks should be dealt with first. Removing POPs from a condition or

situation where it can enter the environment and storing them securely can often be the most cost-effective strategy for immediately mitigating risk consistent with the Conventions' objectives. This requires the physical capacity to identify, capture, transport and contain them, even if disposal cannot occur immediately. It also requires appropriate sustainable care and custody arrangements to ensure no release while materials are stored. Effective capture is also a prerequisite for any intermediate pre-treatment activity that may optimize and support the application of a disposal technology.

Selection and Qualification of a Disposal Technology including Management of By-Products and Residuals

1) *Environmental Performance.* The most important parameter for assessing environmental performance of POPs destruction technologies is Destruction Efficiency (DE) which is the percentage of originating POPs destroyed or irreversibly transformed by the technology. Destruction and Removal Efficiency (DRE) is the percentage of original POPs destroyed, irreversibly transformed or removed from the air emission stream. It may serve as a supplementary performance parameter recognizing it only accounts for releases to air and not what could be transferred to other by-products and residuals streams. A DE >99.99% and DRE>99.9999% are recommended as working benchmarks for application in GEF projects. In general, higher DEs are preferred, but technologies should be evaluated on a case-by-case basis. Where large stockpiles exist and financial capacity is limited, the actual volume of POPs destroyed or irreversibly transformed may be maximized by use of a lower cost option that achieves the minimum DE, rather than a higher cost option that greatly exceeds the minimum DE.

While DE provides a current general performance standard, consideration also needs to be applied to the potential for transformation of originating POPs to other POPs in the technological process. Therefore, any technology should demonstrate that this potential is minimized and at acceptable levels. Ensuring application of best available techniques and best environmental practices (BAT/BEP) as well as safe design and operating conditions specific to the technology involved is required to ensure the anticipated environmental performance is achieved. For solid residuals or by-products containing either original or transformation POPs, the current provisional Basel low-POPs content level should apply as a upper limit. Lower levels based on BAT/BEP should be attained where practical. Similarly, limits for air release of original and transformation POPs should be set at a level generally accepted in developed countries. For polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans (PCDD/PCDF), this is 0.1 ng

TEQ/Nm^3 to air, again noting that truly best achievable technologies can perform substantially better.

2) *Safeguard Measures:* These include documented processes, procedures and oversight actions that should be part of a GEF project's monitoring and evaluation plan, including:

- Institutional/regulatory commitment and capacity to undertake appropriate oversight and enforcement;
- A national POPs inventory and endorsed NIP, regularly maintained;
- Unambiguous legal custody and ownership of POPs stockpiles and wastes, covering rights of access, assignment of financial liability for disposal and environmental damage, and monitoring and site closure;
- Credible environmental assessment and permitting applied to facilities and activities and benchmarked against international standards and practice;
- Performance monitoring during operations and documentation of the fate of all residues;
- Public participation, consultation and disclosure including timely access to information about POPs stockpile and waste disposal and input on how these activities are conducted;
- Health, safety and emergency response plans covering protection and monitoring of workers involved in operating the technology and any potentially exposed members of the public.

3) *Commercial Viability and Economies of Scale:* Successful, sustainable performance of any technology also depends upon commercial or financial sustainability. In general, it is preferred that selected technologies are packaged on a complete turn-key basis operating at a predictable "all inclusive" unit cost, with appropriate performance guarantees, free of any dispute over technology ownership or licensee rights. This generally requires that a vendor possess the technology, a demonstrated track record, and the capacity to operate it at the required location. It also includes technical support and training capacity, and the financial strength to undertake the proposed work, particularly where 1) the application is to occur in developing countries and CEITs and 2) technology transfer is involved. Where the vendor arrangements involve local partnerships, national government guarantees may be required to ensure the sustainability of local arrangements and completion of the disposal works.

The need for disposal capacity, current and future, and the potential for economies of scale can influence POPs destruction technology choices. That need also guides decisions regarding development of domestic capacity *vs.* utilization of qualified

facilities elsewhere. In many cases, countries should consider combining their disposal requirements with others and cooperating in regional pre-treatment and disposal capability. They may also consider integrating POPs stockpile and waste disposal with development of more broadly-based hazardous and chemical waste management infrastructure so as to maximize the effectiveness of scarce financial resources.

4) *Infrastructure considerations:* Most qualified POPs disposal technologies have been implemented in developed countries possessing mature regulatory and institutional frameworks, good supporting infrastructure, a strong technical expertise base, and sufficient resources to support their application. However, these supporting attributes may not be as readily available in developing countries and CEITs. High-performance technologies involve complex equipment, sophisticated controls and processes and require such things as reliable power and other utilities for safe and sustainable operation. A technology selection process has to assess these infrastructure needs and prudently balance the decision between technological complexity and practical applicability vs. simplicity of operation.

The GEF may wish to consider some financing of technology demonstration, transfer to, and/or acquisition by GEF recipient countries, or support for the latter stages of commercialization of locally developed technologies. The latter approaches involve assumption of risks in development, performance, cost and timing. Such proposals should generally be oriented toward technologies that are compatible with local conditions, and which offer economies of scale and realistic potential for future cost reduction and efficiencies. In particular, such initiatives may be most productively oriented to dealing with longer-term POPs waste issues such as low-concentration/high-volume contaminated materials and sites.

This document contains a listing of technologies applicable to POPs stockpile and waste disposal that potentially meet environmental performance, safeguards and commercial viability requirements, including technologies that have or are currently being supported in GEF financed projects. It summarizes their principal application characteristics and includes references to detailed fact sheets where available. This listing covers commercial and near-commercial technologies classed as operating in reducing, closed, and/or starved oxygen environment, and commercial technologies operating in open oxidizing environments. A third category covering primary pre-treatment technologies is also included. It is emphasized that this list is illustrative and is not intended to exclude any other technologies or variations of those identified that can demonstrate the above requirements. New technologies or

modifications of current technologies offering both improved environmental performance and cost-effectiveness will inevitably enter the market and may be considered.

The document concludes with an approach to the technology selection process, noting that the timing constraints of maintaining an efficient GEF project cycle may themselves limit technology selection. A screening stage leading to a short list of technologies or combinations of technologies may be undertaken in advance of Project Information Form (PIF) submission but also may occur during the GEF supported project preparation stage. A final technology selection might be made at this stage as well but could also be part of project implementation, involving the formal evaluation of concrete commercial proposals. In some cases, particularly where technology transfer is involved, final selection might proceed in two stages; the first involving a demonstration of the technology, followed by a commitment to disposal of the larger volume POPs stockpiles and wastes.

STAP's Advisory Document concludes with the following overarching recommendations respecting the GEF's role in supporting the disposal of POPs stockpiles and waste and specifically the selection of POPs disposal technology:

1) POPs disposal should not be considered in isolation. It is an integral component of environmentally sound POPs management.

2) As a general principle, developing countries and CEITs should not be held to more stringent standards than those accepted and generally applied in developed countries.

3) Environmentally sound disposal of POPs is not generally limited by availability of appropriate and capable commercial and near-commercial POPs destruction technology.

4) Many available technologies are limited largely by their current cost-effectiveness and commercial maturity. For some, there is also a lack of application experience in developing countries and CEITs where implementation and financial risks are generally higher.

5) The cost of environmentally sound disposal of the totality of POPs waste in developing countries and CEITs will greatly exceed available GEF resources. Therefore, maximizing the mass of POPs destroyed, and the global environmental benefit achieved from GEF funding, will involve trade-offs in the technology selection process among unit disposal costs, destruction efficiencies, financial risk, application location, and implementation time required.