# Scientific and Technical Advisory Panel

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

(Version 5)

## STAP Scientific and Technical screening of the Project Identification Form (PIF)

Date of screening: March 01, 2013 Screener: Christine Wellington-Moore

Panel member validation by: Hindrik Bouwman
Consultant(s):

**I. PIF Information** *(Copied from the PIF)*
**FULL SIZE PROJECT GEF TRUST FUND**
**GEF PROJECT ID**: 4877
**PROJECT DURATION** : 4
**COUNTRIES** : Serbia
**PROJECT TITLE**: Environmentally-Sound Management and Final Disposal of PCBs
**GEF AGENCIES**: UNIDO
**OTHER EXECUTING PARTNERS**: Ministry of Environment, Mining and Spatial Planning
**GEF FOCAL AREA**: POPs

**II. STAP Advisory Response** *(see table below for explanation)*

Based on this PIF screening, STAP's advisory response to the GEF Secretariat and GEF Agency(ies): **Major revision required**

**III. Further guidance from STAP**

PIF Information Extract: The primary objective of this project is to protect human health and environment and to contribute to the overall capacity for development of sound management of chemicals by assisting Republic of Serbia, particularly in establishing the environmentally sound management (ESM) of PCBs, as well as in identification and prioritization of PCBs contaminated sites. Activities include capacity building to enhance identification and management of PCBs wastes and contaminated equipment in non-power sectors, complete with a trial disposal exercise of 200 tonnes of PCBs.

STAP Guidance:-

The project approach is grounded on fairly adequate baseline data with respect to potential quantities of PCBs. However the project does seek to improve the baseline information concerning contaminated sites, acknowledging that "there is no available data in Serbia that identifies the number of sites specifically polluted by POPs or PCBs; [though] there are a large number of sites generally contaminated by different types of pollutantsâ€¦[Further, due to the war legacy of Serbia, there is ] the presence of high levels of soil pollution [in various parts of the country] primarily by hydrocarbons, PCBs, heavy metals and other dangerous substances ". There is intent to create a contamination sites inventory on the basis of determined presence of pollutants exceeding the limit values allowed for concentrations in soil. The project also plans to devolve a pilot site for future decontamination based on the assessments, with the selection of decontamination technology options being driven by the UNIDO Contaminated Site Investigation and Management Toolkit, where appropriate. Bilateral/multilateral assistance will then be sought to implement the clean up plan developed under the project.

The STAP sees some potential risks to the project approach because of the background elements identified in the project. There is a legacy of sites polluted by multiple contaminants. And prior to site characterisation, there is intent to create a list of potential technologies for remediation. The STAP thinks that it should be relatively easy to adjust the project approach, such that thorough characterization of sites be part of this project to help evaluate applicability of potential technologies, and ultimately assess appropriate costs for any follow up remediation plans. Also, despite the risk table citing the possibility that PCB owners may not be committed to identifying and treating PCB contaminated equipment, and that retention of high level commitment is key, there doesn't appear to be any awareness component in the project. This should be remedied.

Given the rapid increase in remediation projects entering the work programme, the STAP has seen that there is a need to work with the GEF Secretariat to better amass the knowledge and lessons learned around GEF technology demonstration projects. It is only just now beginning these efforts, but has already begun distilling some of the lessons from the literature, and the few recent comprehensive evaluations to hand, such as the GEF/UNDP demonstration project "Environmental Remediation of Dioxin Contaminated Hotspots in Vietnam"; though the broader Agent Orange program with US support is relevant as well. The STAP also awaits lessons that might be gleaned from the World Bank's Belarus project "Persistent Organic Pollutant Stockpile Management and Technical/Institutional Capacity Upgrading". But with what evaluative material is available, what is evident is that in spite of the fact that projects may target different chlorinated POPs products, there are many lessons that can be shared across remediation projects in general; and the STAP is sure that more lessons will be gleaned with more evaluations completed. There ought to be recognition of the successes and failures observed to date, with proper recording of operations of such projects to feed into the knowledge base. Admittedly, many key findings thus far actually apply to many thermal desorption processes; but lessons on non-combustion processes are fewer in the GEF portfolio (though the STAP does provide a link to external reports on the latter within this screen).

1) Program Design with an eye to replication and upscaling

In this type of GEF project, the focus is on elucidating a technology that is appropriate for the intended scale of remediation required and under the conditions within the country. So one is not attempting to set up a definitive test of the technology's acceptability or otherwise, but rather assess potential for the technology to operate on a full scale basis, meeting national and internationally benchmarked remediation and environmental performance standards. Therefore, key outputs should include development of a proposed full scale commercial configuration based on information and lessons learned from the project. The remediation plan in its overall context for the site involved must include the scaling of the technology proposed, with some reasonable estimate of unit costs, and perhaps, consideration of handling of remediation output materials (see further details below).

Similarly if the technology is to continue to operate post-project, and/or be up-scaled it follows that there should be some capacity strengthening within the project, and if possible, a national training plan elaborated to support the commercial configuration and facilitate technology transfer. Also, given the expense of investing in any one technology, where possible (as this is not always the case), a criterion for technology selection might also include applicability to other chlorinated contaminant species.
There also needs to be recognition that any technology needs site-specific trials cost and performance analyses are to be reliable.

2) Define the problem well (site assessment and risk assessment) including addressing all contaminants (few sites are single contaminant problems) and doing baseline ambient environmental impact as well as monitoring during any site work

a) Clarity on the characterization of contamination levels anticipated is critical. The characterized inventory envisaged in B1.11 seems not have been completed yet. It would be prudent (and may already have been assumed by the project) to use this prioritization to select pilot site(s) that would be representative of the majority of the polluted sites with which to demonstrate the clean-up and remediation technologies. This prioritization activity would need to include recognition of co-contaminants that may affect technology performance, and recognition that there may be high variability. The characterization of remediation in situ, should recognize the non-uniformity of contamination. Target values of soils and other media should be set ab initio so that the effectiveness of the technologies can be tested. This carries over into technologies which are based on in- feed into a particular apparatus. More specifically, one should provide for:
i) a precise and clear definition of the targeted soils through the process of selecting source sites;
ii) acknowledging the possible necessity of increasing the extent of analytical characterization, to give an early and thorough indication of the wide range of contamination levels encountered for a given target location (especially in industrial sites where a mixture of chemicals have been dumped);
iii) appropriate planning of contracted analytical work to have this characterization available well in advance of starting remediation trials, and
iv) better expectations of soil concentrations, such that there is common understanding of what might be encountered, and there can be better correlation made between pretreatment concentrations and remediation efficiency of the technology being assessed for commercial scale up.

b) Related to the aforementioned, direct analysis for key active ingredients and by products of the POPs involved (especially in the case of herbicides), as well as other priority pollutant constituents that may be present (eg chlorophenol, (heavy) metals such as mercury and arsenic, lead, and zinc,) should be identified prior to remediation.

Though it may be potentially commercially and politically attractive, there is some evidence that it is detrimental to select separate technologies for sites based on predetermined contamination levels, which in and of themselves were not based on an adequate sampling and characterization regime. Thus it would be prudent to undertake a comprehensive, site-specific, advance characterization and site assessment in advance of undertaking remediation activities, such that the whole range of contamination encountered, and its distribution at a relatively fine scale, is known. This also has implications for any attempt to apply absolute remediation standards to all results given the variation in concentration on sites, as well as (in the case of ex situ processes), between in-feed samples (in the latter case there might be pretreatment (eg through mixing of soils) to make for more uniform in-feed).

c) There should be good procedural definition of expectations and practices related to day to day technical communication and joint decision making on events and alterations during the program. Also, seemingly peripheral elements that could substantially affect the performance of the technology (eg. reliable power supply in the site area) should be thought through, and the appropriate stakeholder partners engaged in support of the work.

d) There should be some emphasis on workplace and general ambient monitoring so that emissions (eg VOCs and any noxious releases). There should be an ambient baseline set and monitoring during the remediation process; and capture of emissions and comprehensive environmental monitoring should be considered for any full scale commercial configuration.

3) The level of contamination and final handling of the treated soil should be carefully considered, including if there was unintended augmentation of active toxic by-products, heavy metals etc, as a result of the remediation action, or any other reduction in the quality of the soil. In some cases, for purposes of future land use planning, sites should be considered generally contaminated, and as such, may have inherent limitations respecting future land use including restriction to lower value and risk designations. In these cases, some form of land disposal that provides sufficient natural or engineered containment to avoid release to the general environment is required. However in some cases (particularly thermal and/or mechanical processes), the remediation process may result in treated material where soil structure is lost due to incineration of organic matter. The very fine grained structure generated therefore will require cover to avoid uncontrolled dispersal of windblown, potentially toxic, particulates. With this in mind, the handling of the treated matter should be considered in assessing any technology so that at the earliest, the client country is aware that additional investigation, investment, and perhaps broader national consultation and planning (eg with Land Use Planners), should be undertaken with respect to future management of treated material generally. This may include further investment into Research and development, such as consideration of stabilization perhaps within a building materials production process (eg cement on runways), use of soil additions to enhance fertility and restore soil structure (should toxicity levels meet appropriate standards), or what have you. But this can contribute to the overall cost of using a particular technology.

More general advice:

Remediation work should not commence unless there is clear characterization of contaminants, a "cradle to grave" assessment of employing a particular technology, and it is certain that there are sufficient financial and other resources to complete the job. There is a tendency for gross underestimation of costs at the start of a remediation due to the uncertainty of the magnitude of contamination ahead of the commencement of remediation work, so often characteristic in GEF client countries. In the absence of such precautions, one can end up with a half finished job, with (re-)mobilised pollutants, and exacerbated risks to environmental and human health. As such, some form of completion guarantee in the form of Government backstopping could be useful, as was done in the Belarus POPs burial site cleanup, where more POPs waste was found than estimated, but the government did the extra work to get it clean up and secured (see http://www.worldbank.org/en/news/feature/2013/01/28/belarus-neutralizing-dangerous-chemical-stockpile). In the absence of such, it may be wiser to simply present the definition of problem and commercial configuration plan, and not begin the remediation until better guarantee can be made that it can be carried out to completion.

Technology selection and evaluation should draw on the large body of existing work, such that there is not a tendency to "reinvent the wheel", whilst retaining the ability to improve on the knowledge base. There is some anecdotal evidence that in the POPs destruction area, there was an artificial creation of "POPs destruction technologies", when in the commercial world, POPs were but a subset of chlorinated wastes that could be handled en masse. This artificial divide, however, meant there was a myopic approach to possible applications, and to recognition of shared experience that may have been mutually beneficial. Therefore as remediation projects become more frequent, it would be good to avoid the lack of coordination and sharing of lessons amongst similar GEF projects, and not tapping into global research and knowledge gained both inside and outside of the GEF, where it may exist (eg use of STAP products, Convention technical guidance and other training materials, etc). Remediation work should also try to draw on the extensive global experience on remediation and research that exists within key government agencies (eg EPA's

assessment of non-combustion remediation technologies http://www.clu-in.org/download/remed/POPs_Report_FinalEPA_Sept2010.pdf ).
Further, the capacity of national partners should be built as well, perhaps using elements from training guides such as the 2002 Basel Secretariat training manual "Destruction and Decontamination technologies for PCBs and other POPs Wastes under the Basel Convention: A Training Manual for Hazardous Waste Project Managers" (http://archive.basel.int/meetings/sbc/workdoc/TM-A.pdf). Though largely (but not exclusively) targeted to PCBs, and published a considerable time ago, it still has some utility in pointing out useful operational planning steps and stages that apply to any disposal or remediation project, and would amply inform the steps to be considered within any project. More research on lessons learned and planning/training materials would help ensure there are proper checks in place for the uncertainties for which remediation projects are prone.

POPs Disposal Aspects

With respect to the PCB disposal aspects of the project, as a reminder, the STAP trusts that the eventual project document will also consider all of the elements that constitute environmentally sound disposal. The STAP Advisory document on POPs Disposal Technology in GEF Projects, focuses on what exactly constitutes environmentally sound disposal of POPs, and what disposal technologies can achieve it. This follows initial contributions from the GEF (through the STAP) in 2003/2004 in relation to available non-combustion technologies for POPs disposal; and apart from this, the Basel Convention, acting in concert with the Stockholm Convention, has issued and periodically updates technical BAT/BEP guidelines on POPs management. This guidance includes 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. There have also been comprehensive reviews of technologies which are periodically published, and on-line libraries of technology data sheets are maintained by the Basel Convention and supporting organizations. 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 (SC-5/9). Likewise, in its decision SC-5/20, 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).

The findings of the document state, inter alia, that:

".... the destruction or irreversible transformation of POPs in an environmentally sound manner is not limited by the availability of appropriate technologyâ€"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."

Therefore based on the aforementioned background:

a) In developing the project document and determining disposal options, action should be taken to incorporate the Stockholm/Basel and GEF guidance on technology selection for POPs disposal and the overall development of the ESM system for PCBs. This would ensure that a comprehensive set of parameters be used to select technologies for GEF investment (e.g. environmental performance, ability to manage residuals and transformation products of the destruction and decontamination processes, full assessment of pre-treatment steps required and attendant associated risks, and required resources and capacities to manage them). Explicitly following of the aforementioned scientific guidelines would be desirable in the course of project development, implementation, and monitoring and evaluation. This would also ensure that the true costs of a technology are brought to light since pre-destruction steps (eg. characterization of the PCB congeners to be handled, mass or volumes to be treated, prioritization, capture and transport, containment and pre-treatment) can carry their own significant resource and capacity burdens, and can often be the barrier to implementation of technologies. Definition of environmentally safe low POPs concentrations would also be clearer and kept consistent with best practices.

b) The dangers of informal, repurposed use of POPs containing containers should be included in any targeted awareness in stakeholder communities. There may be a large gender component to this (eg if women do water collection and other gathering of food etc using repurposed containers). But this may or may not be a problem in Serbia.

c) The document does not take into account the Climate Vulnerability risks, and the role Climate can play in prioritising sites for action. Apart from their high log KOW values which permit strong adsorption to nonpolar surfaces (eg organic carbon) and lipophilic matrices in food chains (both aquatic and terrestrial, PCBs are marked by a number of chemical and physical characteristics, not the least of which are:- a) the myriad of congeners in existence, with attendant different levels of chlorination, b) the difference in behaviours and break down products of these congeners when released to the environment, c) the difference in their degree to be metabolised and non-uniform break down products within organisms, d) their readiness to volatise when spread over soil and water surfaces, e) their short atmospheric residence times (in the order of months), allowing them to vaporize and be re-deposited, cycling back between land and waters surfaces and air. Given these characteristics alone, it is hardly surprising that site-specific uniqueness has played a role in the recorded behaviour of PCBs in contamination cases around the globe. When one further considers that Climate Change is impacting, inter alia, on atmospheric temperature, rainfall regime, storm frequency and attendant drought/flood cycles, it is clear that in considering the potential impacts of PCB releases, it is equally important to look at the physical-chemical characteristics of the congener along with the natural geological and hydrological features of the area of contamination, and the fluctuating atmospheric conditions (temperature, rain, wind, vulnerability to storms etc) of the sites eventually selected.

| *STAP advisory response* | *Brief explanation of advisory response and action proposed* |
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| 1. **Consent** | STAP acknowledges that on scientific or technical grounds the concept has merit. However, STAP may state its views on the concept emphasizing any issues where the project could be improved.<br><br>Follow up: The GEF Agency is invited to approach STAP for advice during the development of the project prior to submission of the final document for CEO endorsement. |
| 2. **Minor revision required.** | STAP has identified specific scientific or technical challenges, omissions or opportunities that should be addressed by the project proponents during project development.<br><br>Follow up: One or more options are open to STAP and the GEF Agency:<br>(i) GEF Agency should discuss the issues with STAP to clarify them and possible solutions.<br>(ii) In its request for CEO endorsement, the GEF Agency will report on actions taken in response to STAP's recommended actions. |
| 3. **Major revision required** | STAP has identified significant scientific or technical challenges or omissions in the PIF and recommends significant improvements to project design.<br><br>Follow-up:<br>(i) The Agency should request that the project undergo a STAP review prior to CEO endorsement, at a point in time when the particular scientific or technical issue is sufficiently developed to be reviewed, or as agreed between the Agency and STAP.<br>(ii) In its request for CEO endorsement, the Agency will report on actions taken in response to STAP concerns. |