



REQUEST FOR CEO ENDORSEMENT

PROJECT TYPE: Medium-sized Project

TYPE OF TRUST FUND: GEF Trust Fund

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PART I: PROJECT INFORMATION

Project Title: Implementation of BAT and BEP for reduction of UP-POPs releases from open burning sources			
Country(ies):	Armenia	GEF Project ID: ¹	5038
GEF Agency(ies):	UNIDO(select)(select)	GEF Agency Project ID:	120228
Other Executing Partner(s):	Leading agency: Hazardous Substances and Waste Policy Division, Ministry of Nature Protection of the Republic of Armenia Cooperating agency: Waste Research Center - State Non-commercial Organization.	Submission Date: Re-submission date:	10-10-2014 11-24-2014 12-19-2014
GEF Focal Area (s):	Persistent Organic Pollutants	Project Duration(Months)	24 months
Name of Parent Program (if applicable):		Project Agency Fee (\$):	81,035
	<ul style="list-style-type: none"> ➤ For SFM/REDD+ <input type="checkbox"/> ➤ For SGP <input type="checkbox"/> ➤ For PPP <input type="checkbox"/> 		

A. FOCAL AREA STRATEGY FRAMEWORK²

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount (\$)	Cofinancing (\$)
(select)CHEM-1	Outcome 1.3 POPs releases to the environment reduced.	Output 1.3.1 Action plans addressing un-intentionally produced POPs under development and implementation.	GEF TF	500,000	1,800,000
(select)CHEM-1	Outcome 1.5 Country capacity built to effectively phase out and reduce releases of POPs.	Output 1.5.1 Countries receiving GEF support for the implementation of the Stockholm Convention.	GEF TF	353,000	1,588,420
(select)(select)			(select)		
(select)(select)			(select)		
(select)(select)			(select)		
(select)(select)			(select)		
(select)(select)			(select)		
(select)(select)			(select)		
Total project costs				853,000	3,388,420

B. PROJECT FRAMEWORK

¹Project ID number will be assigned by GEFSEC.

² Refer to the [Focal Area Results Framework and LDCF/SCCF Framework](#) when completing Table A.

Project Objective: Reduce UP-POPs releases in open burning sources in Armenia through the introduction of BAT and BEP and create capacity within the Government and private sector on BAT and BEP implementation						
Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Grant Amount (\$)	Confirmed Cofinancing (\$)
1.Regulatory framework and institutional strengthening	TA	National regulatory and enforcement infrastructures in place to assure continuous release reduction of Annex C POPs from open burning sources	1.1: Waste management regulatory framework updated 1.2: Adequate management capacity built in implementing BAT/BEP and waste management practices 1.3: Adequate capability strengthened in monitoring activities and in evaluating and reporting data of U-POPs releases	GEF TF	183,000	1,180,000
2.Promotion of BAT/BEP at selected demonstration locations	Inv	Annex C POPs releases into the environment are gradually reduced from open burning activities	2.1 Cost and benefits of the available BAT/BEP measures for reducing Annex C POPs releases from open burning assessed 2.2 Pilot demonstration activities carried out in a selected site promoting waste reduction, re-use, recycle and BAT/BEP implementation	GEF TF	490,000	1,448,420
3.Awareness and dissemination	TA	Project activities are sustainable and replicated	3.1 Awareness raising campaigns implemented 3.2 U-POPs from open burning and chemical safety of waste management related matters incorporated into educational curricula	GEF TF	100,000	560,000
4. Monitoring and Evaluation	TA	Project objectives attained	Effective monitoring and evaluation implemented	GEF TF	40,000	40,000
	(select)			(select)		
	(select)			(select)		
	(select)			(select)		
	(select)			(select)		
Subtotal					813,000	3,228,420
Project management Cost (PMC) ³				(select)	40,000	160,000
Total project costs					853,000	3,388,420

C. SOURCES OF CONFIRMED COFINANCING FOR THE PROJECT BY SOURCE AND BY NAME (\$)

Please include letters confirming cofinancing for the project with this form.

³PMC should be charged proportionately to focal areas based on focal area project grant amount in Table D below.

Sources of Co-financing	Name of Co-financier (source)	Type of Cofinancing	Cofinancing Amount (\$)
National Government	Ministry of Nature Protection	In-kind	500,000
Other Multilateral Agency (ies)	European Union Framework of the European Neighborhood and Partnership Instrument	In-kind	1,084,000
Other Multilateral Agency (ies)	Asian Development Bank	In-kind	750,000
Local Government	Ararat Municipality	Cash	443,460
Others	Research Centre for Toxic Compounds in the Environment	In-kind	300,000
Others	Bureau for Chemical Substances Poland	In-kind	210,960
GEF Agency	UNIDO	Cash	40,000
GEF Agency	UNIDO	In-kind	60,000
Total Co-financing			3,388,420

D. TRUST FUND RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY¹

GEF Agency	Type of Trust Fund	Focal Area	Country Name/ Global	(in \$)		
				Grant Amount (a)	Agency Fee (b) ²	Total c=a+b
(select)	(select)	(select)				
(select)	(select)	(select)				
(select)	(select)	(select)				
(select)	(select)	(select)				
(select)	(select)	(select)				
(select)	(select)	(select)				
(select)	(select)	(select)				
(select)	(select)	(select)				
(select)	(select)	(select)				
Total Grant Resources						

¹ In case of a single focal area, single country, single GEF Agency project, and single trust fund project, no need to provide information for this table. PMC amount from Table B should be included proportionately to the focal area amount in this table.

² Indicate fees related to this project.

F. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

Component	Grant Amount (\$)	Cofinancing (\$)	Project Total (\$)
International Consultants	84,000	40,000	124,000
National/Local Consultants	127,000	123,000	250,000

G. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? No

(If non-grant instruments are used, provide in Annex D an indicative calendar of expected reflows to your Agency and to the GEF/LDCF/SCCF/NPIF Trust Fund).

PART II: PROJECT JUSTIFICATION

A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN OF THE ORIGINAL PIF⁴

A.1 National strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NAPs, NBSAPs, national communications, TNAs, NCSA, NIPs, PRSPs, NPFE, Biennial Update Reports, etc

The information presented in this document builds on those reflected in the PIF. Minor revisions have been made to further strengthen and elaborate certain components. Outputs in Components 1 and 3 were merged and restructured to fully correspond to the desired outcome. Minor changes have been introduced to differentiate outputs versus activities. The budget was also reallocated to fully reflect the project needs.

Further elaboration of the PIF elements are provided in the following section:

1. The project is consistent with the national priorities set out in the NIP of the Government of Armenia in particular with the minimization/elimination of POPs releases into the environment and with the application of BAT/BEP principles as background for the development of the strategy for future industrial progress. More specifically, it is consistent with the following relevant activities required to implement priority goals described in the Annex 1 of the NIP: (a) development and adoption of normative documents for sound chemicals and wastes management; (b) introduction of normative acts for development and establishment of the Register on POPs and POPs-containing wastes; (c) set up of the State Register on the sites/entities, at which POPs-containing wastes are generated, processed, utilized, and disposed; (d) development of guidance and handbooks/manuals; (e) development of regulatory /legislative acts required for remediation of actions at contaminated sites; (f) evaluation of possibilities to apply alternative methods for PCDD/PCDF emission reduction and update the inventory on PCDD/PCDF releases; (g) review and evaluation of the main sources of PCDD/PCDF and emission factors; (h) determination/ selection of methods for PCDD/PCDF wastes disposal/destruction in an environmentally sound way and POPs releases reduction from dumps/landfills; (i) evaluation of environmental and economic efficiency of preventive measures application; (j) development of tools/mechanisms for identification of contaminated sites/areas; (l) creation and handling of Register of POPs contaminated sites; (m) strengthening the awareness of general public on POPs issues, risks, consequences and required mitigation measures; (n) establishment of POPs Central Analytical Laboratory to perform constant monitoring programmes, analyses and ecological control aimed to solve POPs problems relevant to the implementation of the Stockholm Convention; (o) strengthening of already established 15 Aarhus Regional Centers for ecological education in 11 marzes (regions) of Armenia; the Centers facilitate active participation of public in decision-making, as well as activities aimed at environmental governance; (p) development of a concept for long-term POPs monitoring aimed to facilitate implementation of the Stockholm Convention.
2. More specifically, the measures taken for reduction of the amounts of hazardous wastes and other waste are involved in all the strategy documents of the country, such as:
 - Millennium Development Goals (2000-2015);
 - Governmental Action Plan (2008 -2012);
 - National Environmental Action Plan (NEAP) (2008-2012);
 - National Poverty Reduction Strategy;
 - Republic of Armenia Sustainable Economic Development Strategy;
 - Republic of Armenia Agricultural Sustainable Development Strategy;
 - European Neighborhood Policy (2009-2011);
 - Republic of Armenia National Security Strategy.
 - Individual Partnership Action Plan (IPAP): Armenia / NATO.

A.2. GEF focal area and/or fund(s) strategies, eligibility criteria and priorities.

3. The proposed project is consistent with the objectives set by GEF-5 to promote the sound management of chemicals throughout their life cycle in ways that lead to the minimization of significant adverse effects on human health and

⁴ For questions A.1 –A.7 in Part II, if there are no changes since PIF and if not specifically requested in the review sheet at PIF stage, then no need to respond, please enter “NA” after the respective question.

the global environment. It addresses Chemicals FA objective CHEM-1 "Phase out POPs and reduce POPs releases"; Outcome 1.3 "POPs releases to the environment reduced and Output 1.5 "Country capacity to effectively phase out and reduce releases of POPs". The project focuses on the demonstration of BAT/BEP to reduce releases of unintentionally-produced POPs in pilot locations prioritized by the Government of Armenia. It also puts importance to regulatory and institutional strengthening and awareness raising of relevant stakeholders to effectively manage waste management initiatives in the country.

A.3 The GEF Agency's comparative advantage:

4. The project falls within the comparative advantage of UNIDO. It involves initiatives for technological solutions and best environmental practices to address the impacts of open burning activities which is within the functions and mandate of the organization addressing its Energy and Environment Thematic Priority. UNIDO has expertise with the waste recycling industry and has a large pool of experts on this subject to provide technical assistance. UNIDO has developed a range of demonstration and capacity building projects geared to support the implementation of the Stockholm Convention. The organization has successfully implemented projects focused on the introduction of BAT/BEP in priority industrial source categories including but fossil fuel-fired utilities and industrial boilers, metallurgical industries and waste incineration. It has built partnerships with several institutions with regard the issue of UP-POPs in general and these will be tapped for the project. It has also long experience in private sector involvement and sectoral development.

A.4. The baseline project and the problem that it seeks to address:

A.4.1 Overview of the Baseline situation

A.4.1.1 Waste management practices in Armenia

5. Currently, the quality and coverage of waste collection in Armenia is better in urban centers than in rural areas, but generally the collection and transportation equipments are outdated and insufficient to deliver a regular service. At the same time, minimal wastes sorting (separation at source) is practiced. There is no plant for waste treatment, recycling, utilization, and the appropriate specialized polygons for hazardous wastes are lacking.
6. As in other countries, in Armenia almost all industrial and municipal wastes are disposed to landfills without separation and open burning of waste is common, because it is the cheapest, easiest, most sanitary means of volume reduction and disposal of combustible materials, though the incomplete burning is not efficient to reduce the sanitary risks due to the pathogens present in the waste. In urban areas, it can be expected that municipal waste is mainly composed by food residues, packaging of goods and some hazardous wastes (such as batteries and electronic devices), whereas in suburban or rural zone these shares can decrease in favor of country specific agricultural wastes.
7. Hazardous wastes streams are commonly diverted to some uses other than final disposal, or mixed and disposed of with other waste streams. Among them, contaminated ashes from processes (incinerators, cement kilns or industrial boilers) are often dispersed in open dedicated fields and waste oils are burnt. Medical waste collection and management in large hospitals is usually carried out. In Armenia there are 4 entities, (Ecologia W.K.H", Center of Health Development LLC, EcoProtect» Ltd. and Yerevan State Medical University after M. Heratsi), which treat/destroy these specific wastes and have appropriate licenses in accordance with Decision of the Government of the Republic of Armenia "On the order of licensing for activity on processing, treatment, storage, transportation, and placement of hazardous wastes in the Republic of Armenia" (No. 121-N dated January 30, 2003). However, in many small hospitals, and especially in remote countryside and private clinics, it is common that waste is not collected at all for special treatment. Among the side effects, the uncontrolled disposal and breakage of mercury-containing devices (such as thermometers and blood pressure meters) has as consequence the release of this global contaminant in the environment.

A.4.1.2 Relevant legislative aspects in Armenia

8. The legislation of the Republic of Armenia does not specifically apply U-POPs and in particular those generated as by-products in open burning of waste and there is no reference to the Best Available Techniques (BAT) and Best Environmental Practice (BEP). The existing legislation does not directly define the obligations/ responsibility of state

and private sectors in concern of POPs management during the entire life-cycle from the production to destruction, as well as remediation of POPs polluted sites; therefore, so far, by the legislative point of view, POPs and U-POPs from open burning are indirectly addressed by a number of the laws and other legal acts described hereafter and aimed at prevention of the harmful impact of chemicals and wastes to the environmental and human health. In particular, there are direct implication for POPs in the laws, other legal acts and international environmental agreements regulating the hazardous waste management in the Republic of Armenia.

9. The main regulatory framework is defined by the “Law on Waste” of the Republic of Armenia. The law is aimed to regulate the legal and economic basis of the relations arising from the collection, transport, storage, disposal, recycling, re-use, reduction of waste and other relations arising from above mentioned activities and also the prevention of adverse impacts of the generation and management of waste on human health and environment. Waste generated from production and consumption process is covered by this law. Some type of waste are not covered. The law also defines the rights and the obligations of state and local authorities involved of waste management. The law mainly defines the authorities of state bodies involved of waste handling, the waste disposal limits, the waste state cadastre, the waste register, the waste statistics, the waste identification, the rights and duties of physical and legal persons as far as concerns waste handling, the waste disposal sites. Article 7 of the same law defines that hazardous waste treatment, neutralization, storage, shipment and disposal/placement are subject to licensing in the Republic of Armenia.
10. The Order of the Minister of Nature Protection of 26 October 2006 N 342-N specifies the list of consumption and production waste generated in Armenia. The Order of the Minister of Nature Protection of 25 December 2006 N 430-N classifies four classes of waste by hazard (1st class is the most dangerous). Household waste is classified as 4th class. It is worth mentioning that sorted waste from residential areas is not included in the order and therefore it is not considered as hazardous waste.
11. The Republic of Armenia “Law on nature use and nature protection payments” (1998) regulates environmental fees and related payments for use of nature goods owned by the State, in order to compensate the harm caused to the environment; In accordance with the Law, environmental payments are compulsory and should be directed to the state budget, in order to get the financial resources necessary for the implementation of environmental actions.

The main classes of emission for which environmental fees are defined are: (i) release of harmful substances to the environment (atmospheric air and water); (ii) placement of industrial and household waste; (iii) articles/goods causing harm to the environment.

12. Fees are aimed at establishment of equal conditions for economic entities, which use the natural resources for industrial production processes. Fees are set for water use, exhausted natural resources and use of bio-resources. The rates of environmental fees are defined by the Law, while the fees for nature use are fixed by the Government of the Republic of Armenia. Payments are calculated quarterly by the above-mentioned types of resources. Following the above considerations, the Republic of Armenia Law “On nature protection payments” (245-N of December 27, 2006) sets new rates of nature protection fees and the procedure for their calculation instead of the rates defined by the previous regulatory document of FY 2000. The rates of nature protection fees are defined for releases of hazardous substances to the environment, placement of industrial and household wastes in the environment (the rates are set for each ton of wastes depending on the class of hazard) and goods causing harm to the environment. The latter fees are calculated on the basis of customs value of the goods and paid to the state budget as appropriate while either importing or exporting goods. Nature protection fees for commodities produced and realized in Armenia and causing harm to the environment are calculated by the producer based on the volumes of turn-over realized. The payments are done proportionally to volumes of realized production for the reporting period.

According to article 3 of the Republic of Armenia Law “On nature protection payments” (245-N of December 27, 2006) the fees supposed for placement of industrial and household wastes are as follows:

Class 1 - extremely hazardous wastes: 48,000 AMD (≈US\$ 117)

Class 2 – highly hazardous wastes: 24,000 AMD(≈US\$ 58)

Class 3– moderately hazardous wastes: 4, 800 AMD ((≈US\$11.7)

Class 4 – low- hazard wastes: 1,500 AMD(≈US\$3.7)

Class 5 - non- hazardous wastes (except wastes placed by mining-extraction operating legal persons and wasted generated due to soil surface destruction, as well as construction/ demolition non-hazardous wastes): 600 AMD(≈US\$1.5)

Wastes placed by mining-extraction operating legal persons: 0 AMD

Wastes due to soil surface destruction, as well as construction/demolition non-hazardous wastes: 60 AMD(≈US\$ 0.15)

*Exchange rate: 1US\$ = 408.4 AMD

13. In Armenia, not only normative acts (which have binding character) but also Governmental protocol decrees (which do not have binding character, but advisory character) were adopted. Among the main ones, the Protocol Decree of 19 November 2009 N 48 confirms the specific indicators of generation of main types of production and household waste and set up the list of waste generated from different technological processes. The Protocol Decree of 19 February 2009 N 8 amends the previous one and include the revised National Profile on chemicals and waste management in the Republic of Armenia. The Protocol Decree of 23 July 2009 N 30 regulates the conditions of safe management of construction and demolition waste.
14. The Decree of the Government of the Republic of Armenia on 19 January 2006 N 47-N “Setting up regulations of waste identification” is aimed to regulate waste identification procedures and defines the waste identification document (Passport), which must be compiled by each waste holder with data concerning the quality, quantity and nature of waste generated by waste producer.
15. The waste registration procedure is also defined by the Decree of the Government of the Republic of Armenia on 7 December 2006 N 1739-N “Setting up regulations of waste state registration”. The aim of waste state registration is to set up a database of quantity of waste generated in the Republic of Armenia. The database is necessary for establishment and management of State Waste Cadastre..
16. The Decree of the Government of the Republic of Armenia on 14 September 2006 N 1343-N on “On defining the order of wastes accounting in accordance to wastes generation, disposal (elimination, treatment, placement) and use” defines the regulations of waste registration and re-use. Registration of waste is a system of continuous update of the documentary information, which contains information on waste management and qualitative and quantitative indicators of waste. The Decree applies to waste holders, who must primarily implement waste registration.
17. The Decree of the Government of the Republic of Armenia on 20 April 2006 N 500-N “On establishing the procedure for maintaining the register of waste generation, recycling and utilization facilities” regulates the order of management of registers for recycling and re-use operations.
18. Establishment and management of Waste State Cadastre is based on information submitted by natural and legal persons in the framework of the Governmental Decree of RA “Laying down the order of waste identification”, Governmental Decree of RA “Laying down the order of register management of establishments and undertakings carrying out waste generating, recycling and re-use operations” and the Governmental Decree of RA “Laying down the order of waste disposal site register”. This information includes data on generation, type, composition, qualitative and quantitative characterization of waste, the class of hazard, disposal sites, the use and neutralization of waste.
19. Creation of Waste State Cadastre aims to make waste management ecologically more efficient. It will also help waste producers to use best available technologies in the field of waste recycling and re-use. The database contains information on all production and consumption waste quantity generated in the Republic of Armenia Establishment and management of the State Waste Cadastre is based on information submitted by natural and legal persons in the framework of the above Decrees. This information includes data on generation, type, composition, qualitative and quantitative characterization of waste, the class of hazard, disposal sites, the use and neutralization of waste. Creation of Waste State Cadastre aims to make waste management ecologically more efficient. It will also help waste producers to use best available technologies in the field of waste recycling and re-use. The database contains information on all production and consumption waste quantity generated in the Republic of Armenia
20. Finally, the Decree of the Government of 27 April 2007 N 97-N, provides general requirements for the estimation of generated waste and provides draft limits to be met in waste disposal sites.

21. The licensing process is more detailed regulated by the “Law on Licensing” and by the resolution of the Government of January 30, 2003, No.121-N. The licence is issued by the Government based on the conclusion of the inter-agency commission, composed by the representatives of the competent state governance bodies and experts in this field, with the supervision of the Ministry of Nature Protection and Ministry of Health.
22. The legislation addressing landfill management in the Republic of Armenia mainly consists of: (i) the Law on Waste of the Republic of Armenia; (ii) the Law on environmental impact assessment of the Republic of Armenia. (iii) the Law on Waste Disposal and Sanitary Cleaning of the Republic of Armenia; (iv) the Law on Licensing of the Republic of Armenia; (v) the Law on Local Self-Government.
23. The registry of waste disposal sites, according to article 16 of the “Law on waste” is managed by the Ministry of Nature Protection. The registry is based on the appropriate waste passports and waste producers’ reports. The monitoring of disposal sites is envisaged by article 17 of the Law on Waste, but it must be mentioned that the legislation does not indicate monitoring procedure.
24. According to the “Law on Environmental Impact Assessment”, several activities on hazardous waste are also subject to environmental impact assessment, such as their disposal and the choice of waste disposal facilities. The disposal (or treatment for disposal) of hazardous and other waste and the management of waste disposal facilities are subject to environmental impact assessment:
25. The “Law on waste collection and sanitary cleaning” regulates the relevant activities in the country, the waste collection fees, the framework of fee payers, their rights and obligations etc.. The law also defines waste collection and storage requirements. One of the principles of waste collection and sanitary cleaning, according to the Law, is to provide conditions for sorting, recovery and re-use of recoverable waste and the reduction of quantities of waste in landfills. The law also defines requirements to waste placement/disposal. The waste must be disposed of in patented landfills or must be treated. The placement/disposal of waste in landfills must be carried out in accordance to sanitary, hygienic and landfill exploitation norms. Waste placement/disposal in not specified places or areas is prohibited. The Code on Administrative Offences of the Republic of Armenia provides responsibility for illegal waste incineration.
26. According to Resolution of the Government of the Republic of Armenia of January 30, 2003, No.121-N “On the approval of the procedure for licensing of recycling, treatment, storage, transportation and placement of hazardous waste in the Republic of Armenia”, the licence for recycling, treatment, storage, transportation and placement of hazardous waste in the Republic of Armenia is issued by the Government of the Republic of Armenia (referred to as “licensing body”) based on the conclusion of a inter-agency commission.
27. According to the “Law on Local Self-Government” concerning competencies of the local government bodies, they must ensure protection against the landslides, floods, waterlogging, swamping, as well as against pollution by chemical, radioactive substances and industrial wastes. Local bodies are in charge to supervise garbage collection, to compile the schemes of sanitary cleaning of territories, to close uncontrollable and unauthorized waste dumpsites and to organize the participation of the population in the collection of not hazardous waste that can be regarded as valuable resource. Local bodies can participate in the formulation of national policies and programs in waste management, can draft local programs, issue permits in coordination with the authorized state body for waste disposal, draft sanitary cleaning schemes and supervision over garbage collection, compile records for waste generation, recycling, disposal and utilization facilities and manage site decontamination. Local self-government bodies, according to the resolution of the Government of the Republic of Armenia of July 13, 2006, No.1180-N “On adoption of the procedure to maintain the register of waste disposal sites” also must proceed with the registration of waste disposal sites as authorized landfills according to legislation.
28. The Administrative offences’ Code and the Criminal Code of the Republic of Armenia provide responsibility for several illegal activities in the sphere of hazardous waste handling

A.4.1.3 Institutional settings relevant to waste management

29. According to Government Resolution of May 19, 2005 No. 599-N on the designation of the authorized body in the sphere of waste utilization, and to the Annex 1 to Resolution of August 8, 2002, No. 1237-N, RA Ministry of nature protection was designated as the authorized waste management body and has the following competences:

- environmentally safe management of hazardous chemicals and wastes produced and used in the country;
 - drafting procedures for state monitoring of the environment, including waste disposal sites;
 - hazard-based classification of chemicals and generated industrial and consumption waste produced and used in the country;
 - creation of a state cadastre and a register for waste generation, recycling and utilization facilities and disposal sites, and defining the maintaining procedure.
30. The Hazardous Substances and Wastes Policy Division, as a structural subdivision of the Ministry of Nature Protection of the Republic of Armenia is the focal point of:
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal;
 - Stockholm Convention on Persistent Organic Pollutants (POPs);
 - Rotterdam Convention on the prior Informed Consent Procedure for Certain Hazardous Chemicals and pesticides in International Trade;
 - UNECE Convention on Transboundary effects of Industrial accidents;
 - Strategic Approaches in International Chemicals Management (SAICM);
 - Environment and Health WHO Initiative.
 - The Hazardous Substances and Wastes Policy Division coordinates Minamata Convention related activity.
31. The Hazardous Substances and Wastes Policy Division in the frameworks of its responsibilities regulates the problems dealing with chemicals and wastes. It performs the following activities:
- Develop concepts and strategy, as well as programs aimed at management of chemicals and wastes;
 - Develop drafts of the legislative acts on chemicals and waste management;
 - Carry out Inventory of wastes generated on the territory of the Republic of Armenia;
 - Analyze of risks degree at enterprises, on the territory of which there is production, use of chemicals and wastes, which are potentially subject to industrial accidents, as well as inventory/accounting of a.m. enterprises;
 - Coordinate activities dealing with chemicals and wastes management, as well as classification of chemicals produced and used and wastes generated on the territory of Armenia, according to degree of hazard.
 - Expertise of Safety Passports for the hazardous industrial entities.
32. The Hazardous Substances and Waste Policy Division coordinated the implementation of the following projects:
- UNIDO/GEF Project “Enabling Activities to Facilitate Early Action on the Implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs) in the Republic of Armenia” (2002-2004);
 - UNITAR Programme “Strengthening the Integrated National Programme of Chemicals and Waste Environmentally Sound Management in the Republic of Armenia” (2004-2006);
 - UNDP Country Office (Armenia) project “Strengthening waste integrated management in Armenia” (2006);
 - UNITAR project «Design of a National PRTR System to Strengthen Capacity Building Activities for the implementation of Stockholm Convention on POPs in Armenia” (2007-2009);
 - UNIDO/GEF Project “Enabling activities to review and update the National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (POPs) (2013);
 - UNIDO/GEF Project “Implementation of BAT and BEP for reduction of UP-POPs releases from open burning sources in Armenia” (2013).
 - Other projects were coordinated and jointly participated with the Waste Research Center (WRC) as described hereafter.

33. According to the above cited Government Resolution of May 19, 2005 No. 599-N, the dedicated structural unit of the Nature Protection Ministry in charge of hazardous material and waste functions is the State Non-Commercial Organization “Waste Research Center” (WRC). The “Waste Research Center” facilitates development and implementation of the State Policy and strategy in the area of waste management, as well as secure environmentally sound management of chemicals. Its activity consists in the classification of waste generation, recycling and utilization facilities and disposal sites, as well as the collection and analysis of information on waste utilization and decontamination, low-waste and wasteless technologies. The Center is engaged in issues relevant to waste inventory, in the classification according to the hazard degree, in research activity to study the unfavourable impact of waste disposal sites towards the environment, developing normative acts (regulations and standards) in the area of waste management, as well as in the analysis of information on low-waste and waste-free technologies. WRC is also engaged in the collection of samples of different environmental media and in the following analytical analyses. The WRC is participating in the implementation of the Project “Training and Capacity Building for the Development of a Nano-safety Pilot Project in Armenia” (UNITAR) (2014-2015).
34. The Waste Research Center coordinated and jointly participated with the Hazardous Substances and Waste Policy Division in the implementation of other projects as follows:
- UNIDO/GEF Project “Establishment and Operation of a National Cleaner Production Programme in Armenia” (NCP) (2006-2008);
 - UNIDO/GEF Project “Technical assistance for environmentally sustainable management of PCBs and other POPs waste in the Republic of Armenia” (GF/ARM/08/002) (2009- 2012);
 - NATO Science for Peace Programme (SfP) Project “Inventory, Monitoring and Analysis of Obsolete Pesticides in Armenia for Environmentally Sound Disposal” (NATO SfP – Armenia Pesticides) (2009- 2012);
 - SAICM/UNEP project “Armenia and UNEP Partnership Initiative for Sound Management of Chemicals and Implementation of SAICM in Armenia” under the framework of the Quick Start Programme (QSP) of the Strategic Approach to International Chemicals Management (2009-2010);
 - UNEP/ SAICM QSP project “Training on risk assessment of chemicals at national level in a global context” in the Republic of Armenia, (2012-2014).

A.4.1.3 Inventory of dumpsites and the issue of Open Burning

35. During the PPG phase some questionnaires were distributed in order to collect the most updated information on the number and types of dumpsites/landfill and practices of open burning for agricultural waste in the country. The survey is still ongoing and will be continuously updated during the project implementation, but some general figures are hereby presented. It is confirmed that municipal waste disposal is mainly addressed in local dumpsites. Currently, there are 48 urban dumpsites (of which 11 without permission to operate) and in 869 rural communities there are only 274 (32%) rural dumpsites (of which 178 without permission to operate) and many other non-organized dumpsites for an estimated total of 429.
36. In 10 marzes (provinces) of Armenia and Yerevan (the capital city) the total surface of the functioning dumpsites of household wastes (both urban and rural) accounts for about 622.04 hectares (ha), of which about 148.1 ha are operated without permission. Total quantity of wastes accumulated in urban dumpsite is 2,782,476.8 Tons and that accumulated in rural dumpsites is 2,856,113 Tons. The majority (if not the entire number) of those sites do not correspond to sanitary requirements, and have the characteristics described above. Constant burning and smouldering of wastes at many dump sites (intentionally by scavengers with the target to recover recyclables and reduce the volume or, in a minor fraction, accidentally generated due to ignition of methane emissions in summer time) produce environmental pollutants such as U-POPs. Moreover, the soil of open dumpsites contains great amounts of U-POPs. The provisional inventory is provided as Annex 1.
37. It is recognized that poor combustion due to insufficient air (smouldering phases typical of open burning), inhomogeneous and poorly-mixed fuel materials, the presence of chlorinated precursors and catalytic metals (copper, iron) are the main factors for the formation and releases of U-POPs in open burning processes. Releases from uncontrolled burning processes also include polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds

(VOCs), heavy and volatile metals (Pb, Cu, Cd, Hg, Mn) and particulate matter (PM10 and PM2.5). At the same time the lack of entities for e-waste treatment/ recycling and the dispersion of medical devices cause significant amounts of dangerous substances (metals and other types of persistent toxic substances) to penetrate into the waste dumps. According to expert data in Armenia 15,000 tons of e-wastes are generated annually.

38. As far as U-POPs are concerned, they can be emitted to the air, mainly associated with the smoke and dust formed in the burning process, and in solid residues. These contaminants can travel long distances and deposit on soil, plants, and transported with sediments with water. The remaining ash in the burnt pile also contains pollutants, which can spread into the soil and water. When washed away by the rain and floods, wastes and ash are spread into the soil and can reach ground water and the sea. Moreover, at all dumpsites some amounts of landfill gases (mainly methane and CO₂) are generated as a result of anaerobic decomposition of organic matter inside the waste dumpsite. Methane creates a powerful green-house effect. Current research indicates that the practice of open burning is a more serious threat to public health and the environment than previously thought. There is enough evidence that high levels of exposure over the long term, such as those experienced by waste management workers and scavengers, may contribute to increasing birth defects, fertility problems, greater susceptibility to disease, reduced intelligence and some types of cancers. Recent studies indicate that many UP-POPs may act as endocrine disruptor and acute exposure can even cause death.

A.4.1.4 Dioxin inventory for open burning sources in Armenia

39. Open burning covers a wide range of different uncontrolled waste combustion practices, including fires in waste dumps backyard fires, disposal of agricultural residues and forest fires. The UP-POPs inventory presented in the 2005 NIP of Armenia was based on the old emission factors of the UNEP Toolkit. It analyzed industrial and diffuse sources of PCDD/PCDFs releases. The trend from 1985 showed a dramatic decline in industrial production compared to the time of the fall of the Soviet Union. Since 1993, industrial production has been slowly but steadily increasing. In the NIP, some figures related to the past decade are provided in the following table. It can be seen that the waste burning activity was responsible for up to 90% of the total annual PCDD/PCDF releases and that uncontrolled combustion represents the highest share.

Table 2.23: National Register on Calculated Releases of PCDDs/PCDFs in the Republic of Armenia

Part	Source Categories	Annual Emissions (g TEQ/year)									
		2001					2000				
		Air	Water	Soil	Product	Residue	Air	Water	Soil	Product	Residue
I	Ferrous and non-ferrous metal production	1.601	-	-	-	0.666	1.533	-	-	-	0.811
II	Production of mineral products	0.0899	-	-	-	0.0008	0.0957	-	-	0.0007	
III	Production of chemicals, Consumer goods	-	-	-	17.5	-	-	-	0.0283	-	
IV	Miscellaneous	0.075	-	-	-	0.165	0.0002	-	-	-	
V	Waste combustion	0.5469	-	-	-	1.406	0.7155	-	-	1.8401	
VI	Uncontrolled combustion processes	3.174	-	0.834	-	0.834	25.99	-	43.346	43.346	
VII	Disposal (Landfill)	-	5.269	-	-	19.867	-	12.415	-	19.8	
VIII	Power generation and heating	No data	No data	No data	No data	No data	0.021	0	0	0.0162	
	TOTAL	5.4868	5.269	0.834	17.5	22.9388	28.355	12.415	43.346	0.0283	65.8140

Part	Source Categories	Annual Releases (g TEQ/year)									
		1999					1998				
		Air	Water	Soil	Product	Residue	Air	Water	Soil	Product	Residue
I	Ferrous and non-ferrous metal production	1.326	-	-	-	0.484	1.131	-	-	-	0.69
II	Production of mineral products	0.0968	-	-	-	0.0009	0.0631	-	-	0.001	
III	Production of chemicals, Consumer goods	-	-	-	0.0187	-	-	-	0.0629	-	
IV	Miscellaneous	0.0003	-	-	-	-	0.0002	-	-	-	
V	Waste combustion	0.3722	-	-	-	0.9571	0.2696	-	-	-	
VI	Uncontrolled combustion processes	No data									
VII	Disposal (Landfill)	-	11.165	-	-	20.2	No data	16.475	No data	No data	29.00
VIII	Power generation and heating	0.021	0	0	0	0.0162	0.021	0	0	0.0162	
IX	Transport	No data	No data	No data	No data	No data	0.66	0	0	0	
	TOTAL	1.8163	11.165	-	0.0187	21.6582	2.1449	16.475	-	0.0629	30.2772

40. This inventory figures were revised in 2013, taking in account the revision made by UNEP, that has drastically reduced the values of the relevant emission factors and the new data provided by updated source inventories in Armenia. As far as open burning processes is concerned, the updated inventory for year 2012 demonstrates that no significant changes are observed. Only in some cases, worse situation is reflected and this might be correlated with the data on volumes of burnt materials provided by the Ministry of Agriculture and the National Statistical Service of the Republic of Armenia.

41. In particular, as far as the subcategory of forest fires is concerned, in 2010-2013, in spite of the fact that the number of fires and biomass burning cases dramatically increased, the emissions of PCDD/PCDF into the air and soil significantly decreased. This is not associated with a decrease in the loss of biomass because of fires but with the decrease in values of emission factors. The total release if this subcategory is 3.54 mg TEQ/t.
42. As far as agricultural residues and wastes subcategory is concerned, the quantity of agricultural residues that might be burnt during a year depends on the crops yield. According to data of the Ministry of Agriculture of the Republic of Armenia, 56% of agricultural residues are burnt. Burning might occur during autumn or spring of the next year and this can hinder quantitative evaluation of the burning-related activity scales. The total release in air and to land account for 212.96 mg TEQ/a. It is evident that in a period of 2001-2012 the arable area under crop and the area covered by agricultural residues burning did not significantly change. However, PCDD/PCDF emissions decreased due to decreasing of coefficients used in UNEP Toolkit 2013.
43. As far as household wastes burning is concerned, the calculation were based on data of the National Statistical Service. It must be mentioned that the amount of burnt wastes in Yerevan has gradually decreased from 2395.9 t/year in 2007 to 0.6 t/year in 2012. The total is 6.86 mg TEQ/a in 2012.
44. Finally, the PCDD/PCDF emissions resulting from fires at dumpsites were calculated as 13,818.00 mg TEQ/a in 2012. Due to decrease of coefficients for PCDD/PCDF emissions to air, the emissions in the period of 2006-2012 were significantly decreased (about 3 times) as well. In UNEP Toolkit 2005 emissions to land were not considered, while in Toolkit 2013 the toxic equivalent was established at 10 mcg TEQ/t.
45. In conclusion the above four main subcategories give an overall release of 14,041.37 mg TEQ/a for year 2012, the main contribution coming from waste open burning in dumpsites. The full revised inventory regarding open burning activities is provided as Annex 2

A.4.2 Baseline project

46. The baseline projects associated with the project components are discussed on this section. During the PPG phase, the findings and results obtained in other projects/programmes were analyzed and the conclusion of some ongoing feasibility studies were assessed. Some of these projects were implemented (and some are about to start) to evaluate the best options to start implementing suitable waste management for Armenia. But, with the exception of the UNIDO PCB project, these projects on waste management do not consider Annex C POPs releases. This might be important especially when the increasing costs of waste management services have to be justified to the public. The main activities of these projects consider landfills set up and waste collection and disposal options.
47. The activities for institutional strengthening and update of the regulatory framework foreseen by the proposed project under Component 1 will build on the ongoing and future initiatives by the Government in addressing this issue. The action plans on this component are also well elaborated in the NIP document, i.e, (i) Improvement of legislative/regulatory background for regulation of POPs relevant issues; (ii) Setting up institutional capacities/structures and strengthening the interaction amongst Ministries and Agencies in taking joint action for prevention of their impact to human health and; (iii) Establishment of the Central Analytical Laboratory to ensure analyses and control on the environment.
47. On the issue of waste management in general, the Intergovernmental Board on Solid Waste Management worked out a Waste Management Plan for the Republic of Armenia, the Board includes representatives of various Ministries as well as independent experts. The plan was widely discussed among the stakeholders and revised, but has not been approved yet. Moreover, among the national plans, it must be cited that the Ministry of Urban Development (MUD) aims to build seven regional sanitary landfills to serve the whole country. According to the information collected during the PPG phase, Arabian, Swiss and French companies are interested in the waste management business in Armenia. The plan would enhance the country's regulatory framework on waste management and will focus on the provision of necessary infrastructures to address waste management in the country. However, in the latest version of the document, POPs or the deployment of BAT/BEP in this sector were not covered.
48. The Ministry of Nature Protection is the main partner in a Regional Waste Governance project financed by the European Union and implemented by the consortium EPTISA within the framework of the European Neighbourhood and Partnership Instrument for seven countries, namely Azerbaijan, Armenia, Belarus, Georgia, Moldova, Russia, and

Ukraine. The project started in 2009 and ended in 2013 but has still some ongoing activities. The project focused on the following: (i) Inventory of illegal wastes disposal sites; (ii) Strengthening of wastes classification practices; (iii) Development of pilot regional waste management strategies and; (iv) Information dissemination and capacity building. The main outputs of the project will serve as a strong foundation in looking at the POPs angle within the GEF project framework.

49. The Bureau for Chemical Substances, Lodz, Poland, under the framework of the Polish aid Program, is preparing and conducting a set of trainings on chemical management and environmental protection for specialists in Armenia, in order to facilitate economic integration with the European Union. The set of trainings and skills developed will be further enhanced by integrating the issues of POPs and BAT/BEP.
50. The EaP GREEN Regional Programme is implemented by European Commission, UNIDO, UNEP, UNECE, OECD. The UNIDO component on Clean Production is 500,000 EUR (675,000 US\$). Cleaner production strategies serve as the backbone for BAT/BEP implementation.
51. The project will also seek coordination with other initiatives and projects already carried out, such as the “Enabling activities to review and update the NIP for the SC on POPs GEF project, the UNDP project “Elimination of Obsolete Pesticide Stockpiles and Addressing POPs Contaminated Sites within a Sound Chemicals Management Framework” specifically on the drafting of relevant legislations and awareness-raising activities. With this perspective, the results of the activities carried out in the Nubarashen burial site will be taken in consideration.
52. Component 2 of the project on demonstration activities will build on the results of ongoing and planned initiatives/projects that directly or tangentially impact the issue of waste management in the country. These initiatives/projects are described in the following section:
53. In 2012, German KfW carried out a detailed baseline assessment in the Lori province for the selection of an appropriate site for a new landfill, with geological characterization of the potential sites and morphological analysis of the waste. Two different options were elaborated: the first one included transfer stations in the municipalities and collection of waste in bins. No separation of hazardous waste was studied. The second option included the set up of one main landfill and many others of small size. This was considered the cheapest solution to reduce costs of transportation. A 20 hectares site with clay soil was chosen. All the expenses should be covered by the tariffs for waste collection. In the main landfill the study includes the set up of a MRF (material recovery facility). The study suggested to set up two companies, one for MRF management and recyclable selling and the other for the landfill management. The plan included the closure of existing dumpsite as well, but with all the relevant costs to be borne by the Public administration. KfW will finalize the proposal in May 2014.
54. A SAICM Quick start programme “Training on Risk Assessment of Chemicals at National Level in a Global Context” Regional Project, implemented through a UNEP Armenian partnership involved Ghana, Chile and Armenia with a budget of 355,500 USD. The SAICM project provided trainings for risk assessment and management. The potential linkage with the proposed project is to utilize the training workshop of SAICM to address landfill management related risk assessment and UP-POPs monitoring and mitigation.
55. The Ministry of Nature Protection with its operating agency will provide assistance in the above activities on risk assessment and management as well.
56. The Asian Development Bank has recently developed a national program on waste management, “Solid waste management improvement investment”, especially focused on the identification of six regional landfills with transfer stations. The proposed activities are aimed to facilitate waste selection at source and separate collection of different waste streams, diverting wastes from being burnt and promoting recycling. The evaluation study carried out by ADB recommends that a sustainable waste management system and attractive for investors would necessarily imply an increase of the tariffs for the population, even though there is now a sort of cap set by the current legislation. Moreover, the study highlighted that composting could be not feasible in Armenia situation, because a considerable part of the organic fraction of waste is used for animals and agricultural scope, so the content of organic compounds could not be sufficient for the production of good quality compost.
57. The World Bank financed an Advisory Study to the consulting company Fichtner GmbH & Co. KG on the improvement of the solid waste management in the city of Yerevan, with private sector involvement. Seven reports were produced within the scopes of the project covering waste collection, transportation and disposal issues;

financial, tariff and legal issues regarding MSWM, preferred PPP options and recommendation for tendering process, as well as development and operation of the Nubarashen landfill. The outputs would directly benefit this project.

58. Upon request of the the Ministry of Urban Development (MUD), the European Bank for Reconstruction and Development (EBRD) has financed a feasibility study for the solid waste management of Kotayk province. Kotayk was selected due to its proximity to Yerevan, with the intention of creating a demonstration project for the entire country. In September 2008, the Bank commissioned a Technical Review of the project and the report was submitted in October 2008 by the consulting company COWI. It provided preliminary considerations on upgrading the landfill at Hrazdan and constructing transfer stations in several cities within Kotayk. The review also included recommendations and several options on improving solid waste management in Kotayk. COWI suggested to prepare a project based on the collection of waste by separate bins in the street and to dispose the residual waste in a new landfill without any pretreatment or further sorting of recyclables. In this scenario, the residual part of hazardous waste present in the municipal waste should be only removed and stored, and leachate would be only collected and stored as well, but not treated. The closure of existing dumpsite was planned to be covered by the ERBD financing. The latest collected information during the PPG phase revealed that in 2011, the project stopped. The set up of the new landfill should have started in 2014, but it was delayed. Moreover, the last version of the project excluded the collection of waste by bins in the municipality as previously planned, that means that all the mixed waste should be transported to the new landfill when ready. Currently, each municipality of the province has separate contracts with private companies for the collection and transport of waste to the dumpsite. According to the latest update, the new landfill will be on the place of an existing dumpsite and the others will be closed or converted to controlled dumps with transfer stations. ADB joined the project supporting ERBD with technical assistance in the waste management aspects.
59. The Nubarashen Landfill Gas Capture and Power Generation Project in Yerevan is being implemented since 2009 by Japanese Shimizu Corporation in cooperation with the Municipality of Yerevan in the Yerevan's major landfill, that has been accepting the municipal waste of the city since 1960. The main project objective is to collect landfill gas (LFG) and utilize it in a gas engine generator (GEG) with a view to generating electricity. This was the very first project under the Kyoto Protocol's Clean Development Mechanism implemented in the CIS counties The first stage of the project (installation and operation of LFG collection and flaring system) was implemented on 6.5 ha segment of the landfill where gas collection wells and pipe systems have been installed with flaring unit. The project site is covered by soil in order to reduce level of fugitive emissions of the landfill gas and is fenced to prevent entrance of animals and scavengers. The second stage of the project will envisages installation of small-scale GEG technology (CHP unit) and will include the expansion of project area over the other part of the landfill were new garbage is to be collected.
60. Among the Communities involved in the "REDAM II" Project of the European Union set up to manage waste issues, it must be mentioned the case of the Vedi Intercommunity Union (VIU), established in 2004 as a partnership among 15 communities of the Ararat province is worth duplicating. The total area covered by the VIU is 2096 km², with a population of 71,000 inhabitants. The primary goal of this organization is to mobilize and regulate the communities' activities with joint efforts, to solve community problems. The Vedi municipality was visited during the PPG phase and information were collected on the future plans in waste management. The Maqur Erkir company operating in the city of Vedi and in 14 communities, involved in waste collection, is planning to close the existing local dumpsite and to build a waste sorting facility that will ensure separation of organic and non-organic fractions with subsequent sorting of non-organic materials and separation of plastic, metals, glass, textile, paper, etc. Later on an organic waste processing facility is planned that will produce biogas or organic fertilizers for agricultural needs. A feasibility study was prepared by BSC Business Support Center in 2012. The plan is to realize the waste sorting building with a capacity of 50,000 tons of waste. There were also contacts with international companies (Zorg from Germany, GTZ, PUM from Netherlands) to provide the equipment.
61. The same technical approach as those undertaken in VIU will be taken in consideration for the UNIDO project and is further detailed in the next chapter. The aim will be to choose a pilot municipality site where waste collection and segregation to recover recyclables for the domestic market will be enhanced and possibly linked with the ongoing activities in the above described provinces and municipalities. With this perspective, during the PPG phase, some companies were contacted for the waste recycling Armenian market, and relevant information were collected. The recyclables selling prices provided by some companies in Armenia and specifically for the Ararat-Vedi area were as follows:

Glass World Company” CJSC (located in Byureghavan, Kotayk region): 0.05 USD/kg (unspecified glass)

In Vedi: dirty glass: 80 Drams/kg (0.20 USD/kg)

In Vedi: washed glass: 150 Drams/kg (0.37 USD/kg)

Eco Engineering - Dirty PET bottles: 60 Drams/kg (0.14 USD/kg)

Eco Engineering - Clean PET bottles: 90 Drams/kg (0.22 USD/kg)

“Vedi Plast” LLC (in the process of plastics recycling: 0.18 USD/kg)

“Grand Holding” CJSC for paper:Paper: 20-35 Drams/kg. (0.05 - 0.09 USD/kg)

“Maqur Erkat” LLC (in the recycling of metals): 0.06 USD/kg.

62. Moreover, an average morphological composition of waste for the Ararat region was provided by the feasibility study carried out by BSC Business support center. The share of waste fraction were as follows:

Organic fraction 65%; Recyclables(20%) of which:Glass, bottles (2.3%); Plastic bottles (2.3%); other plastics (5.0%), metals (3.6%); paper (2.9 %); textile (0.6 %); Leather, rubber (2.3%). Other (non recyclable): 15% . It must be mentioned that the share of the organic fraction seems quite high and it should be verified.

63. In summary, the following table shows the ongoing baseline projects in Armenia in relation to waste management, the description of the activities and how they complement the activities in the GEF project:

Project	Activities	Proposed intervention under the GEF project
Regional Waste Governance project (European Union – EPTISA) within the framework of the European Neighbourhood and Partnership Instrument	a) Inventory of illegal wastes disposal sites; b) Strengthening of wastes classification practices; c) Development of pilot regional waste management strategies ; d) Information dissemination and capacity building.	Support to the Ministry of Nature Protection in updating the regulatory framework, in particular preparation of “Guidance on safe conditions of disposal and neutralization of industrial and household waste”, including also POPs and open dumpsites, as foreseen by the NIP
Polish aid Program, Bureau for Chemical Substances	Trainings on chemical management and environmental protection for specialists in Armenia	Additional training is needed to specifically address waste disposal site management and set up of new controlled sites incorporating elements of U-POPs including U-POPs emissions, inventory of major sources of releases and countermeasures to prevent and reduce emissions
SAICM Quick start programme “Training on Risk Assessment of Chemicals at National Level in a Global Context”	Trainings for risk assessment and management	Utilize the training workshop of SAICM to address landfill management related risk assessment and UP-POPs monitoring and mitigation.
German KfW baseline assessment in the Lori province for the selection of an appropriate site for a new landfill	Set up of one main landfill with MRF	The plan includes the closure of existing dumpsite, but with all the relevant costs to be borne by the Public administration. The GEF intervention on a pilot dumpsite is intended to incorporate the

		experience and lessons learned from this dumpsite into the intervention of the proposed dumpsite in the GEF project.
Asian Development Bank program “Solid waste management improvement investment”	The program is focused on the identification of six regional landfills with transfer stations in accordance with the plan by the Ministry of Urban Development (MUD)	The Study states that Sector Investment Plan, supported by the short, medium, and long term funding strategy needs to be further developed, fine-tuned to adapt to specific local modalities.
(EBRD) feasibility study for the solid waste management of Kotayk province	New landfill will be on the place of an existing dumpsite and the others will be closed or converted to controlled dumps with transfer stations	While specifically working on Kotayk province, the experience in landfill rehabilitation maybe applied in the GEF project.
Nubarashen Landfill Gas Capture and Power Generation Project by Japanese Shimizu Corporation	Collect landfill gas (LFG) and utilize it in gas engine generators (GEG)	The project would rely on the experience gained in landfill gas recovery
REDAM II” Project of the European Union in Vedi Intercommunity Union (VIU)	Open dumpsite converted to controlled site, waste collection practices put in place. Plan to build a waste sorting facility for separation of organic and non-organic fractions and collection of recyclable materials.	Vedi is very close to Ararat town and GEF intervention could create linkages between the two experience, so that the entire province could receive benefits.

64. As cited above, an Intergovernmental Board on Solid Waste Management is planned and will focus on the harmonization of the institutional framework and the planning of necessary infrastructures to address waste management in the country. The ongoing projects tabulated above focus on the improvement of the legislation for the entire life-cycle of the waste management, including the application of BAT/BEP for reduction of U-POPs emission.

65. It is worth to mention that the report “*Strategic Development Plan, Road Map and Long Term Investment Plan for the SWM Sector in Armenia*”, prepared by the consulting company COWI for ADB, provided an estimation of the relevant costs based on a comprehensive survey performed under the management of the Ministry of Territorial Administration (MTA) including registered and unregistered dumpsites across Armenia and the related area (hectares). The survey indicates that there are 438 dumping sites, of which 242 are officially registered. ADB reported that closure/remediation costs are depending on the type and amount of works to be executed, which in its turn is dependent on among others the waste volume of the dump, design and layout, types of waste deposited, the environmental status, slope stability etc. Using general unit costs and assumptions on the amount of work to be performed, the estimated total closure and remediation costs amount to around EUR 184 million.

Since this is a very high figure, ADB recommended that launching of priority demonstration projects applicable to remote rural collection and upgraded disposal be provided for, and this activity might be initially undertaken over a longer period potentially using a legacy viability fund established for this purpose as is the practice in many OECD countries.

This investment option would promote local pilots demonstrating small community cooperation and improved disposal in rural areas.

66. Based on the above considerations, since the set up of new landfill will require time and national budget along with private or international funding, the project aims to demonstrate that it is possible to better manage the old dumpsites

with relatively low investment, affordable technologies and appropriate financial schemes, reducing drastically the main environmental problems while waiting for new advanced sites. This will allow the Government to better plan the future interventions and will reflect in a more coherent manner the efforts in adopting a national waste management program.

67. As far as Component 3 on awareness raising and dissemination of results, the project could rely on the dissemination activities already implemented by the above described projects. For the proposed project, the main component of the awareness raising activity will include the elements of BAT/BEP and the issue of uPOPs. The Ministry has also actively promoted, from its own resources, awareness raising activities focusing on chemicals management, in general. Also, there are 15 Regional Centers for Ecological Education in marzes (districts) that were created for the implementation of Aarhus Convention in Armenia. These centres maybe tapped to organize training and awareness raising programs to local citizens.

A.4.3 Gap and Barrier Analysis

Given the above baseline information, the following barriers for the implementation of the components of the proposed project can be highlighted.

68. Component 1: Regulatory Framework and Institutional Strengthening

a) Gaps in the legislation relevant to landfills management.

The main gaps are concerned is the absence of concept or legal act, which would regulate the landfill management. This is necessary to determine classes of landfills in the Republic of Armenia, activities prohibited in landfills, which types of waste would be accepted in each class of landfills, etc. It is therefore necessary to properly and timely prepare the legal acts on the following topics: (i) Classification of landfill sites; (ii) Preparation of a national strategy reducing the amount of biodegradable municipal waste going to landfill; (iii) Establishment of an application and permit system and of waste acceptance procedures; (iv) Establishment of control and monitoring procedures in the operation phase of landfills and closure and after-care procedures for landfills to be disaffected

b) Lack of national regulation about the implementation of BAT/BEP in the open burning activities and lack of national standards regulating unintentional POPs releases from open burning source category.

The BAT/BEP and UP-POPs related regulatory infrastructure is still weak specifically, concerning the waste management and disposal sites. Only general rules on the registration of sites have been documented, but legal measures concerning appropriate and environmentally sound landfill management is lacking. No national standards currently exist regulating UP-POP releases in ambient air or other environmental media coming from open burning activities, including emissions from landfills and from agricultural residues burning. Consequently the enforcement capacity within the relevant Ministries concerning the disposal of wastes and monitoring open burning is limited. Current projects on waste management only partially consider Annex C POPs releases. This might be important especially when the increasing costs of waste management services have to be justified to the public.

c) Inadequate technical knowledge and experience by stakeholders in waste management issues and landfill operations

It must be recognized that after the approval of the NIP some capacity building programs with trainings have been undertaken within the central government in the field of chemicals management. SAICM contributed to identifying the main sources of hazards in Armenia, industrial impacts of POPs and other chemicals on human health. UNIDO has implemented a GEF project on environmentally sound PCB management of PCBs, which created the basic technical and human resources within the government and key stakeholders to implement the PCB related obligations of the Stockholm Convention. NATO supported basic training of few specialists on POPs analysis. Notwithstanding, with the exception of some public bodies and professional institutes involved in sectors of waste management and environmental protection, there is still a limited awareness regarding POPs issues in Government agencies and other stakeholders. Consequently, so far the enforcement capacity within the Ministry of Nature Protection and its control capability, within the Ministry of Health and Ministry of Agriculture concerning the disposal of wastes and discouraging open burning is limited.

Moreover, apart POPs issues, there are limited appropriate human resource and expertise at the national level for identifying and adopting the most appropriate technology options for BAT/BEP and Cleaner production measures, and that usually impede to the public and private sector to implement waste management plans, both at municipal and provincial level. This is especially true as far recycling programs are concerned and for landfill managements. Technical guidelines that support the selection and purchase of appropriate equipment are also lacking, hence impede the dissemination and transfer of the new, environmentally sound technology.

d) Lack of laboratory facilities, technical knowledge, experience, or standard methodology for unintentional POPs monitoring

In Armenia, there is a very limited number of laboratories able to deal with analysis in the waste sector, and at least only one (the Central Analytical Laboratory of the Waste Research Centre in Yerevan) is equipped with the minimal instrumentation to carry out analysis of U-POPs (PCDD/PCDF, HCB and PCBs). This laboratory in the past received training and equipment (Gas-Chromatograph/mass-spectrometer from NATO project and PCB-analyzer L 2000 DX-Dexsil from UNIDO Project) for the analysis of PCBs in the framework of another UNIDO project and under a NATO project, but there are still limited technical and human resources capacity to address the amount of analysis that should be carried out when the regulation on monitoring will be implemented, especially for the analysis of U-POPs in ambient air and other media. The lack of monitoring capacity will hinder or make difficult the effective enforcement of POPs regulations in the sector, and limit the POP reporting requirements under the Stockholm Convention.

e) Need to continuously update information on disposal sites

The last UP-POPs inventory collected information on the potential sources of POPs releases. But, as far as open burning is concerned, this should be strictly connected with the inventory of waste disposal sites. During the PPG phase the survey could not look at and investigate all landfills and dump sites and thus the figures may be underestimated. Since the waste burning sector is the major UP-POPs releasing sector a very detailed inventory of all disposal sites is needed and should be carried out during the project. Landfills registration process is very slow and updated legislation is required. It is necessary to supplement the “Code of Administrative Violations” with the new article that implies responsibility of legal and physical persons if they do not register in the Specific Register. Moreover, a revision of the already cited Decree N 1343-N on “defining the order of wastes accounting in accordance to wastes generation, disposal (elimination, treatment, placement) is needed.

69. Component 2: Promotion of BAT/BEP at selected demonstration locations

f) Need to focus on the closure/conversion of small open dumpsites

Although the reports and feasibility studies reported before suggest different solutions, all of them agree on the fact that modern sanitary landfills shall be built in Armenia, preferably based on a regional approach with or without transfer stations, covering some hundred thousand inhabitants, and that the collection fee shall be increased to sustain the costs. Moreover, some studies recommend the strengthening of the recycling activities linked to the waste management activities. It appears quite clearly that the closure of the existing dumpsites will be totally charged on the national/public funds. This means that in a long transition period, there will be the need to manage as much as possible the currently used dumpsites, converting them to controlled dumpsites or setting up plans for their closure. This will result to a continuous reduction of the emissions of harmful contaminants in all environmental media

g) Lack of on-field activity related to BAT/BEP

With the exception of few cases (i.e. Nubarashen landfill), there is a general lack of pilot or full scale activities concerning the feasibility of BAT/BEP implementation or waste management programs, although there are many studies concerning the benefits that could be achieved through BAT/BEP in the open burning sector. Moreover, many of the past projects were concerned only with recycling activities in small cities.

h) Inadequate financial mechanism for supporting BAT/BEP in waste management and waste reuse/reduction measures.

Currently, wastes is not looked at as a potential resource. The recovery of valuable materials for industry and for the recycling market is still weak. The existing laws and plans concerning POPs issues are not fully carried out because

of inadequate funding and insufficient administrative and legal support /maintenance. BAT/BEP investments are currently not supported by the governments and investment promotion loan package for BAT/BEP is not in place. Banking sector is not fully aware of the financial opportunities in investing in BAT/BEP.

70. Component 3: Awareness and Dissemination

i) Still inadequate public awareness on POPs issues

There is currently, still inadequate public awareness on the need of environmentally sound practices to dispose of waste or other types of residues, Therefore, the public at large has little or no awareness of the risks posed by UP-POPs to human health and the environment caused by common practices such as waste open burning in dumpsites and backyards, especially people working on or living close to the disposal sites, and this often results in increased exposure. Appropriate public awareness tools and programmes are missing to convey UP-POPs and BAT/BEP related information to the public. With few exceptions, NGOs are also lacking information, thus they key role in warning citizens is not appropriately practiced. Due to lack of financing, faculty and facilities, graduate and post-graduate education curricula and R&D network have not been established yet at national level. Without targeted awareness raising, the contemporary and the next generation of professionals will continue to be unaware of need and methodologies for the reduction of POPs and environmentally sound management of POPs related wastes. It is necessary to create system for data obtaining and information transfer on-line. The system of “Wastes”-reports supposes the necessity of electronic management for obtaining the reports from legal persons via on-line regime, creation of registers, data summarizing and provision of available information to the general public.

5. Incremental /Additional cost reasoning: describe the incremental (GEF Trust Fund/NPIF) or additional (LDCF/SCCF) activities requested for GEF/LDCF/SCCF/NPIF financing and the associated global environmental benefits (GEF Trust Fund) or associated adaptation benefits (LDCF/SCCF) to be delivered by the project:

The proposed alternative scenario, with a brief description of expected outcomes and components of the project is described in the following section:

5.1 Component 1: Regulatory framework and institutional strengthening

71. In the first component of the project, the main objective is to enhance the institutional capacity and technical capability of public bodies and relevant stakeholders. It will encompass a review of the gaps in the current legislation and development of policies and incentive mechanism for the adoption of waste management practices and BAT/BEP with specific connection with open burning and landfill operation. On this component, coordination will be sought with the other projects on waste management already ongoing and described above. The current proposal will benefit largely on the general policy framework that will be developed on POPs management in the country. However, the issue of open burning requires sector-focused policies and will involve stakeholders which may differ from the target groups in other projects. Thus, the framework of the current proposal includes legislation development specifically targeting UP-POPs and their releases in the open burning sector. The legislative update will be carried out by taking as reference the best examples of international experience and fully take advantage of the opportunities given by the existing regional and international Conventions and/or Agreements.
72. Among the financial mechanisms envisaged, the potential of public-private partnerships (PPP) to help governments meet the financing gap by stimulating private sector investment and financing for infrastructure was recognized years ago and more attention to this topic has been given since 2010 and global guidance was made available by UN agencies and several MDBs. The project will evaluate the most feasible possibilities and modalities for PPPs for the waste management sector. The adoption of recently developed additional financing sources and financial models (i.e. under carbon/climate mitigation/adaptation finance, crowd funding, specific development financing instruments, etc.), creation of socio-economic benefits through PPPs and replicating potential will be considered and the most appropriate mechanism will be proposed.
73. Proposal for the regulatory framework on landfill management, specifically addressing POPs and BAT/BEP issues for the open burning sector will be formulated, with the aim to include them in the relevant legislative acts in the project timeline. To support the legislative action an adequate management capacity building will be promoted, in

order to train not only technicians but also managers in evaluating the best options for Armenia in the field of waste management. Particular attention will be posed in the development and dissemination of landfill operation practices and operating manuals for landfill owners concerning improved waste management, recycling and opportunities for increased profit earning. A manual will also be developed to standardize and harmonize open burning related inspection procedures. A continuous update of the national inventory of waste dumpsites will be carried out, in order to set up a National registry and to better program future intervention of closure of re-conversion to technologically advanced disposal sites.

74. The project proposes the strengthening of the laboratory infrastructure (mainly the Central Analytical Laboratory) with the aim to receive accreditation for POPs analysis) and will endeavour to build technical capacity for U-POPs sampling, monitoring and analysis. In particular, dedicated training will be carried out for the staff on the appropriate standard analytical methodologies and a support will be given in the reallocation of dedicated spaces for the different analysis steps. As a results this will give Armenia the capacity to address the increasing need of monitoring and control of activities related to waste disposal and will create the basis to set up a regional centre for analogous projects.
75. With this perspective, the update of inventory of UP POPs releases from open burning sources will benefit of detailed laboratory analysis, statistical data collection and risk assessment. National emission factors will be established for quantification of PCDD/PCDF and PCB releases. The emission factors would be published in scientific papers to increase global knowledge on POPs.
76. Since the management and regulation of waste and biomass disposal are usually addressed by different ministries or public/private organizations entrusted with environment and agriculture, the support of the project and the international assistance could impede that the country continue to rely on independent programs to address the above tasks without a coherent and integrated approach, which would lead to duplication of efforts, inefficient use of financial, technical and human resources and not focussing on the reduction of open burning and thus of U-POPs releases.

The detailed outcome, outputs and activities of this component are reported below:

OUTCOME 1: NATIONAL REGULATORY AND ENFORCEMENT INFRASTRUCTURES IN PLACE TO ASSURE CONTINUOUS REDUCTION OF ANNEX C POPs RELEASES FROM OPEN BURNING SOURCES.	
Output 1.1: Waste management regulatory framework updated	Responsibility
Activity 1.1.1: Update the regulatory framework on chemical and waste management.	PMT, MoNP
Activity 1.1.2: Address the gaps and barriers in the regulatory framework specifically addressing POPs and BAT/BEP	PMT, MoNP
Activity 1.1.3: Formulate proposal for the regulatory framework on landfill management, specifically addressing POPs and BAT/BEP issues for the open burning sector including development of financial mechanisms that maybe implemented	PMT, MoNP
Activity 1.1.4: Conduct workshop and training to discuss the proposed revised legal framework and circulate comments among governmental agencies, enterprises, academia and relevant stakeholders	PMT, MoNP
Output 1.2: Adequate management capacity built in implementing BAT/BEP and waste management practices	Responsibility
Activity 1.2.1: Carry out targeted training for public officers and relevant stakeholders involved in waste management to introduce BAT/BEP concepts.	UNIDO, PMT
Activity 1.2.2: Continuously update the National inventory of waste disposal sites and establish the relevant National registry.	PMT
Output 1.3: Adequate capability strengthened in monitoring activities and in evaluating and reporting data of U-POPs	Responsibility

releases	
Activity 1.3.1: Strengthen laboratory capacity in sampling and analysis methods of UP-POPs.	UNIDO, PMT
Activity 1.3.2: Update and evaluate the National inventory of U-POPs releases	PMT

5.2 Promotion of BAT/BEP at a selected demonstration site

The second component of the project will focus on the promotion of BAT and BEP at at least one demonstration site selected during the PPG phase.

77. The detailed outcome, outputs and activities of this component are reported below:

OUTCOME 2: ANNEX C POPS RELEASES INTO THE ENVIRONMENT ARE REDUCED FROM OPEN BURNING ACTIVITIES	
Output 2.1: Cost and benefits of the available BAT/BEP measures for reducing Annex C POPs releases from open burning analyzed.	Responsibility
Activity 2.1.1: Carry out preliminary evaluation of releases and impact indicators and conduct risk assessment study for the current practices of open burning in the demonstration site incorporating gender and health issues.	PMT
Activity 2.1.2: Carry out financial and technological assessment study on the potential reduction of U-POPs after BAT/BEP implementation on the demonstration site.	UNIDO, PMT
Output 2.2: Demonstration activities carried out in a selected site promoting waste reduction, re-use, recycle and BAT/BEP implementation	Responsibility
Activity 2.2.1: Dedicated training for staff involved in waste disposal management in the selected demonstration site	UNIDO, PMT
Activity 2.2.2: Introduce sustainable measures for an effective rehabilitation of the selected site to reduce U-POPs and other contaminants releases	UNIDO, PMT
Activity 2.2.3: Facilitate the set up cooperation programs with local stakeholders for the promotion of recycling activities, to boost the waste management local business through incentive mechanisms	UNIDO, PMT

78. An evaluation study will be carried out to better investigate the geology of the selected site, depth of groundwater, surface water bodies, water wells, production of leachate according to the climate conditions and individuation of points of leachate seepage, stability of the slopes. This component will be financed from the contribution of the Ararat Municipality.
79. A risk assessment study on the current situation with respect to BAT/BEP implementation will be produced in terms of impact for the population and on the environment. Human health related risks for those who work at landfills and dump sites or live close to these places will be assessed and appropriate risk management tools and trainings will be provided. This will also assure that those working on the project will not be excessively exposed to UP-POPs during the project implementation. Likewise, the risk assessment study should include facets of gender and health issues.
80. The environmental impact indicators will be monitored. Samples of soil and leachate and samples of ambient air will be collected to investigate the occurrence of chlorine containing substances as possible indicators of the presence of U-POPs. In particular, analysis of PCBs and the already available data on PCBs for other sites will be used as

comparison and for the risk assessment study. If necessary, specific sampling will be carried out during intentional open burning events to simulate the same critical conditions. Additionally, new POPs, such as brominated flame retardants, will be considered for analysis.

81. The demonstration activities will be based on the implementation measures to convert the open dumpsite to a controlled one, following the principles reported by international guidelines developed by UNEP and the Ministry of Environment of Philippines, by ISWA, by Basel Convention and by the World Bank. The main goal is to introduce the basis to achieve a progressive phasing out of the open burning practices and to start reducing releases U-POPs and of other harmful contaminants (particulate matter, polycyclic aromatic hydrocarbons, heavy metals and mercury). It will also involve the establishment of a recycling facility for the management of recyclables coming into the landfill.
82. For the scope of the project, the demonstration site have been selected according to the following criteria:
 - Site where mixed municipal or industrial waste (containing halogenated plastic materials, glass, metals or wet fractions) are dumped without any proper technical disposal method (as in sanitary landfills) but just spread on the ground.
 - Site where mixed waste and or agricultural residues are burnt without means of dedicated facilities, i.e. (furnaces, incinerators, controlled fires with dedicated staff).
 - Site where the uncontrolled open burning is intentionally carried out by waste pickers (scavengers) to recover recyclables or to reduce waste amount.
 - Site where unintentional fires due to landfill gas releases and hot temperatures are common in hot seasons
 - Site for waste disposal where conventional pollution control measures (liners, leachate recovery) are absent and where the above described characteristics are valid.
 - Site without any sanitary control by local administrations and where animal grazing is common.
 - Site close to agricultural fields or residential areas.
83. Due to the funding available in the project, additional criteria for site selection were formulated:
 - Sites of small size, where the measures to drastically reduce open burning without necessarily closing the site can be applied without strong engineering interventions, as reported by international guidelines such as the UNEP BAT/BEP guidelines, the UNEP training module for the closure or conversion of dumpsites, the ISWA (International Solid waste Association) guidelines, etc. Upgrading from open to controlled dumping does not generally require significant capital investments as compared to upgrading from controlled dumping to sanitary landfilling and the maintenance costs can be born in the perspective of the implementation of a new sanitary landfill, especially in a short term period.
 - Sites where possibly other ancillary activities maybe possibly carried out by local administrations, such as waste sorting and recycling programs. These activities are indeed a prerequisite for the decrease of the risk connected with waste open burning, acting directly on the potential source of formation of the harmful contaminants.
 - Sites where effective conversion of open dumps to controlled ones are feasible and sustainable, with the possibility to plan their closure them in the near future.
 - With the previous perspective, the location dimensions and morphological characteristics of the site are prerequisites. Sites with clay soil and no presence of basins or rivers are more easy to adapt, on the contrary some more advanced measures must be taken to limit the environmental burden.
 - Sites where some basic infrastructures are already present (electricity and water supply)
 - Sites where feasibility studies have been already prepared by other investors, to be considered a sort of in-kind contribution for the project.
84. Based on the above criteria and consultation with relevant stakeholders, the site selected in the PPG phase was the dumpsite of the Ararat municipality, in Ararat province. Ararat province is considered by the Government of Armenia as one of five national priority areas for environmental problems, due to presence of a cement kiln and gold mining activities. Moreover, the area near Ararat town is characterized by the presence of agricultural fields and an important fruit production facilities.
85. The town has a population of some 20000 inhabitants. According to the information collected the estimated generated municipal waste amount accounts for a maximum of 3600 Tons/year. The collection fee is 190 drams/capita and it covers only the costs of personnel involved in the waste collection. The collection fee recovery is very high (almost 100% including fees for industrial wastes). The municipality has three trucks of different capacity for a total load of some 10 Tons/day.

86. The city has a contract with the recycling company Eco-engineering for plastic bottles collection, with a selling price of some 60 drams/kg. The company provides plastic and metals bins for waste collection. The project envisages to promote more recycling activities to include other recyclables.
87. The urban dumpsite is located at a distance of 2 km from the town. The disposed waste in the dumpsite accounts for only 1500 Tons/year (almost 50% of the total). There is no information on the composition of waste, only some 50% for organic waste was reported. The dumpsite area is composed by three different sites, the first two are close each other and have a size of 0,88 ha and 3 ha, respectively. The third one is over a small hill and has an area of 2 ha. The sites are officially have being managed by the municipality for the last 6 years, but they were illegally used before. Therefore, based on the current disposal capacity the amount of accumulated waste can be estimated in at least 10,000 Tons (or more).
88. The access road is not asphalted and it is very narrow, passing through a small cemetery. Before the dumping area a huge amount of illegally dumped construction debris is spread along the road. Some private house are located just before the dumping area, with animals and agricultural fields and some people (scavengers) live within the sites. In the two visited sites mixed waste is spread everywhere and, though a separate collection has been mentioned, plastic bottles are present, along with paper, food waste and any type of metallic waste.
89. Open burning is often carried out, especially by some scavengers but it also unintentionally happens during summer, A lot of ash is spread in all the parts of the dumping sites. Moreover, a lot of construction debris are spread in the edge of the sites. According to the information collected, only once per year the municipality send a truck with water to wash the waste in order to extinguish fires. The municipality does not have any allocated budget to purchase soil and cover daily the waste to drastically reduce open burning events.



Ararat dumpsite where open burning activities are prevalent

90. Industrial and medical wastes are not disposed in the dumpsite, because the municipality has dedicated contracts with an incinerator where these types of wastes are disposed of.

91. Possible BAT/BEP interventions that maybe implemented in the demonstration sites have been identified based from the initial assessment of the open dumpsite. The Municipality of Ararat has committed resources to convert the old dumpsite into a controlled one. The range of activities/interventions that maybe carried out and funded by the Municipality includes the following:

- The access road will be renovated in order to facilitate waste transport and electricity and water supply will be provided by the local authorities.
- The dumping area will be fenced to prevent illegal dumping and or intentionally fires,
- Some portions of the area will be leveled off and slopes reduced in order to obtain a suitable surface prior to controlled disposal operations. The dumping area will be reduced in size
- After removal of bulky wastes, part of the site will be equiped with clay or plastic liner, depending on the characteristics of the ground evaluated in the initial study to contain leachate and residue dispersion. The use of clay liners or geoliners to avoid releases of residues/ashes to the bottom of the site is recommended, as these matrices can be heavily polluted with U-POPs. Organic compounds (including dioxins) entrapped in ashes resulting from open burning activities can be desorbed by the organics in the leachate (depending on pH and temperature) which can then migrate to the soil.
- Drainages around the dumping area will be set up to channel the rainwater off from the dumping area.
- At the gate, a weighting station will be built to have a record of the incoming waste. This information could be used to measure the efficiency of the collection system. This would also allow the control of the types of wastes that are taken to the site.
- The remaining residual waste after the above sorting will be disposed in the renovated site, compacted and constantly covered with soil. This would limit the occurrence of fires under the waste pile and the consequent smouldering process in which U-POPs can be formed
- In case that the site accepts also some household hazardous wastes (e.g. asbestos, batteries, tires, etc.), they shall be segregated from ordinary wastes and disposed of in separate cells, specifically prepared with bottom liners in one corner of the dump site area.
- Other hazardous waste (such as spent oils or factories solid residues, ashes, etc) shall not be disposed of in the dumpsite.

The GEF grant for Component 2 may be used primarily on the following activities (see table below) corresponding to the application of BAT/BEP in the demonstration site:

MRF Construction	
MRF facility including beltways and other minor equipment	USD 80,000
Automatic separation devices	USD 100,000
Upgrading of the old disposal site	
Removal of historical dioxin rich ash layer from the open dumpsite and disposal in a dedicated part of the site and management of accumulated leachate	USD 80,000
Construction of monitoring wells to ensure that POPs monitoring is set up from these wells and/or the biota in the vicinity of the dumpsite	USD 50,000
Technical Assistance	USD 50,000
Total GEF grant	USD 360,000

The implementation of the specific measures to be undertaken, including costs, will be evaluated in depth during the initial assessment (Activity 2.1.2) of the site. In this activity, estimation of the dioxins in the residue and the amount of leachate production (depending on the seasonal variation) and its dioxin content maybe better quantified.

A tentative reduction target for U-POPs can be estimated for the selected site using the UNEP Toolkit and considering both the emission factors provided for source subcategory 6b for waste burning and those provided for the main source category 9, Disposal/landfill as detailed in Section B.3. Emission factors provided in the Toolkit consider the PCDD/PCDF releases from leachate and residues. Considering that the current dumpsite is being used

for dumping of mixed wastes and upon introduction of the BAT/BEP proposed above, the following U-POPs releases and reduction have been estimated:

Baseline			After BAT/BEP (with 1000 tons disposed)	
	Emission Factor µg TEQ/t	Releases mg TEQ/a	Emission Factor µg TEQ/t	Releases mg TEQ/a
Air	300	150	0	0
Land	10	5	0	0
Water	0.5	0.75	0.05	0.05
Residue	50	75	5	5
Total		230.75		5.05

Releases caused by historical leachate and residues were quantified to be around 75.75 mg TEQ/a (about 30% of the total) for every 1000 tons of wastes disposed. The contribution of leachate (water) to the overall PCDD/PCDF release maybe minimal (Emission Factor = 0.5 µg TEQ/t) but the management of this matrix and that of residues (Emission factor = 50 µg TEQ/t) by putting in cell liners will prevent further migration/dispersion of dioxins and other contaminants to the soil.

The rest of the GEF project funds for Component 2 will be allocated for the assessment of dioxins and other important pollutants in the dumpsite area, provision of training to the relevant stakeholders involved in the demonstration site and in the development of partnership modalities with existing recycling material markets in Armenia. It will also be used to set up incentive mechanisms that maybe adopted by the Government of Armenia in ensuring a holistic and effective municipal waste management system in the country.

92. Since some families of scavengers would prefer to remain to work in the site, their involvement by further strengthening basic recycling activities on the residual waste will be promoted in a more integrated manner, with dedicated training on recycling activities and on health education and accident prevention.
93. After the implementation of BAT/BEP and the effective reduction of open burning events, due to the short duration of the project, it is expected that the presence of U-POPs in soil sample will be dependent on the activities carried out, but reasonably in old part of the dumpsite the positive effects could be registered only after a long time, otherwise in new parts where new soil has been added the content of U-POPs can be expected as negligible. Therefore a overall assessment of the environmental impact indicators will be carried out and will reflect the long term effect of the reduction of open burning and not only the short terms effects. As far as the social and economic aspects are concerned, the relationship between investment, release reduction of PCDD/PCDFs and return of investment will be evaluated. This will increase the global knowledge concerning the implementation of BAT/BEP, and might increase investments in cleaner technologies and sound environmental practices

5.3 Awareness raising and dissemination of results

94. The third component of the project is focused on dissemination activities and awareness raising. As part of their obligation to the Stockholm Convention, the Ministry of Nature Protection have already undertaken other awareness raising activities in similar projects for the general populace and to targeted audience on the basis of available resources. Within this project, dedicated activities will be focused on the particular aspect of waste open burning common practices and in waste minimization and recycling. Specific training workshops will be organized for public officials and stakeholders. This will be linked to the development of university curricula on environmentally sound waste management. These activities will be accompanied by continuous and regular awareness raising campaigns, identifying target groups according to their involvement in the waste management sector and producing information materials for each target group and for the public at large.

95. With the GEF project, the lessons learned from the local interventions would be available for the other provinces or in neighbor countries for replication and thus the impacts on the environment and human health could be maximized in a long term vision.

96. The detailed outcome, outputs and activities of this component are reported below:

OUTCOME 3: PROJECT ACTIVITIES ARE SUSTAINABLE AND REPLICATED	
Output 3.1: Awareness raising campaigns implemented	Responsibility
Activity 3.1.1: Carry out targeted awareness raising campaigns on environmental and health hazard of U-POPs for relevant stakeholders, including vulnerable groups such as women and children.	UNIDO, PMT
Activity 3.1.2: Hold awareness workshops to share information on experiences on good practices, promote new technologies and economic feasibility of technological approaches among relevant stakeholders	UNIDO, PMT
Activity 3.1.3: Develop awareness raising dissemination material and set up a website for information dissemination ensuring that gender dimension is observed.	PMT
Output 3.2: U-POPs from open burning and chemical safety of waste management related matters incorporated into educational curricula	Responsibility
Activity 3.2.1: Design education programs for disseminating knowledge on U-POPs issues ensuring that gender dimension is observed.	PMT
Activity 3.2.2: Develop education curricula at university level focused on BAT/BEP, waste management and UP-POPs monitoring	PMT

Component 4: Monitoring and Evaluation

97. Component 4 of the project involves project management and monitoring and evaluation, including establishment of a Steering Committee, the National Project Management Team and in the set up of National Coordination Units composed of national stakeholder agencies, establishment and staffing of the Coordination Units at the national, recruitment of national and international consultants and ongoing monitoring and reporting of project activities.

98. The detailed outcome, outputs and activities of this component are reported below:

OUTCOME 4: PROJECT OBJECTIVES ARE ATTAINED	
Output 4.1: Establishment of project management	Responsibility
Activity 4.1.1: Establish the Project Steering Committee (PSC) by relying on resources from related ministries or commissions at the national level and from local governmental agencies	UNIDO, MoNP
Activity 4.1.2: Establish the Project Management Team	UNIDO, MoNP
Output 4.2: Project impact monitoring system identified and implemented	Responsibility
Activity 4.2.1: Prepare project Inception report.	PMT
Activity 4.2.2: Prepare Annual Project Reports and Project Implementation Reports	UNIDO, PMT
Activity 4.2.3: Carry out final external evaluation	UNIDO, MoNP
Activity 4.2.4: Complete Project Terminal Report	UNIDO, PMT

Innovativeness, sustainability and potential for scaling up

99. The sustainability of the project outputs will be ensured by the following measures:

- Setting up the conditions to strengthen and adapt the policies, laws, and regulations related to UP-POPs management and control will ensure the sustainability of the regulatory environment. By assuring the practicality of laws and regulations, enforcement will also be improved if supported by adequate and targeted capacity building.
- Compliance with ongoing monitoring and reporting requirements under the Stockholm Convention will be improved by increasing the capacity to collect and process data and to formulate reports to fit to the format and to meet the standards required by the Convention.
- The relevance of the project in the context of environmental and public health issues resulting in decreased exposure to U-POPs (emissions and wastes) guarantees sustainability of project outputs.
- Ensuring a strong project ownership by the Government of Armenia by involving and/or enhancing institutional engagement in project activities will contribute in ensuring sustainability.

100. To achieve replicability, a wide range of innovative activities will be carried out. They are as follows:

- The Project will conduct pilot demonstrations at a selected dumpsites. Local staff will be educated and trained so that after project completion national experts will be available for conducting training for nation-wide implementation of BAT/BEP in this source category.
- Experience gained through successful demonstration of application of the BAT/BEP requirements for the operation of landfills in conjunction to the set up of waste management plans will provide a solid base for introducing sustainable management of municipal waste as well as pilot cases for cost-effectiveness analysis to plan wide dissemination of project results.
- The capacity building will be carried out by using modular training program. The training modules will jointly be developed by international experts, who would work in close cooperation with national experts. The national experts will serve as resource persons in training programs beyond the project life. Consideration will be given to the integration of U-POPs modules into the existing training programs of the environment and research organizations, such as universities, chemicals management organizations, foundations, etc.
- An adequate monitoring capacity will be developed during the project. This could provide services to other BAT/BEP projects in the region and the capacity might be used in neighboring countries. Furthermore the development of monitoring capacity itself can be replicated in the country with the experience and under assistance of the capacity developed in the project.
- Replicability of BAT/BEP adaptation measures beyond the project life will require capacity that includes not only know-how and a supportive policy environment, but also innovative financing mechanisms. Through exploring and piloting BAT/BEP in selected sites, the project will set models for identification of financing options, mobilizing funds and establish cooperation patterns with the private sector (PPP mechanisms) to replication of project results in the future.
- During the development of this project, the potential of investments will be explored with multilateral organizations to replicate the results of this project.
- The project will seek support from vendors and designers of technologies for landfill operations to better address the specific needs of the demonstrative site.
- A variety of reports such as workshop reports, brochures, and inventory and data collection reports will be published. In addition workshop modules will be developed and formulated for technical and in-plant workshops. Conclusions of the scientific evaluations of the data and regular monitoring results will be published in scientific journals and will be integrated into public awareness programs beyond the project life.

A.6 Risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and measures that address these risks:

101. The following risks and mitigation measures are foreseen:

Risks	Risk Level	Mitigation Measures
OUTCOME 1: NATIONAL REGULATORY AND ENFORCEMENT INFRASTRUCTURES IN PLACE TO ASSURE CONTINUOUS RELEASE REDUCTION OF ANNEX C POPS FROM OPEN BURNING SOURCES		
Delays in the official approval of the of new/revised regulations	Medium	All concerned stakeholders will be involved in the development of new/revised legislations. Trainings and workshops are planned to increase the awareness on the need for cross-sector cooperation.
The country will not have the necessary resources to maintain UP-POPs laboratory up to standards	Medium	Funding requirements for equipment purchase and supporting institutions should be mobilized in time
OUTCOME 2: ANNEX C POPS RELEASES INTO THE ENVIRONMENT ARE GRADUALLY REDUCED FROM OPEN BURNING ACTIVITIES		
The technology transferred to the demonstration sites will not be as functional as planned	Medium	The implemented measures will be adapted to the local circumstances in consultation with the representatives of the demonstration sites.
OUTCOME 3: PROJECT ACTIVITIES ARE SUSTAINABLE AND REPLICATED		
Low participation and interest on behalf of the stakeholders and general public.	Low	Dedicated workshops will address broader issues than UP-POPs, such as waste management and agricultural activities..
The project will not be able to create the critical mass of human resources to support BAT/BEP	Low	BAT/BEP concerning open burning will be integrated in higher level education.
OUTCOME 4: ESTABLISHMENT OF PROJECT MANAGEMENT AND MONITORING OF IMPACTS		
M&E framework of the project will not be timely established	Low	Various ministries of participating countries will be committed to support the project
The projects may not reach its targets	Low	Project target indicators will be assessed regularly
CLIMATE CHANGE RISK		
Changing climate patterns may hinder the effective application of BAT/BEP measures on the selected dumpsites	Low	The interventions to be proposed will consider changing climate patterns in the area.

A.7. Coordination with other relevant GEF financed initiatives

102. The project will seek the coordination with the following programs:

- The SAICM Quick start programme through the UNEP Armenian partnership to develop chemicals related legislation. The SAICM project provide trainings for risk assessment and management. The potential linkage is to utilize the training workshop of SAICM to address landfill management related risk assessment.

- UNDP-implemented project "Elimination of Obsolete Pesticide Stockpiles and Addressing POPs Contaminated Sites within a Sound Chemicals Management Framework" specifically on the drafting of relevant legislations and awareness-raising activities.
- Enabling activities to review and update the NIP for the SC on POPs

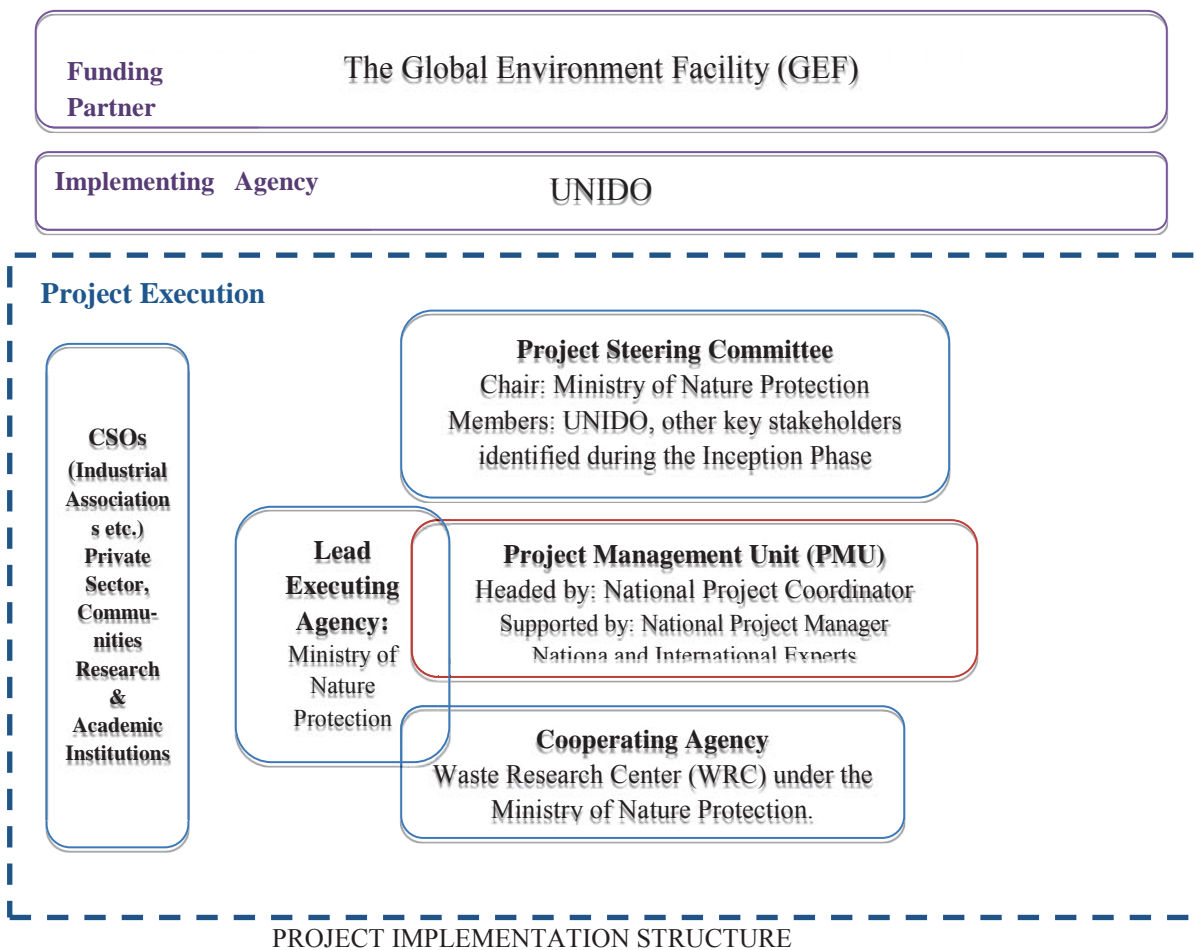
B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:

B.1 Describe how the stakeholders will be engaged in project implementation

103. The key stakeholder of the project is the Ministry of Nature Protection. This organization will be the executing agency for the project. Local authorities present another key partner, being responsible for waste management at their administrative area.
104. The project will provide the opportunity for involving national stakeholders, such as some Ministries, municipalities, local authorities, research and academic institutions, and universities as technical partners. NGOs working in the field of industries and environment including women's groups and organizations involved in the health of children will be invited as part of the project implementation. The private sector will be tapped to participate in the project. These enterprises will be key stakeholders in implementing BAT/BEP, and making a shift from burning of waste to recycling or re-use. Relevant government ministries and departments, laboratories will be involved for awareness raising activities and for the coordination of the project implementation. The list of the stakeholders identified at this stage, and maybe engaged during project implementation, is as follows:
- Ministry of Nature Protection of the Republic of Armenia (RA);
 - Ministry of Health, RA;
 - Ministry of Agriculture, RA;
 - Ministry of Urban Development;
 - Ministry of territorial Administration;
 - National Statistical Service,
 - National Academy of Sciences;
 - Waste Research Center - State Non-Commercial Organization;
 - Environment and Health "EcoTox" NGO;
 - "Narek Research Center" CJSC,
 - State Agrarian University;
 - Yerevan State University;
 - State Engineering University of Armenia,
 - Armenian Women for Health and Health Environment;
 - EcoEngineering recycling company
105. At local level, the involvement of the local authorities will be supported at all levels, with the participation of the local Ararat communal service, under the Ararat municipality in the management structure, as responsible of the demonstration activities with UNIDO and the HSWMD. At the same time, local people will be involved in technical trainings, in the daily running of the facility and in the waste compaction activities in the site.
106. The population will be fully involved in the waste management programs and will receive continuous information on the best practice to separate waste fractions and deliver residual wastes. Workers and people living near the dumpsites will be targeted in awareness raising activities and trainings on health and cocupation hazards from exposure to U-POPs and other chemical or biological hazards. The involvement of scavengers and local authorities will be fundamental to start reducing the bad practices linked with pollutant generation
107. The NGOs Environment and Health "EcoTox" NGO and the Armenian Women for Health and Health Environment will be involved especially in the awareness raising activities, giving their contribution in the preparation of workshops and diffusion material.

B.1.1 Institutional arrangement for project implementation:

108. The project implementation arrangements will be based on the following principles:
- Established and well-defined cooperation among governmental authorities involved in environmental protection and industrial development including the relevant ministries, the local authorities, the private sector, universities/research institutions and NGOs.
 - Accountability of the project related work and expenditures of all involved parties;
 - Transparency through clearly defined monitoring indicators and evaluation methodologies including data generation throughout the project implementation.
109. UNIDO will be the implementing agency (IA) of the project. UNIDO is implementing and/or developing a range of demonstration and capacity building projects to support the Convention implementation. UNIDO has committed considerable effort to build this assistance program, both in support of the Convention implementation and in furtherance of UNIDO's mandate and corporate strategy in support of the Millennium Development Goals. The organization's Field Office in Armenia will also play a significant role in the coordination and monitoring of the project activities.
110. The Hazardous Substances and Waste Policy Division of the Ministry of Nature Protection of the Republic of Armenia (HSWMD) will be the executing agency for the project as it is the national focal point for the Stockholm Convention in Armenia. It will take the responsibility of the day-to-day management of the project. HSWMD was the coordinating agency for the management of the projects described in the previous section.
111. The Waste Research Center (WRC), a state non-commercial organization at the Ministry of Nature Protection of the Republic of Armenia, will be the cooperating agency and will enter into contractual arrangements with UNIDO to perform specific activities in the project. WRC will be engaged in the development of scientifically based recommendations aimed at implementing the most appropriate measures in minimizing open burning activities in dumpsites and in the adoption of the BAT/BEP at dumpsites/landfills. At the same time it will be involved in the development of the manuals for landfill operation and control and in the assessment of the proposed solution in terms of decrease of the risks for the population. Finally, WRC will also be engaged in the process of taking samples of different environmental media for further analytical analyses. WRC has a successful experience in hosting the "Establishment and Operation of a National Cleaner Production Programme in Armenia" Project (UNIDO, 2006-2008) and "Inventory, monitoring and analysis of PCBs, obsolete pesticides in Armenia for environmentally sound disposal" (NATO, 2008-2010).
112. The Ararat communal service under Ararat municipality will be the responsible for the execution of the demonstration activities under Component 2 with the supervision of HSWMD and UNIDO.
113. A Project Steering Committee (PSC) will be established, chaired by the National Project Director from the Ministry of Nature Protection, and comprising of representatives from relevant ministries, UNIDO and other relevant stakeholders. The members of the PSC will be finalized during the project inception phase. The PSC will hold its regular sessions twice a year throughout the project implementation, but additional meetings can be held if necessary. A Technical Working Group (TWG) may also be formed to discuss technical issues that may arise during project implementation. The TORs of both PSC and TWG will be formulated and agreed during the project inception phase.
114. A Project Management Team (PMT) will be set up to ensure adequate organizational structure and facilitate day-to-day monitoring of implementation progress based on the project's annual work plan and its indicators. A National Project Coordinator (from the Ministry) will head the PMT and will be supported by a national project manager (NPM) to be recruited by the project. The PMT will inform UNIDO of any delays or difficulties faced during implementation so that appropriate support or corrective measures can be adopted in a timely and remedial fashion. The schematic diagram of the implementation arrangements for the project is given in the figure below:



B.2 Describe the socioeconomic benefits to be delivered by the Project at the national and local levels, including consideration of gender dimensions, and how these will support the achievement of global environment benefits (GEF Trust Fund/NPIF) or adaptation benefits (LDCF/SCCF):

The project size and the type of activities foreseen is one of the aspect to be taken in consideration when analyzing the benefits that could be delivered by the project. The project components cover regulatory framework, capacity building, education and pilot demonstration activities. Therefore, it is envisaged that the project activities will result to both local and national environmental and social benefits.

115. At the local level, the introduction of specific measures at the selected dump site will deliver immediate and tangible results in reducing air pollution, and enable assessment and measurement of the effects of using BAT/BEP. Diverting highly chlorinated waste streams on specific sites from burning will address POPs releases and reduce its local negative environmental impact, and promoting reduction, recycling and reuse of articles will significantly reduce the potential emissions of PAHs, particulate matter, Mercury, NOx, SOx, and diminish releases of dust, fly ash and odors. As far as land contamination is concerned, U-POPs and other contaminants are partly released in soil, due to the accumulation of ashes. This aspect will be addressed by the planned activities of removal of ashes spread on the ground and by discouraging open burning. Finally, as some contaminants are partly released in water streams due to leachate dispersion, by discouraging open burning and supporting leachate treatment and generally waste management the Project will reduce water contamination caused by flooding and will improve ecological state of local water bodies and reduce risks for severe water contamination.
116. As social local benefit, the project will address specific training and will set up preventive actions and strict occupational measures to protect workers and people living near the dumpsites from exposure to U-POPs and other chemical or biological hazards. The involvement of scavengers and local authorities will be fundamental to start reducing the bad practices linked with pollutant generation. Moreover, the population will be involved in waste

separation and collection programs through a targeted awareness raising campaign. The project will involve women's group and children (particularly those living in the community of the pilot area) in the training and awareness raising programs. The changes in the technology of the landfill and dump site, the improvement of small and medium-sized businesses engaging in waste recycling would require specialized staff to be employed and would involve many trainings and human resources development. Therefore the project will provide benefit to the community and generate employment at the professional and skilled labor levels.

117. The local activities will include the cooperation with private sector in waste recycling activities and waste management in general, providing at the same time a deeper insight in the BAT/BEPs, especially in the costs and benefits of these measures. The project is also envisaged to create job opportunities in the recycling facility to be constructed in the dumpsite area.
118. At the national level, the implementation of the project components on Legislation update and Institutional strengthening will provide the Government with practical information to address the upcoming problem of the closure/conversion of existing dumpsites. The project will ensure collection of adequate data that will enable continuous monitoring of socioeconomic impacts and reasonable inclusion of the community in decision making process. The aim is to smoothly prepare the field for the set up of new environmental friendly disposal sites, according to the recommendations from other ongoing projects as well, introducing local and global waste management technologies that maybe adapted to specific local circumstances and needs. The know-how will be transferred on local and national levels.
119. From the economic point of view, this part of the project will set the legislative basis for incentive mechanisms and therefore, for new investments in waste management and new business opportunities. It is expected that the sector will gradually integrate BAT/BEP in the waste management sector in general. In line with UNIDO's mandate and experience and with the support of the Government of Armenia the project will seek to address open burning activities with a vision to boost small and medium scale industries engaging in waste management and particularly waste recycling, encouraging establishments of public private partnerships. The main objective is to demonstrate that waste can be a resource and investment in BAT/BEP with a vision of cleaner production (CP) not only reduces the releases of UP-POPs and other pollutants, but at the same time introduce efficiency and sustainability and generates return on investment, as successfully shown by other UNIDO projects and cleaner production initiatives in other regions.
120. The project will also provide valuable data for further enhancement of the UNEP Toolkit. Structured knowledge management within the project and the resulting knowledge database will enable more reliable forecasting of future trends in open burning
121. The implementation of each project component will be conducted having in mind the specific national and local gender dimensions. Educational and employment opportunities will be generated for women, and respecting gender rights in education and employment will be observed. Participation of women at all activities will be encouraged and monitored. The project also foresees human resource development at governmental institutions and environmental NGOs. In general, the implementation of the Project will significantly improve the long-term gender equality in education and employment.
122. Promoting, by the legislative point of view, the decrease of the use of open dumpsites and thus of open burning will have considerable effects in the long term prevention of diseases and the reduction of accidents. Current research indicates that the practice of open burning is a more serious threat to public health than previously thought. There is enough evidence that high level of human exposure to open burning over the long term, such as those experienced by waste management workers and scavengers, may contribute to increasing birth defects, fertility problems, greater susceptibility to disease, reduced intelligence and some types of cancers. In addition to the overall reduction of open burning practices and the human exposure to their highly damaging effects that will be achieved by the project, the implementation of the project component on education and awareness will bring important health and safety benefits by increasing awareness about the dangers connected with open burning and inappropriate waste management. By avoiding animal grazing on the dumpsite and that spreading of contaminants through seasonal variations in rivers or agricultural fields, the load of pollutants that enters the food chain will also be significantly diminished. The project will ensure collection of adequate data to enable continuous monitoring of health and safety impacts of the Project, which will provide valuable knowledge database for dealing with open burning on a global scale.
123. Considering that UP-POPs are global pollutants, the set up of measure to strongly reduce the main emission sources in Armenia will have positive regional environmental impact. By discouraging open burning through diverting highly chlorinated waste streams from burning and promoting reduction, recycling and reuse of articles, not only

Annex C POPs releases will be reduced, but other pollutants load as well, such as PAHs, particulate matter, Mercury, NO_x, SO_x. Moreover, although GHG emissions from the waste sector are not a major contributor to global GHG emissions in developed countries, the damaging effects of open burning and overall current waste management practices have a documented negative Climate Change impact, in terms of methane, CO₂ and N₂O releases.

124. Implementation of sound waste management practices can deliver GHG emission savings. However, recent extreme weather events showed the importance of adapting the current waste management systems and practices to the effects of climate change., which makes aof the current waste management to climate change a very important and urgent task. All Project components will address the adaptation issue, taking in consideration the institutional framework and the specific local geographical characteristics and socio-demographic factors.

B.3.Explain how cost-effectiveness is reflected in the project design:

125. The budget allocated for institutional strenghtening will be used to set up sustainable effects in terms of trained staff and implementing measures (by the legislative and control point of view). The GEF project will focus on the enhancement of national legislation of the overall life cycle of waste management and will include particular provisions on POPs issues (limits, technical solutions, monitoring provisions, etc). A continuous update of the National Registry of waste disposal sites will be enhanced, providing the Government with adequate and updated information to set-up future interventions to reduce open dumpsites and promote advanced disposal systems.
126. The strenghtening of the National laboratory will reflect not only in the possibility to monitor the quality of the environment in waste disposal facility and will be fully utilized in the foreseen increase in analytical activities due to legislative improvements in the sector.
127. The demonstration of the implementation of environmentally sound measures for closure and/or conversion of old dumpsites, with reasonable efforts both in term of budget and time, will reflect in the more convinced efforts by the Government in adopting a national waste management program as far as new landfill set up is concerned. Infact, according to the evaluation studies prepared by international or national programs, the cost of the closure of old dumpsite, preliminary or in parallel with the construction of new landfill, should be charged on public funds.The contribution of the Ararat Municipality reflects this modality that maybe showcased in other parts of the country, as well.
128. A tentative reduction target for U-POPs can be estimated for the selected site. The UNEP Toolkit (that is the official PCDD/PCDFs release estimation method for the Stockholm Convention) lists the emission factors for estimating PCDD/PCDFs releases according to different source categories. The main source category No 6 is related both to biomass (category 6a) and waste burning (category 6b). These emission factors take into account waste burning activities in both developed and developing countries. The last update of the Toolkit (January 2013) proposed updated values that specifically addressed the releases of PCDD/PCDFs from open burning activities. The revised figures concerning waste open burning (at landfills or backyard) have been generally reduced with respect the previous version of Toolkit and are shown in the following tables.

Table II.6.5 PCDD/PCDF emission factors for source category 6b Open Burning of Waste and Accidental Fires

6b	Open Burning of Waste and Accidental Fires	Emission Factors ($\mu\text{g TEQ/t}$ material burned)				
		Air	Water	Land	Product	Residue
1	Fires at waste dumps (compacted, wet, high organic carbon content)	300	ND	10*	NA	NA
2	Accidental fires in houses, factories	400	ND	400	NA	NA
3	Open burning of domestic waste	40	ND	1*	NA	NA
4	Accidental fires in vehicles ($\mu\text{g TEQ}$ per vehicle)	100	ND	18	NA	NA
5	Open burning of wood (construction/demolition)	60	10	10	NA	NA

* Based on a few field measurements and consistent with the biomass burn EF_{Land} where the release in the ashes is 5%-10% of the EF_{Air} .

129. Class 1 refers to spontaneous or intentional fires occurring in a municipal or domestic waste repository. In some cases, these fires have the purpose of reducing the volume of waste in the repository. Typically, the waste will be relatively high in organic carbon. The combustible material will tend to be compacted and moist, and will burn poorly and slowly; hence the higher emission factor than for class 3. Typically, ignition occurs from either sparks occurring at the surface area, from self-ignition inside the waste body or intentionally for management reasons. It should be noted that fires of this type are very uncommon in modern engineered landfills, particularly those with compaction, daily soil cover, runoff water recycling or leachate and landfill gas collection. Class 3 includes burning of domestic waste in open piles, pits, barrels, with no pollution controls. The waste is typically characterized by a large fraction of organic/agricultural waste and is loosely arranged (not compacted).
130. Additionally, PCDD/PCDFs are also addressed in the UNEP Toolkit main source category 9, Disposal/landfill. In this case emission factors consider the PCDD/PCDF releases to landfill leachate and residues. These releases are due to PCDD/PCDF already present in the wastes, that are considered as a reservoir source of UP-POPs. The Toolkit recommends emission factors depending on the type of waste (hazardous, mixed, domestic).

Table II.9.3 PCDD/PCDF emission factors for source category 9a Landfills, Waste Dumps and Landfill Mining

9a	Landfills and Waste Dumps	Emission Factors ($\mu\text{g TEQ/t}$ waste disposed of)				
		Air	Water	Land	Product	Residue
1	Hazardous wastes	NA	5	NA	NA	NA*
2	Mixed wastes	NA	0.5	NA	NA	50
3	Domestic wastes	NA	0.05	NA	NA	5

*The residues of wastes from category 1 to 8 are accounted in the respective categories.

131. Based on these values above, it is possible to estimate the current emissions from the selected site, applying the updated values of the Toolkit for a purely uncontrolled open burning condition (class 1), namely $300 \mu\text{g TEQ/t}$ for air emissions, $10 \mu\text{g TEQ/t}$ for land releases and tentatively an average value of 0.5 TEQ/t (used for mixed waste) for releases to leachate and 50 TEQ/t for residues. Based on preliminary data collected at the site of Ararat town some 1500 t/a of waste is dumped. According to this figure, assuming that about 30% of MSW dumped is burned, (500 t/a), a preliminary estimation of the releases of PCDD/PCDF to air, land,

leachate and residues can be calculated.

Baseline				
	Open burning Emission Factor (UNEP Main Cat. 6) $\mu\text{g TEQ/t}$	Landfill and waste dump Emission Factor (UNEP main cat. 9) $\mu\text{g TEQ/t}$	Amount of waste burned or disposed of t/a	Releases mg TEQ/a
Air	300	NA	500	150
Land	10	NA	500	5
Water	NA	0.5	1500	0.75
Residue	NA	50	1500	75
Total				230.75

132. It is then possible to calculate the reduction of PCDD/PCDF emitted in air and solid residues by applying the demonstration measures implemented in the site. In a short-term situation, assuming that recyclable materials will be recovered before dumping (thus reducing the amount of incoming waste), and that appropriate means of waste disposal will be put in place along with the end of open burning activities (due to better control and lower organic content generating methane), the release to air could be reasonably assumed as totally eliminated, the releases to land are expected to decrease as well because land contamination is directly linked with the formation of solid residues from burning processes, while those caused by leachate and residues (already deposited ashes) should be still taken in consideration for a longer period due to the past activity and the contamination in the ground. After the conversion to controlled dumpsite, the residual waste that is still disposed of can be assumed as the less polluted domestic waste in terms of emission factor. In case of presorting of the recyclables, the amount of reduced waste can be estimated in some 30-40%, assuming that the share of organic fraction be less than 60% and that not recyclable items could be recovered as much as possible by the MRF. therefore the calculation is made on an amount of 1000 Tons/year of waste disposed of.

Baseline			After BAT/BEP (with 1000 tons disposed)	
	Emission Factor $\mu\text{g TEQ/t}$	Releases mg TEQ/a	Emission Factor $\mu\text{g TEQ/t}$	Releases mg TEQ/a
Air	300	150	0	0
Land	10	5	0	0
Water	0.5	0.75	0.05	0.05
Residue	50	75	5	5
Total		230.75		5.05

133. It can be therefore estimated that a potential reduction ranging 97 % could be achieved for emission to air and in solid residues if open burning practices could be decreased by implementing short term actions. In the long term scenario, if no contaminated waste will be disposed in the site and no open burning will be carried out as the MSW will be recycled, confined in an engineered landfill and dumped, the releases to the air, water and residues will be therefore zero, unless biogas recovery and burning is undertaken

134. As far as the economics of the interventions and specifically the revenues coming from selling the collected recyclables, an estimate can be made based on the figures for the Ararat region given by the feasibility study carried out by on BSC Business support center on waste morphological composition, already described in the chapter on baseline scenario. It was indeed not possible to collect these type of information at the PPG stage for the Ararat town. This will be a specific study to be carried out during the preliminary evaluation and the risk assessment activities. Possible synergies with the Vedi Intercommunity Union plans will be assessed as well.

135. In Ararat Town, assuming 1500 tons/a as an initial amount of waste disposed in the dumpsite (that will probably increase due to improvement of waste collection efficiency), the following amount of waste fractions and recyclables could be expected:

Organic fraction (65%):975 Tons/year

Recyclables (20%):300Tons/year, of which: Glass bottles (2.3%)6.9Tons/year; Plastic bottles (2.3%)6.9Tons/year; Other plastics (5.0%)15.0Tons/year; Metals (3.6%)10.8Tons/year; Paper (2.9 %)8.7 Tons/year; Textile (0.6 %)1.8Tons/year; Leather, rubber (2.3%)6.9Tons/year.

Not recyclables item (15%): 225Tons/year.

According to the selling prices reported in the baseline scenario, the revenues will account for 6100-7500 US\$/year.

C. DESCRIBE THE BUDGETED M & E PLAN:

136. Monitoring and evaluation will facilitate tracking implementation progress toward the outcomes and objectives. Likewise, it will facilitate learning, feedback, and knowledge sharing on results and lessons among the primary stakeholders to improve knowledge and performance. This section of the project document presents a concrete and fully budgeted monitoring and evaluation plan of the project.

Monitoring and evaluation budget and timeframe

Type of M&E activity	Responsible Parties	Budget USD*	Co-financing USD	Time frame
Establish Project management structure	UNIDO PSC		20,000	Within the first two months of project start
Inception Workshop (IW) and inception report	UNIDO, PMT	10,000		Within first three months of project start up
Annual Project Review to assess project progress and performance	PMT, UNIDO and PSC to review the project performance and make corrective decision	0**	10,000	Annually prior to the finalization of PIR and to the definition of annual work plans
Project Steering Committee Meeting	PMT, UNIDO and PSC	0**	10,000	Twice a year and when coincident with the Annual Project Review and whenever an urgent and important decision that need approval of the project Steering Committee
Project Management Team meetings	PMT, UNIDO	0	10,000	Twice a year
Terminal Project Evaluation	PMT, UNIDO, PSC, independent external evaluators	30,000		Evaluation at least one month before the end of the project; report at the end of project implementation
TOTAL indicative cost				
* Excludes project team staff time and UNIDO staff and travel expenses ** The costs are covered under Project Management Costs		40,000	40,000	

137. Project Inception Phase

The project Inception Phase will involve the establishment of the PMT, appointment of the members of the Project Steering Committee, the project launching through an Inception Workshop (IW) and convening of the first Project Steering Committee (PSC) meeting. The IW is aimed at launching the project with the full project team, relevant government counterparts, co-financing partners, key stakeholders, UNIDO and representative from the UNIDO Regional Office, as appropriate. This will provide the platform to disseminate project objectives, general workplan and implementation structure to relevant stakeholders. The 1st PSC meeting is aimed at convening the project team to better understand and assimilate the goals and objectives of the project, as well as to finalize the preparation of the project's first annual work plan on the basis of the project's results framework matrix. This work will include reviewing the results framework as necessary (indicators, means of verification, assumptions), imparting additional detail as needed. Additionally, the meeting will: (i) introduce project staff to the UNIDO team, which will support the project during its implementation; (ii) delineate the roles, support services, and complementary responsibilities of UNIDO staff vis-à-vis the project team; (iii) provide a detailed overview of UNIDO reporting and Monitoring & Evaluation (M&E) requirements, with particular emphasis on the content and format of the Annual Project Implementation Reviews (PIRs), the Annual Project Report (APR), the Annual Work Plan (AWP), meetings, as well as mid-term and final evaluations. Equally, the IW will provide an opportunity to inform the project team on UNIDO project related administrative and financial procedures, budgetary requirements and reviews and mandatory budget rephrasing. In the course of the project, the structure of the project's Management Information System will be also introduced. The 1st PSC meeting will also provide an opportunity for all parties to understand their roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines and conflict resolution mechanisms. Specific targets for the first year implementation progress indicators together with their means of verification will be developed and agreed in this workshop. The Inception (Phase) Report will be drafted and circulated for comments and approval by project partners within one month from the meetings.

138. *Monitoring and Implementation*

- One month before the starting of each implementation year, the PMT will draft an Annual Work Plan, complying with requirements and formats established for the first Annual Work Plan at IW. The AWP will be submitted to UNIDO for approval. The Annual Work Plan will set the target against which project performance shall be measured at the end of each implementation year.
- Day to day monitoring of project implementation progress will be the responsibility of the National Project Manager (NPM) based on the project's Annual Work Plan (AWP) and its indicators. The NPM will inform UNIDO of any delays or difficulties faced during implementation so that the appropriate support or corrective measures can be adopted in a timely and remedial fashion.
- Targets and indicators will be reviewed annually as part of the internal evaluation and planning processes undertaken by the Project Management Team (PMT).
- UNIDO and/or UNIDO Regional Office will conduct periodic visits based on agreed schedule to be detailed in the project's Inception Report / Annual Work Plan to assess project progress. Mission reports will be prepared by UNIDO on each corresponding visits and will be circulated to the project team.
- Annual Monitoring will be done through PSC meetings, which will take place at least once every year. The national project manager will prepare an Annual Project Report (APR) and submit it to UNIDO at least two weeks prior to the PSC for review and comments.
- The PSC has the authority to suspend funds disbursement if project performance benchmarks are not met.

139. *Key impact indicators for the project*

The main objective of this project is to enhance the institutional capacity (by updating the current legislation and introducing new regulations) and technical capability of public and private officers in addressing the waste management issues and monitoring U-POPs. This will reflect in the implementation of new tools for the management of waste disposal sites, and in the related decrease of open burning activities that generate the release in the environment of harmful contaminants, including U-POPs.

As for Component 1, as far as the legislative aspects are concerned, the most direct indicators to characterize the impacts of this project should include the proposal of change of the legislative acts with reference to the open burning activities, U-POPs new standards to be met, and the reference to BAT/BEP in the set up of disposal sites.

The indicator related to the institutional strengthening will include the number of personnel of the public institution that will receive appropriate training to set up the new regulations. Moreover, as the project foresees the strengthening of at least one national lab, another indicator will be the updated capacity of at least one lab to address the analytical activities and number of technicians trained in U-POP analysis.

As for Component 2, related to the implementation of BAT/BEP in a demonstration site, the most relevant indicator will be the advancement of works related to the conversion of the open dumpsite to a controlled site and the reduction of the open burning events (this latter indicator should be realistic achieved in the very first part of the demonstration activities). Moreover another indicator will be the decrease of air and leachate pollution in the site, due to the decrease of open burning events.

As for Component 3, related to awareness raising and dissemination activities, the main indicator will be the number of people reached by the training and dissemination activities

140. Key project Impact Indicators

Key Impact Indicator	Baseline	Target (at Year 2)	Means of Verification	Frequency of verification	Location
Regulatory instrument on landfills	General landfill regulation not considering BAT/BEP and U-POPs	One set on landfill management requirements and another set on U-POPs emission standards for environmental matrices in landfill adopted or alternatively proposed for legislative approval	Meeting reports, copy of the officially adopted regulatory instrument or at least of the proposal of new regulations	Twice a year	-
Central Analytical laboratory capacity in POPs monitoring and staff	The laboratory can make PCDD/PCDF analysis but lack sufficient personnel and instrumentation to address the country needs	laboratory staff properly trained and able to analyze sets of samples from landfills in the country	Training reports; laboratory strengthened with dedicated equipment	Twice a year	Yerevan
BAT/BEP activities implemented in the demonstration site	Only basic control is present at the site and no action is carried out to prevent open burning	one open dumpsite converted to controlled/engineered waste disposal site	Reports on renovation works, technology procurement documents, Site visits, reports,	twice a year	-

Open burning events and amount of U-POPs reduced	In demonstration dumpsite open burning cause release of U-POPs	Open burning activities stopped and U-POPs emission reduced by 90%. Concentration in soil constantly monitored	Prevention of open burning is enforced Analysis of pollutants regularly carried out	3 per year	demo site
Dissemination activities	Scarce awareness on impact of U-POPs during open burning events and poor waste management	Specific courses are prepared for university students and at least two training modules for public stakeholders		One in the first and one in the second year	

141. Terminal Project Workshop

The terminal project meeting will be held in the last month of project operation. A draft final report will serve as the basis for discussions in the final workshop. This will serve as a venue to consider the implementation of the project as a whole, paying particular attention to whether the project has achieved its stated objectives and contributed to the broader environmental objective. It decides whether any actions are still necessary, particularly in relation to sustainability of project results and acts as a means, which lessons learned can be captured for use in other projects under implementation or formulation.

142. Project Monitoring Reporting

The Project Management Team in conjunction with the UNIDO will be responsible for the preparation and submission of the following reports that form part of the monitoring process.

(a) Inception Report

A Project Inception Report (IR) will be prepared immediately following the Inception phase. It will include a detailed First Year Work Plan divided into quarterly timeframes, which detail the activities and progress indicators that will guide the implementation during the first year phase of the project. The Work Plan will include the tentative dates of specific field visits, support missions from UNIDO and/or UNIDO consultants, as well as timeframes for meetings of the project's decision-making structures. The report will also include the detailed project budget for the first full year of implementation, prepared on the basis of the Annual Work Plan, and including any monitoring and evaluation requirements to effectively measure project performance during the targeted 12 month timeframe.

(b) Project Implementation Report

The Project Implementation Report (PIR) is an annual monitoring process mandated by the GEF. It is an essential management and monitoring tool for project managers and offers the main vehicle for extracting lessons from ongoing projects. Once the project will be under implementation for a year, the project team shall complete the PIR. The PIR can be prepared any time during the year and ideally, immediately prior to the PSC meeting.

The PIR includes the following: (a) Analysis of the achievement of project objectives; (b) Analysis of project performance over the reporting period, including outputs produced and information on the status of the outcome; (c) Management of Risks (d) Co-financing accounting (resources provided both as in kind or cash contribution). Expenditure reports, lessons learned and recommendations to address key problems, if applicable, maybe reported. The PIR shall also constitute the annual project report of the project. The annual progress report is a UNIDO requirement and part of the UNIDO central oversight, monitoring and project management.

143. Independent Evaluations

The project will be subjected to an independent final evaluation that will take place after the operational completion of the project, and will focus on the same issues as the mid-term evaluation, with a greater focus on project impact and

sustainability of results, including the contribution to capacity development and the achievement of global environmental goals. The Final Evaluation should also provide recommendations for follow-up activities future projects, based on lesson learned and success stories. The Terms of Reference for this evaluation will be prepared by the UNIDO in accordance with the generic TORs developed by the GEF Evaluation Office.

A Project Management Information System will be established to support the Project Manager and the project management team to ensure that all the project activities be completed on time, in quality and within budget. The MIS will include a database containing (in electronic format or scanned PDF) all the project technical and administrative documentation. The MIS will keep baseline records of Annual Work Plans and contracts with consultants and subcontracts with performance indicators, result reports, responsibilities and budgets, allowing the easy comparison of them with the progress of the activities.

144. *General Consideration*

According to the Monitoring and Evaluation policy of the GEF and UNIDO, follow-up studies including Country Portfolio Evaluations and Thematic Evaluations can be initiated and conducted. All project partners and contractors are obliged to (i) make available studies, reports and other documentation related to the project and (ii) facilitate interviews with staff involved in the project activities

145. *Legal Context*


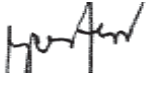
The Government of the Republic of Armenia agrees to apply to the present project, *mutatis mutandis*, the provisions of the Standard Basic Assistance Agreement between the United Nations Development Programme and the Government, signed on 8 March 1995 and entered into force on 8 June 2000.

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT(S) ON BEHALF OF THE GOVERNMENT(S): (Please attach the [Operational Focal Point endorsement letter\(s\)](#) with this form. For SGP, use this [OFP endorsement letter](#)).

NAME	POSITION	MINISTRY	DATE(MM/dd/yyyy)
H.E. Aram HARUTYUNYAN	Minister	MINISTRY OF NATURE PROTECTION	3/12/2012

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for CEO endorsement/approval of project.					
Agency Coordinator, Agency Name	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
Mr. Philippe R. Scholtès Managing Director Programme Development and Technical Cooperation Division UNIDO GEF Focal Point		11/24/2014	Carmela Centeno 	+43(1) 260263385	c.centeno@ unido.org

ANNEX A: PROJECT RESULTS FRAMEWORK (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).

Hierarchy of Objectives	Indicators	Baseline	Target	Sources of Verification	Assumptions
<p>Project Objectives: Reduce UP-POPs releases in open burning sources in Armenia through the introduction of BAT/BEP and create capacity within the government and private sector on BAT/BEP implementation</p>	<p>mg TEQ/year uP-POPs prevented No. of men/women trained on BAT/BEP implementation</p>	<p>13,818 mg TEQ/year UP-POPs releases based on 2012 inventory. Capacity to implement BAT/BEP in the waste management section is currently inadequate</p>	<p>BAT/BEP implemented in major dumpsites to reduce UP-POPs releases in the national inventory Involvement of at least two (2) women technical staff from government and private sector partners trained on BAT/BEP measures</p>	<p>UP-POPs releases based on the amount of wastes managed Training reports</p>	<p>Continued Government commitment and commitment by relevant stakeholders to address waste management issues in the country.</p>
<p>Outcome 1: National regulatory and enforcement infrastructures in place to assure continuous reduction of Annex C POPs releases from open burning sources.</p>	<p>A set of regulatory instruments compliant with Stockholm requirements on BAT/BEP</p>	<p>In Armenia, there is currently only generic provisions on waste management in the legislation.</p>	<p>A new set of guidance/guidelines particularly focusing on BAT/BEP prepared Enforcement and incentives mechanism for the adoption of BAT/BEP developed.</p>	<p>Copies of officially adopted regulations</p>	<p>BAT/BEP implementation on waste management policies is among national priorities</p>
<p>Output 1.1: Waste Management regulatory framework updated</p>	<p>Updated regulations formulated to facilitate implementation of BAT/BEP in waste disposal practices including landfill legislation and inventory</p>	<p>Waste Management regulatory framework does not include BAT/BEP in its provisions.</p>	<p>Inclusion of BAT/BEP provisions in waste management regulations Manual on the management and inspection of waste disposal sites prepared Public- Private Partnership mechanism developed</p>	<p>Meeting/workshop reports, copy of the officially adopted regulatory instrument.</p>	<p>Agreement among stakeholders on the content of the regulatory tool will be reached rapidly and effectively.</p>

<p>Output 1.2: Adequate management capacity built in implementing BAT/BEP and sound waste management practices</p>	<p>Number of men/women trained Targeted trainings on BAT/BEP conducted National inventories on type and number of disposal sites updated</p>	<p>No current capacity on BAT/BEP implementation</p>	<p>At least 20 core men/women trained on BAT/BEP implementation in landfills At least 1 training institution strengthened to deliver training courses</p>	<p>Training reports, courses on BAT/BEP Report on National Inventory of waste disposal sites</p>	<p>Relevant national and local institutions are fully involved in training activities</p>
<p>Output 2.3: Strengthened capacities in monitoring activities and in evaluating and reporting data on UP-POPs releases.</p>	<p>Number of staff from governmental laboratory institutions provided with the necessary skills to carry out sampling, analysis and reporting of UP-POPs.</p>	<p>Currently, capacity of governmental laboratory institutions on sampling and analysis of UP-POPs is still inadequate.</p>	<p>At least 4 core staff (focal points) intensively trained to analyze and evaluate UP-POPs.</p>	<p>Training Reports National UP-POPs inventory report</p>	<p>Strengthening of National laboratories is within NIP priorities.</p>
<p>Outcome 2: Annex C POPs releases into the environment are gradually reduced from open burning activities</p>	<p>Amount of UP-POPs reduced in the selected demonstration site Amount of GHG reduced in the selected demonstration site No. of jobs created in recycling/waste management Value of materials recycled</p>	<p>230 mg TEQ/year on the selected demonstration site. No study on GHG releases on the demonstration site is made Recycling of wastes is currently not being done in the selected demonstration site No valuation is made on the amount of recyclable materials</p>	<p>5.5 mg TEQ/year on the selected demonstration site At least 80% GHG reduction due to proper waste segregation and recycling Establishment of a recycling center and creation of jobs Valuation of the recyclable materials to be undertaken</p>	<p>UP-POPs release assessment Experts and facility report on the recycling activity</p>	<p>Support from local stakeholders/dumpsite operators on the demonstration project</p>
<p>Output 2.1: Cost and benefits of available BAT/BEP measures for reducing Annex C POPs releases from open burning analyzed</p>	<p>UP-POPs precursors analysis carried out Risk assessment study conducted</p>	<p>No current study made on the selected demonstration site</p>	<p>Technical, social and risk assessment studies undertaken</p>	<p>Evaluation Report Risk Assessment Report</p>	<p>Support from the local dumpsite operators in carrying out the assessment of the demonstration site.</p>

<p>Output 2.2:Demonstration activities carried out in a selected site promoting waste reduction, re-use, recycle and BAT/BEP implementation.</p>	<p>BAT/BEP interventions carried out Amount of incremental investment from dumpsite operators/local authorities</p>	<p>Currently, no sound waste management is in place in the candidate site.</p>	<p>At least one demonstration site implementing BAT/BEP to arrest indiscriminate burning of wastes</p>	<p>Cooperation Agreements set up with selected municipality and stakeholders. Report on BAT/BEP implementation</p>	<p>Investment from the municipality to implement BAT/BEP interventions timely available.</p>
<p>Outcome 3:Project activities are sustainable and replicated</p>	<p>Number of institution in the country engaged and strengthened to deliver awareness raising campaigns.</p>	<p>The awareness of the UP-POPs and BAT/BEP issues is very limited.</p>	<p>At least 2 institutions engaged and strengthened to deliver training</p>	<p>Cooperative Agreement with training institutions. Awareness raising plan and strategy report.</p>	<p>Willingness of relevant stakeholders to cooperate and participate in the activities is present.</p>
<p>Output 3.1:Awareness raising campaigns implemented.</p>	<p>Number of targeted awareness raising and dissemination workshop held Number of awareness raising materials developed in English and in local language incorporating gender dimensions</p>	<p>Previous awareness raising workshops did not focus on the issue of BAT/BEP and UP-POPs</p>	<p>At least one targeted awareness raising workshop and one dissemination workshop held</p>	<p>Awareness raising plan and strategy report. List of targeted stakeholders contacted. Reports / recording of raising awareness initiatives.</p>	<p>Target stakeholders identified are willing to participate in raising awareness initiatives.</p>
<p>Output 3.2:UP-POPs from open burning and chemical safety waste management related matters incorporated into the educational curricula</p>	<p>Number of university involved in setting up dedicated courses Number of teaching modules developed.</p>	<p>POPs issues are not being taught in the educational system</p>	<p>At least one university deploying the designed courses</p>	<p>Course curriculum Teaching modules</p>	<p>Suitable expert is available to design the required course.</p>

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

GEF comments have been adequately addressed at the PIF stage.

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS⁵

A. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES FINANCING STATUS IN THE TABLE BELOW:

PPG Grant Approved at PIF:			
<i>Project Preparation Activities Implemented</i>	<i>GEF/LDCF/SCCF/NPIF Amount (\$)</i>		
	<i>Budgeted Amount</i>	<i>Amount Spent To date</i>	<i>Amount Committed</i>
Kick off Meeting with counterparts	3,000	2,800	
Updated inventory for the open burning sector and preliminary inventory of dumpsites	10,000	8,000	
Review and analysis of gaps in the legal framework	5,000	5,000	
Selection of demonstration sites for BAT/BEP implementation (experts' mission)	15,000	14,800	1,900
Stakeholders' Workshop held to secure public and private sectors' commitment to the project	5,000	3,000	
Development of the logical framework and project document	12,000	8,500	4,000
Total	50,000	44,100	5,900

The PPG activities undertaken have resulted to the achievement of the objectives set in the project preparation phase. Concrete results were achieved through the studies undertaken by national experts on various baseline information required to complete the project document and the conduct of the experts' mission to visit various candidate sites in Armenia.

A kick-off meeting was held on 11 February 2014 between UNIDO and the representatives from the Ministry of Nature Protection to agree on the workplan and timelines of the project. The main project framework was reviewed and minor revision on the components were decided. Data requirement was identified and national experts' TORs were developed.

An expert mission, with the assistance of the Hazardous Substances and Waste Policy Division of the Ministry of Nature and Protection, visited the Eghvard dumpsite in Kotayk Province, the Vedi Intercommunity Union in Ararat and the Ararat Dumpsite to make a pre-assessment of the candidate dumpsites. The Central Analytical Laboratory was also visited to assess the current capacity and the requirements of the laboratory in terms of sampling and analysis of U-POPs.

A stakeholders' meeting was held on 12 June 2014 with around 25 participants consisting of government institutions, private sectors and NGOs. This event generated strong interests from the various stakeholders and has provided a venue to inform them of the project.

⁵If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue undertake the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities.

ANNEX D: CALENDAR OF EXPECTED REFLOWS (if non-grant instrument is used)

Provide a calendar of expected reflows to the GEF/LDCF/SCCF/NPIF Trust Fund or to your Agency (and/or revolving fund that will be set up)

ANNEX E: TIMELINE OF ACTIVITIES

TIMELINE FOR COMPONENT 1		Year 1				Year 2							
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4				
	Outcome/Output/Activity	Quarter											
OUTCOME 1	NATIONAL REGULATORY AND ENFORCEMENT INFRASTRUCTURES IN PLACE TO ASSURE CONTINUOUS REDUCTION OF ANNEX C POPs RELEASES FROM OPEN BURNING SOURCES												
Output 1.1	Waste management regulatory framework updated												
Activity 1.1.1	Update the regulatory framework on chemical and waste management.												
Activity 1.1.2	Address the gaps and barriers in the regulatory framework specifically addressing POPs and BAT/BEP												
Activity 1.1.3	Formulate proposal for the regulatory framework on landfill management, specifically addressing POPs and BAT/BEP issues for the open burning sector												
Activity 1.1.4	Conduct workshop and training to discuss the proposed revised legal framework and circulate comments among governmental agencies, enterprises, academia and relevant stakeholders												
Output 1.2	Adequate management capacity built in implementing BAT/BEP and waste management practices												
Activity 1.2.1	Carry out targeted training for public officers and relevant stakeholders involved in waste management to introduce BAT/BEP concepts												
Activity 1.2.2	Continuously update the National inventory of waste disposal sites and establish the relevant National registry.												
Output 1.3	Adequate capability strengthened in monitoring activities and in evaluating and reporting data of U-												

TIMELINE FOR COMPONENT 1		Year 1				Year 2					
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
	Outcome/Output/Activity	Quarter									
	POPs releases										
Activity 1.3.1	Strengthen laboratory capacity in sampling and analysis methods of UP-POPs.										
Activity 1.3.2	Update and evaluate the National inventory of U-POPs releases										
TIMELINE FOR COMPONENT 2		Year 1				Year 2					
	Outcome/Output/Activity	Quarter									
OUTCOME 2:	ANNEX C POPS RELEASES INTO THE ENVIRONMENT ARE REDUCED FROM OPEN BURNING ACTIVITIES										
Output 2.1	Cost and benefits of the available BAT/BEP measures for reducing Annex C POPs releases from open burning analyzed.										
Activity 2.1.1	Carry out preliminary evaluation of releases and impact indicators and conduct risk assessment study for the current practices of open burning in the demonstration site.										
Activity 2.1.2	Carry out financial and technological assessment study on the potential reduction of U-POPs after BAT/BEP implementation on the demonstration site.										
Output 2.2	Demonstration activities carried out in a selected site promoting BAT/BEP implementation										
Activity 2.2.1:	Dedicated training for staff involved in waste disposal management in the selected demonstration site										
Activity 2.2.2:	Introduce sustainable measures for an effective rehabilitation of the selected site to reduce U-POPs and other contaminants releases										
Activity 2.2.2:	Facilitate the set up cooperation programs with local stakeholders for the promotion of recycling activities, to boost the waste management local business through incentive mechanisms										

TIMELINE FOR COMPONENT 3		Year 1				Year 2							
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4				
	Outcome/Output/Activity	Quarter											
OUTCOME 3:	PROJECT ACTIVITIES ARE SUSTAINABLE AND REPLICATED												
Output 3.1:	Awareness raising campaigns implemented												
Activity 3.1.1:	Carry out targeted awareness raising campaigns on environmental and health hazards of U-POPs for relevant stakeholders, including vulnerable groups												
Activity 3.1.2:	Hold awareness workshops to share information on experiences on good practices and promote new technologies among stakeholders												
Activity 3.1.3	Develop awareness raising dissemination material and set up a website for information dissemination.												
Output 3.2:	U-POPs from open burning and chemical safety of waste management related matters incorporated into educational curricula												
Activity 3.2.1	Design education programs for disseminating knowledge on U-POPs issues												
Activity 3.2.2:	Develop education curricula at university level focused on BAT/BEP, waste management and UP-POPs monitoring												

TIMELINE FOR COMPONENT 4							Year 1				Year 2			
	Outcome/Output/Activity	Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
OUTCOME 4	PROJECT OBJECTIVES ARE ATTAINED													
Output 4.1	Establishment of project management													
Activity 4.1.1	Establish the Project Steering Committee (PSC) by relying on resources from related ministries or commissions at the national level and from local governmental agencies													
Activity 4.1.2	Establish the Project Management Team													
Output 4.2	Project impact monitoring system identified and implemented													
Activity 4.2.1	Prepare project Inception report.													
Activity 4.2.2:	Prepare Annual Project Reports and Project Implementation Reports													
Activity 4.2.3	Carry out final external evaluation													
Activity 4.2.4	Complete Project Terminal Report													

ANNEX F: BUDGET PER OUTPUT

OUTCOME 1		NATIONAL REGULATORY AND ENFORCEMENT INFRASTRUCTURES IN PLACE TO ASSURE CONTINUOUS REDUCTION OF ANNEX C POPS RELEASES FROM OPEN BURNING SOURCES									
		Budget lines	Description	Year 1		Year 2		Total			
US\$	w/m			US\$	w/m	US\$	w/m				
Output 1.1:	Waste management regulatory framework updated	11-00	6000	0.5	9000	0.75	15000	1.25			
		17-00	12500	5	17500	7	30000	12			
		51-00	1000		1000		2000	0			
		15-00	6000		7000		13000	0			
		45-00					0	0			
		30-00			10000		10000	0			
		21-00					0	0			
		Sub-total	25500	25500	5.5	44500	7.75	70000			
Output 1.2:	Adequate management capacity built in implementing BAT/BEP and waste management practices	11-00	3000	0.25	3000	0.25	6000	0.5			
		17-00	7500	3	12500	5	20000	8			
		51-00	1000		1000		2000	0			
		15-00	4000		9000		13000	0			
		45-00					0	0			
		30-00	4000		8000		12000	0			

OUTCOME 2		ANNEX C POPs RELEASES INTO THE ENVIRONMENT ARE REDUCED FROM OPEN BURNING ACTIVITIES									
		GEF Outputs	Budget lines	Description	Year 1		Year 2		Total		
US\$	w/m				US\$	w/m	US\$	w/m	US\$	w/m	
Output 2.1: Cost and benefits of the available BAT/BEP measures for reducing Annex C POPs releases from open burning analyzed	11-00	Consultants	6000	0.5	3000	0.25	9000	0.75			
	17-00	Nat. Experts	7500	3	7500	3	15000	6			
	51-00	Sundries					0	0			
	15-00	Project staff travel	6000		5000		11000	0			
	45-00	Equipment					0	0			
	30-00	Workshops					0	0			
	21-00	Subcontracts	60000		20000		80000	0			
		Sub-total			79500	79500	3.5	35500	3.25	115000	
	Output 2.2: Demonstration activities carried out in a selected site promoting BAT/BEP implementation	11-00	Consultants	6000	0.5	9000	0.75	15000	1.25		
		17-00	Nat. Experts	10000	4	5000	2	15000	6		
51-00		Sundries	500		500		1000	0			
15-00		Project staff travel	5000		5000		10000	0			
45-00		Equipment	15000		190000		205000	0			
30-00		Workshops	9000				9000	0			
21-00		Subcontracts	60000		60000		120000	0			
	Sub-total			105500	105500	4.5	269500	2.75	375000		
	Total for Component 2			185000	8	305000	6	490000	14		

PROJECT ACTIVITIES ARE SUSTAINABLE AND REPLICATED									
OUTCOME 3	GEF Outputs	Budget lines	Description	Year 1		Year 2		Total	
				US\$	w/m	US\$	w/m	US\$	w/m
Output 3.1: Awareness raising campaigns implemented		11-00	Consultants	6000	0.5	6000	0.5	12000	1
		17-00	Nat. Experts	5000	2	10000	4	15000	6
		51-00	Sundries	1000		1000		2000	0
		15-00	Project staff travel	3000		4000		7000	0
		45-00	Equipment					0	0
		30-00	Workshops	3000		6000		9000	0
		21-00	Subcontracts	10000		15000		25000	0
			Sub-total	28000	28000	2.5	42000	4.5	70000
	Output 3.2: U-POPs from open burning and chemical safety of waste management related matters incorporated into educational curricula		11-00	Consultants	0		6000	0,5	6000
		17-00	Nat. Experts	5000	2	7500	3	12500	5
		51-00	Sundries					0	0
		15-00	Project staff travel	500		1000		1500	0
		45-00	Equipment					0	0
		30-00	Workshops					0	0
		21-00	Subcontracts	5000		5000		10000	0
		Sub-total	10500	10500	2	19500	3.5	30000	
	Total for Component 3			38500	4.5	61500	8	100000	12.5

OUTCOME 4		ADHERENCE TO PROJECT DOCUMENT AND ATTAINMENT OF PROJECT OBJECTIVE									
		GEF Outputs	Budget lines	Description	Year 1		Year 2		Total		
					US\$	w/m	US\$	w/m	US\$	w/m	
Output 4.1: Establishment of project management	11-00	Consultants									
	17-00	Nat. Experts									
	51-00	Sundries									
	15-00	Project staff travel									
	45-00	Equipment									
	30-00	Workshops									
	21-00	Subcontracts									
		Sub-total		0	0	0	0	0	0	0	0
Output 4.2: Project impact monitoring system identified and implemented	11-00	Consultants		3000					3000	0.25	
	17-00	Nat. Experts		5000		5000	2	10000			
	51-00	Sundries		1000				1000			
	15-00	Project staff travel		1000				1000			
	45-00	Equipment						0			
	30-00	Workshops						0			
	21-00	Subcontracts				30000		30000			
		Sub-total		10000	10000	2.25	30000	0	40000	2.25	40000
	Total for Component 4		10000	2.25	30000	0	40000	2.25	40000	2.25	

GEF Outputs	Budget lines	Description	Year 1		Year 2		Total	
			US\$	w/m	US\$	w/m	US\$	w/m
Project management cost								
	11-00	Consultants	3000	0.25	6000	0.5	9000	0.75
	17-00	Nat. Experts	5000	2	5000	2	10000	4
	51-00	Sundries						0
	15-00	Project staff travel	6000		6000		12000	0
	45-00	Equipment					0	0
	30-00	Workshops	4500		4500		9000	0
	21-00	Subcontracts						0
	Sub-total		2.25	21500		40000	0.75	

PROJECT TOTAL INCLUDING MANAGEMENT COSTS									
GEF Outputs	Budget lines	Description	Year 1		Year 2		Total		
			US\$	w/m	US\$	w/m	US\$	w/m	
	11-00	Consultants	42000	3.5	42000	3.5	84000	7	
	17-00	Nat. Experts	57500	23	70000	28	127500	51	
	51-00	Sundries	5500		3500		9000		
	15-00	Project staff travel	31500		37000		68500		
	45-00	Equipment	54000		190000		244000		
	30-00	Workshops	26500		28500		55000		
	21-00	Subcontracts	135000		130000		265000		
		Project total	352000	26.5	501000	31.5	853000	58	

ANNEX G: BUDGET PER ACTIVITIES

Titles	Financing		
	GEF	COFI	Total
OUTCOME 1: NATIONAL REGULATORY AND ENFORCEMENT INFRASTRUCTURES IN PLACE TO ASSURE CONTINUOUS REDUCTION OF ANNEX C POPs RELEASES FROM OPEN BURNING SOURCES.	183,000	1,180,000	1,363,000
Output 1.1: Waste management regulatory framework updated	70,000	560,000	630,000
Activity 1.1.1: Update the regulatory framework on chemical and waste management.	20,000	160,000	180,000
Activity 1.1.2: Address the gaps and barriers in the regulatory framework specifically addressing POPs and BAT/BEP	10,000	80,000	90,000
Activity 1.1.3: Formulate proposal for the regulatory framework on landfill management. specifically addressing POPs and BAT/BEP issues for the open burning sector	20,000	160,000	180,000
Activity 1.1.4: Conduct workshop and training to discuss the proposed revised legal framework and circulate comments among governmental agencies, enterprises, academia and relevant stakeholders	20,000	160,000	180,000
Output 1.2: Adequate management capacity built in implementing BAT/BEP and waste management practices	45,000	300,000	345,000
Activity 1.2.1: Carry out targeted training for public officers and relevant stakeholders involved in waste management to introduce BAT/BEP concepts	30,000	150,000	180,000
Activity 1.2.2: Continuously update the National inventory of waste disposal sites and establish the relevant National registry.	15,000	150,000	165,000
Output 1.3: Adequate capability strengthened in monitoring activities and in evaluating and reporting data of U-POPs releases	68,000	320,000	388,000
Activity 1.3.1: Strengthen laboratory capacity in sampling and analysis methods of U-POPs.	53,000	200,000	253,000
Activity 1.3.2: Update and evaluate the National inventory of U-POPs releases	15,000	120,000	135,000
OUTCOME 2: ANNEX C POPs RELEASES INTO THE ENVIRONMENT ARE REDUCED FROM OPEN BURNING ACTIVITIES	490,000	1,448,420	1,938,420
Output 2.1: Cost and benefits of the available BAT/BEP measures for reducing Annex C POPs releases from open burning analyzed.	65,000	340,960	405,960
Activity 2.1.1: Carry out preliminary evaluation of releases and impact indicators and conduct risk assessment study for the current practices of open burning in the demonstration site.	40,000	160,960	200,960

Activity 2.1.2: Carry out financial and technological assessment study on the potential reduction of U-POPs after BAT/BEP implementation on the demonstration site.	25,000	180,000	205,000
Output 2.2: Demonstration activities carried out in a selected site promoting BAT/BEP implementation	325,000	1,117,460	1,573,460
Activity 2.2.1: Dedicated training for staff involved in waste disposal management in the selected demonstration site	35,000	60,000	100,000
Activity 2.2.2: Introduce sustainable measures for an effective rehabilitation of the selected site to reduce U-POPs and other contaminants releases	360,000	873,460	1,233,460
Activity 2.2.3: Facilitate the set up cooperation programs with local stakeholders for the promotion of recycling activities, to boost the waste management local business through incentive mechanisms	30,000	184,000	214,000
OUTCOME 3: PROJECT ACTIVITIES ARE SUSTAINABLE AND REPLICATED	100,000	560,000	660,000
Output 3.1: Awareness raising campaigns implemented	70,000	300,000	370,000
Activity 3.1.1: Carry out targeted awareness raising campaigns on environmental and health hazards of U-POPs for relevant stakeholders, including vulnerable groups	25,000	100,000	125,000
Activity 3.1.2: Hold awareness workshops to share information on experiences on good practices and promote new technologies among stakeholders	25,000	100,000	125,000
Activity 3.1.3: Develop awareness raising dissemination material and set up a website for information dissemination.	20,000	100,000	120,000
Output 3.2: U-POPs from open burning and chemical safety of waste management related matters incorporated into educational curricula	30,000	260,000	290,000
Activity 3.2.1: Design education programs for disseminating knowledge on U-POPs issues	15,000	130,000	145,000
Activity 3.2.2: Develop education curricula at university level focused on BAT/BEP, waste management and UP-POPs monitoring	15,000	130,000	145,000
OUTCOME 4: ADHERENCE TO PROJECT DOCUMENT AND ATTAINMENT OF PROJECT OBJECTIVE	40,000	40,000	80,000
Output 4.1: Establishment of project management	0	10,000	10,000
Activity 4.1.1: Establish the Project Steering Committee (PSC) by relying on resources from related ministries or commissions at the national level and from local governmental agencies		5,000	5,000

Activity 4.1.2: Establish the Project Management Team			5,000	5,000
Output 4.2: Project impact monitoring system identified and implemented		40,000	30,000	70,000
Activity 4.2.1: Prepare project Inception report.		10,000	10,000	20,000
Activity 4.2.2: Prepare Annual Project Reports and Project Implementation Reports			10,000	10,000
Activity 4.2.3: Carry out final external evaluation		30,000		30,000
Activity 4.2.4: Complete Project Terminal Report			10,000	10,000
	Project cost	813,000	3,228,420	4,041,420
	Project management costs	40,000	160,000	200,000
	TOTAL project costs	853,000	3,388,420	4,241,420

ANNEX H: WASTE DUMPS INVENTORY

In the Republic of Armenia almost all urban and rural settlements have dump sites for solid household wastes. In 10 marzes (provinces) of Armenia and Yerevan (the capital city) the total surface of the functioning dumpsites of household wastes accounts for about 464.141 hectares (ha), of which about 108.9 ha are operated without permission. Total quantity of wastes accumulated at the dumpsites accounts for about 27.861.586 tons (t). In 869 rural communities of Armenia only 274 (32%) have waste dumps; however only 35% of those sites have permission to operate.

The characterization of urban and rural dumpsites in each marze is presented in the following Tables 1-2.

Characterization of urban dump-sites in the marzes of Armenia

Table 1.

Marz (province)	number of communities	number of dumpsites		Surface area, ha		Quantity of wastes, t		Waste accumulated at sites without permission	
		Total	of which: without permission to operate	Total	of which: ^a unauthorized (illegal)	Total	of which: unauthorized	Quantity, t	surface area, ha
Shirak marz	3	3	1	29	2	745,190	20	565,000	27
Ararat marz	4	4	-	12.9	-	14,200	-	-	-
Armavir marz	3	3	3	18.2	18,2	1,080	1 080	16,500	6.5
Vayots Dzor marz	3	3	1	1.45	0,35	1,200	390	2,065	0.8
Syunik marz	5	5	2	15	4	17,300	9 000	-	-
Kotayk marz	5	5	-	24	-	18,000	-	5,000	1.5

Marz (province)	number of communities	number of dumpsites		Surface area, ha		Quantity of wastes, t		Waste accumulated at sites without permission	
		Total	of which: without permission to operate	Total	of which: unauthorized (illegal)	Total	of which: unauthorized	Quantity, t	surface area, ha
Aragatsoth marz	3	3	1	11.736	3	105,000	50 000	1,065	2.5
Lory marz	8	8	-	19.055	-	1,785,160	-	250,000	7
Tavush marz	5	5	2	6.7	2.3	87,168	250	-	-
Gegharkunik marz	5	5	1	18.2	5	720	70	150	4
Yerevan city	1	4	-	150	-	7,458.8	-	85,000	34.5
<i>TOTAL</i>	45	48	11	306.241	34.85	2,782,476.8	60,810	924,780	83.8

Characterization of rural dump-sites in the marzes of Armenia

Table 2.

Marz (province)	number of communities		number of dump sites		Surface area, ha		Quantity of accumulated wastes, t	
	Total	of which with no waste-dumps	total	of which unauthorized	total	of which unauthorized	total	of which unauthorized
Shirak marz	116	107	9	6	14.75	9.05	33,250	22,300

Marz (province)	number of communities		number of dump sites		Surface area, ha		Quantity of accumulated wastes, t	
	Total	of which with no waste-dumps	total	of which unauthorized	total	of which unauthorized	total	of which unauthorized
Ararat marz	93	16	77	-	77.65	*	*	*
Armavir marz	94	67	27	27	28.9	28.9	1,869	1,869
Vayots Dzor Marz	41	39	2	2	0.38	0.38	-	-
Syunik marz	104	91	13	13	2.15	2.15	92.5	92.5
Kotayk marz	62	32	30	29	*	*	*	*
Aragatsotn marz	111	64	47	42	8.52	8.02	1274	1,124
Lory marz	105	99	6	6	0.65	0.65	333	*
Tavush marz	61	26	35	31	24.42	24.42	*	*
Gegharkunik marz	82	54	28	28	0.48	0.48	*	*

Marz (province)	number of communities		number of dump sites		Surface area, ha		Quantity of accumulated wastes , t	
	Total	of which with no waste-dumps	total	of which unauthorized	total	of which unauthorized	total	of which unauthorized
Yerevan city	869	595	274	178	157.9	74.05	36818,5	25,385.5

Note: * - data not available

Before the collapse of the former USSR permissions for operation of solid household wastes dumps were issued in rural areas by the executive committees of regional councils, while currently permissions are issued by community authorities; permissions to operate urban dumpsites were previously issued by executive committees of the towns, whereas at present they are issued by the town administration.

Waste dumps are located at a 15-20 km distance apart from resident areas. Natural cavities (craters), canyons and areas inappropriate for agricultural use are used as dumps. Most dumps do not meet the basic requirements set for wastes sanitary disposal locations, and necessary environmental facilities are lacking. For many of them their operation life time has expired since many years. Waste-dumps of most big cities are in even poorer condition. Junkyards are not fenced, and people can access to the sites searching some food remnants, empty containers, etc. Garbage sorting and waste covering with soil layer are not carried out. Besides household and industrial waste, other types of wastes of different origin are dumped without regard to their hazard degrees. No dump has test wells for the control of landfill groundwater contamination. In rural areas the spontaneous accumulation of garbage in random places, often near rivers, shores of rivers, valleys and other places is frequent. At the majority of waste dumps garbage burning or ignition occur at relatively low temperature, contributing to environmental pollution by persistent organic pollutants. Under such conditions waste dumps are becoming a powerful source of environmental pollution for air, water, and soil, especially regarding persistent organic pollutants that hazardous for the human health.

In the territory of Armenia about 9,250,000 tons of solid household waste are accumulated in many unauthorized places such as highways, roads, river banks, catering facilities. They include construction and industrial waste, as well as pesticides and empty pesticide containers unfit for use in agriculture. A large amount of waste is composed by plastic (polyethylene) bags, bottles made of polymeric materials and empty containers for different purposes, which are either spontaneously scattered both at the solid waste landfills and over the surrounding areas, roads, highways and settlements

A more specific description for each marz is reported hereafter:

In **Shirak marz**, two urban waste dumps are operated in Gyumri and Maralik; they occupy an area of 10 hectares (ha) and 0.5 ha, respectively, and the accumulated garbage volumes accounts for about 70,000 tons and 45,170 tons. Among rural communities Akhuryan waste dump covers 30 ha and the amount of accumulated wastes is about 180 tons. Waste dumps at Ashotsk, Mayissyan rural communities occupy 0.5 ha. Out of 118 rural communities of the region, 86 have no landfills; hence the accumulated waste is burned or buried in the ground.

In **Lori marz** 6 urban dump sites are in operation. In Vanadzor (major town) the dump site area is 6.5 hectares with nearly 1,600,000 tons of garbage; in Alaverdi the area is 4.6 hectares, with about 25,000 tons of garbage, in Akhtala the area is 1.2 hectares and with about 60 tons; in Spitak the area of dump site is 4 hectares, with an amount of waste of 128,000 tons; in Stepanavan, the area is 0.5 hectares with about 24,000 tons; in Tavush, 5 hectares and about 8,000 tons of waste. Among 109 rural communities of Lori marz, 55 have no landfills, the amount of generated wastes are negligible; wastes are burned and buried into the soil.

In **Gegharkunik marz** there are 5 municipal urban solid waste dumps, the occupied area and quantities of accumulated waste are as follows. The waste dump in Gavar has a total area of 2.5 ha and about 160 tons of waste; in Martuni about 200 tons of waste are accumulated on about 2.0-3.0 hectares of land; in Sevan 190 tons of waste on 8 hectares; in Vardenis, 100 tons of waste on 2.0 ha landfill area. Among 87 rural communities of Gegharkunik marz, in 56 there is no dump-sites. In 28 rural communities there is no fixed place for wastes; in different locations of those communities there are dumps of accumulated heaps of rubbish with a total area of about 0.47 hectares. Settlements localized near the Sevan lake mainly have no waste-dumps and the garbage is dumped with the rain waters into rivers and then to the lake. Large volumes of waste are accumulated in suburban areas in not-dedicated areas.

In **Arnavir marz** 3 urban waste-dumps cover the area of about 69 hectares, where about 768 tons of waste were accumulated. The 94 rural communities of the marz have waste-dumps, and the generated waste is collected at various locations occupying a total area of 909.5 hectares, while the quantity of garbage accumulated makes about 1653 tons.

In **Kotayk marz** the total area of 5 urban household waste-dumps accounts for about 24 hectares, of which 3.0 hectares in Abovyan town, 8 hectares in Hrazdan, 1 hectare in Byureghavan, 3 hectares in Eghvard and 3 hectares in Charentsavan. Among 62 rural communities of Kotayk marz, in 29 there are areas of solid household waste accumulations in different parts of the settlements. Out of all rural communities only Jrvezh community has legal landfill with 3.0 ha area.

In **Syunik marz** the quantitative indicators of urban dump sites of Kapan, Goris, Sisian, Meghri are as follows: In Kapan the dumping area account for 12.97 hectares and the accumulated waste for 800 tons; in Goris, 4.5 hectares of land and 6,800 tons of waste; in Meghri, 0.5 hectares of land and 1200 tons of waste, in Sisian, 2 hectares with 300 tonnes of waste. In this province there are 104 rural communities, but only 8 settlements have waste-dumps, with a total area of 12.8 hectares, but there are huge heaps of wastes covering the area of about 1.3 hectares.

In **Ararat marz** 4 urban waste-dumps occupy the following area: 3 ha in Artashat town, 2 ha in Ararat, about 5 hectares in Masis, 3 hectares in Vedi. Among 93 rural communities of the marz, 73 have waste-dumps with a total area of about 78 hectares.

In **Araratsofn marz** among the 3 functioning urban landfills the landfill of Asharak town covers 3 hectares of land with a total of about 50,000 tons of waste cumulated. The waste-dump of Talin town occupies 3 hectares of land and has a total of 25,000 tons of waste; in Aparan the dumpsite occupies an area of 5.7 hectares area with about 30,000 tons of waste. In 111 rural communities of the marz waste-dumps are lacking; garbage is collected in different segments of the community, at road-sides as heaps of waste and occupies a total area of about 8.5 ha.

In **Tavush marz** the urban dump-sites occupy the surface area: in Ijjevan, 2 hectares, in Ayrum, 0.3 hectares, in Dilijan, 2 hectares, in Berd, 0.5 hectares, in Noyemberya, 2 hectares. Mainly household waste is accumulated in the waste-dumps. At Ijjevan municipal landfill the volume of accumulated waste accounts for about 17.200 cubic meters. However, the garbage is also dumped in an irregular manner to some other (unauthorized) places, as well as in the river itself. In the rural settlements of the the marz the waste-dumps are generally lacking, however in different parts of the communities there are huge heaps of waste covering totally about 18 hectares of land.

In **Vayots Dzor marz**, there are 3 municipal landfills. Jermuk landfill covers an area of 0.5 hectares, Yeghegnadzor about 0.6 hectares, Vayk about 0.35 ha. In the southern part of Yeghegnadzor town there are huge amounts (nearly 2,000 tons) of solid household waste accumulations in an area of 0.5 hectares without any permission. The same picture is observed in Arpa River coastal area: on the area of about 3 hectares of land about 65 tons of waste are accumulated. 41 rural communities have no waste-dumps; household garbage accumulates in different parts of the settlements as heaps of waste.

Yerevan, the capital city, is served by Nubarashen, Sasunik, Jrvezh and Arinj landfills.

Nubarashen landfill is located in the Erebuni community, about 7-8 km apart from the settlement. Annually 544,000 m³ solid household wastes were dumped at the landfill since 1960. The landfill has an area of about 60 hectares, of which about 12 are now used as a place for garbage dumping. About 16 hectares of land is referred to as “waste-dumping former place”, which operated until 1990. At the landfill there continuously occurs low-temperature waste burning that causes clouds of smoke.

Sasunik landfill, which operates in Ajapnyak Community, at 14 km away from the settlement covers an area of 60 ha. At this landfill, about 163.600 m³ of solid household waste cumulates annually. The landfill is operated since 1982. At this landfill mainly solid household waste cumulates, commercial waste (from the shops, catering facilities, etc.), construction/demolition waste, hazardous waste (batteries, medical waste, expired medicine, etc.). At this Landfill no protective measures are in place for collecting rain water, no regular work is done for wastes covering with the soil, plastic bottles are taken by wind and spread all over the surrounding lands. Regularly there occurs ignition of waste, which causes the smoke and pollutants emissions into the atmosphere.

Jrvezh household waste landfill is located in Nor Nork and Avan Communities 12 kilometers away from the settlements. The landfill covers 6 hectares of land, but currently only 3 ha are used, and the volume of placed waste is 237,600 m³; annually about 96,200 m³ of waste is accumulated. In addition to household waste at this landfill commercial and construction/demolition waste, as well as hazardous waste, which are not sorted, are also placed.

Arinj landfill is located about 8 km aside from the settlement, it covers approximately 30 hectares. Annually at this landfill the amounts of accumulated solid household waste is about 30,000 m³.

Currently, in Yerevan City no specially allotted sites are in place for treatment and storage of accumulated hazardous industrial waste (landfill polygons). Some companies store their own hazardous waste at their industrial premises or treat the waste to have a lower class of hazard and transport to solid household waste landfills using the situation at those uncontrolled landfills. If in the past the wastes from production enterprises were transported to landfills using the services of special sanitary purification, currently the enterprises carry out the processes by themselves. For example, the enterprises NAIRIT, Erebumi Medical center, Makur Erkat (Pure iron), Grand Tobacco, Valencia and other organizations have contracts to operate with Nubarashen landfill.

None of the listed landfills meets the sanitary-hygienic requirements. The landfills have no fenced areas, there are no sanitary defensive/protective zones. At the landfills the control, groundwater monitoring wells to determine the degree of contamination are lacking. Mostly, at the waste-dumping sites the wastes are burned or subject to ignition at relatively low temperatures, contributing to air, water and soil pollution by various components and above all by persistent organic pollutants: dioxins, which present a great threat to the human body and the environment. The composition of mixed garbage accumulated at the waste-dumps varies, depending on the characteristics of the settlement. In waste from rural household waste-dumps a substantial part is formed by wastes generated at barns, cowhouses,, wastes of construction/demolition, empty containers of pesticides used in agriculture, as well as obsolete pesticides and unfit for use in agriculture farm chemicals. In waste from urban landfills of solid household wastes the predominant fraction is given by polyethylene-terephthalate containers of juice, drinking water, mineral water, polystyrene boxes, household chemical products containers, plastic bags, containers made of rubber, plastic, and other products made from synthetic materials, mostly in the form of empty containers.

A description of the industrial waste situation is given hereafter

Before the collapse of the USSR, Armenia was a country with a developed industry and agriculture. In industry the leading branches were mechanical engineering, ore-mining, chemical and petrochemical industry, construction (building) materials production. In the republic a number of enterprises manufactured chemical substances: calcium carbide, chlorine, hydrochloric acid, nitric and sulfuric acids, chloroprene rubber and latex, varnishes, caustic soda, nitrogen fertilizers, plastics. Thus, more than 500 industrial enterprises polluted the environment by various industrial wastes. Yerevan and Vanadzor were most intensely polluted by chemical production wastes, as in the former USSR these cities were the major centers of the chemical industry.

In Yerevan there were functioning such large industrial enterprises as "NAIRIT" and "Polyvinylacetate" Scientific-industrial associations, "Tire" Factory, "ErAZ" (Yerevan Car Factory), "Armelectro" plant, lamp factory, rubber goods factory, household chemicals plant, etc. In addition to these large enterprises small businesses also operated in Yerevan and also polluted the environment by wastes of chemical nature. These were manufacturers of consumer products. Apart from landfills that serve for the capital city, there are accumulations of solid household wastes on unauthorized area of approximately 34.5 hectares with approximately 85,000 tons of waste.

In Vanadzor city there were functioning such large industrial enterprises as the "Chemicals" plant (combine) with calcium carbide, urea, melamine production sites, corundum, furs, synthetic fiber production, as well as Adhesives Research Institute.

In Kadjaran and Kapan towns there were such large industrial enterprises as ore-mining plants (combines).

In Agarak – Copper-and-molybdenum factory victory, in Alaverdi - mining plant (combine).

In 1984-1989, before the energy crisis on the territory of the country at industrial enterprises 36 million tons of industrial waste were generated, of which 20 thousand tons were toxic waste. Among toxic wastes mercury, lead, chromium and their compounds prevailed, as well as galvanic production-related waste, fluorine, non-organic compounds, etc. Since it is impossible to accumulate unlimited amounts of generating wastes at business / industrial area, those wastes are dumped at solid household waste landfills or dumped at random places all over the territory of the republic. In addition to industrial waste, empty containers of pesticides used in agriculture, as well as obsolete pesticides were also disposed to solid household waste landfills.

During the Soviet period each year about 30-35 types of pesticides, including organochlorine pesticides (DDT, hexachloran, hexachlorocyclohexane, etc.) were imported to Armenia for use in agricultural production. Those pesticides have been and are still used to combat pests. Year by year, there was an accumulation of inappropriate pesticides and their containers at household waste landfill, as well as at the rural and urban community dumps, because in Armenia specially allotted sites intended for industrial wastes and unfit for agricultural use pesticides are lacking, as well as waste treatment and recycling enterprises. The only burial intended for obsolete pesticides which is located near the city of Yerevan, was arranged in 1982 in the administrative area of Ararat marz (Bardzrashen community near the road towards Nubarashen). The burial site occupies about 0.5 hectares, there were buried nearly 500 tons of agricultural obsolete pesticides, which could also contain dioxins. At the time of construction the burial was fenced, there was concrete drainage system for rain-water removal. Currently there is no fence, and the integrity of the concrete trenches is violated. On the surface of the burial and the land surrounding the cemetery there are deep grooves, wherefrom the rain-waters can easily penetrate inside the burial thus promoting the migration of pesticides. Before the burial arrangement and after that the inappropriate for use pesticides and their empty containers were disposed either as household wastes, or spontaneously - in random places.

To environmental pollution by toxic substances also contributed the fact that the Soviet Union since 1971 by the order of the USSR Ministry of Agriculture it was allowed to apply up to 10 kg of pesticides, as well as to dispose chemicals through burying into the ground.

A study revealed that nearly all waste-dumps of Armenia are contaminated with PCBs and organochlorine pesticides (Table N3).

Results of laboratory investigations of soil samples taken waste-dumps surrounding areas (in mcg/kg)
Table3.

NN	Sampling points description/location	DDT	DDE	DDD	HCH			PCB
					α -isomer	β-isomer	γ-isomer	
1	Yerevan urban waste-dump (Nubarashen)	40,449	37,152	15,094	6,936	3,468	-	123,292
2	Vanadzor urban waste-dump	-	61,919	-	-	2,312	-	163,643

3	Armavir urban waste-dump	620,225	416,099	18,868	16,185	-	11,566	369,877
4	Ranchpar waste-dump (Masis region)	-	-	2,312	-	0,231	-	63,327
5	Ararat urban waste-dump	26,966	30,217	0,755	-	-	1,156	59,404
6	Vedi urban waste-dump	-	0,495	-	6,012	1,156	0,694	137,863
7	Etchmiadzin urban waste-dump	-	1,734	-	1,156	0,925	-	84,623

8	Bazarchai rural waste-dump (Sisian marz)	-	-	-	2,727	0,151	0,454	25,811
9	Yeghegnadzor urban waste-dump	-	5,961	3,636	11,212	-	5,454	79,362
10	Kapan urban waste-dump	1,185	10,039	-	3,03	-	0,303	72,643
11	Gyumri urban waste-dump	-	6,192	9,434	19,653	1,156	-	81,821
12	Berd urban waste-dump (Tavush marz)	-	-	2,812	-	1,231	-	22,340
13	Gavar urban waste-dump (Gegharkunik marz)	-	7,121	2,954	1,151	-	-	29,384

Table 3 shows that highest amounts of PCBs are found in Armavir municipal solid household waste-dump: about 369.877 mcg//kg. In samples from Vanadzor urban solid household waste-dump, their concentration were about 163.643 mcg//kg, in Vedi municipal solid household waste-dump the concentrations were about 137.863 mcg//kg, in samples from Yerevan municipal solid household wastes landfill, concentrations were about 123.300 mcg//kg. The reasons for these concentrations was to find in the common dumping of containers made of synthetic polymers, as well as industrial wastes in the municipal solid household waste landfills.

The largest quantities of DDT were found in samples from Armavir municipal solid waste landfill: about 620.225 mcg//kg; in samples from Yerevan municipal solid waste landfill DDT accounted for about 40.450 mcg//kg; in samples from Ararat municipal solid waste landfill DDT accounted for 26.966 mcg//kg. The largest quantities of DDE were found in samples from Armavir municipal solid waste landfill, with about 416.100 mcg//kg; in Vanadzor samples, about 61.920 mcg//kg; in samples from Yerevan, about 37.152 mcg//kg; in samples from Ararat, 30.22 mcg//kg .

Residual amounts of HCH, Lindane , Hexachlorobenzene were also found.

Almost all solid household waste disposal sites (waste-dump sites) were contaminated by toxic substances (pesticides, dioxins, mercury, nickel, arsenic, lead, fluorine and its compounds, etc.), because there are no waste sorting, recycling facilities (entities), and this imperfection of the process increases the negative impact likelihood towards human health and the environment especially to soil and water.

ANNEX I: DIOXIN INVENTORY IN ARMENIA

Introduction

The United Nations Environment Programme (UNEP) developed "Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases" [1, 2] that facilitated identification of industrial and non-industrial processes as a result of which the substances are released to air, water, soil, waste and products. To quantify the emission it is supposed to use "emission factor" describing dioxins and furans entry into the environment/media per unit of activity characterizing the enterprise, such as TEQ/t (toxic equivalent per ton). TEQ indicates the potential toxicity of the particular substance itself as related to the most powerful poison among all the dioxins – 2, 3,7,8- tetrachlorodibenzo-p-dioxin (TCDD). The sum of emission factors allows us to estimate the total "dioxin" toxicity of the given source. Usually the international system (I-TEQ) is used.

In all countries, including the Republic of Armenia, where an inventory of dioxins was conducted the coefficients given in "Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases" (UNEP publications of 2001-2005⁶) were used.

The results obtained show that the share of uncontrolled combustion processes account for the majority of dioxin releases.

Further studies, including direct measurements of combustion processes, showed that emission factors are significantly lower than coefficients of UNEP.

In 2005, Pat Costner [3] published relative emission factors for forest fires, open burning of agricultural and household waste and landfill fires (see Tables).

In 2013 an updated Methodological Guidance – "Toolkit for Identification and Quantification of Releases of Dioxins, Furans and other Unintentional POPs" [4] was published under which the emissions are estimated by the new mode and the inventory is being updated.

Table 1 shows that the "new" UNEP coefficients are significantly lower than previous ones, but they also differ from previous ones.

According to the new UNEP publication Armenia carried an inventory update for Category 6 "open burning processes". The data obtained are presented below.

Table 1.
Toxic equivalency (TEQ) coefficients

<i>TEQ coefficients, mcg/t</i>				
		According to UNEP	According to P. Costner (2005)	According to UNEP 2013 new factors
Forest fires	air	5	0.5	1
	soil	4	0.05	0.15
Agricultural residue burning in the field	air	30	0.8	0.5
	soil	10	0.05	0.05
fires at waste-dumps	air	1000	34,5	300
	soil	-	145	10
Open burning of household waste at waste-dumps	air	300	17	40
	soil	600	-	1
	residue	600	0.3	

⁶the Russian versions of UNEP Toolkits were used

Forest fires

Forest resources of the Republic of Armenia occupy 371352 hectares or 12.5% of the territory. 62% of forests are on the north-east part of the country. In the central inland regions afforestation makes only 2% of the territory. 75.3% of forest resources are presented by timber land, while the remaining part belongs to bushes. In Yerevan, the capital city forest resources occupy 1.3 thousand hectares, of which 86.7% are covered by forests.

In forest fires a variety of materials are destroyed, e.g., branches and leaves of trees, living and dead wood. Table 2 presents the number of forest fires for 2006-2012.

According to Pat Costner [1] dioxins emissions from forest fires are not so huge. Dioxin emissions from forest fires are mainly related to the chlorine absorption by trees and other plants, most frequently due to organic compounds absorption by leaves and roots directly from the air during the forest aircraft processing with pesticides

Incomplete oxidation during combustion of wet vegetation in the presence of chlorides high concentrations (70-120 mg/kg of pulp) creates conditions favourable for the formation of dioxins and dioxin-like compounds and their accumulation in the soil.

As indicated in Table 2, recently, in 2010-2013, the number of fires and, respectively, biomass burning cases dramatically increased. Data on forest fires are given in accordance with data of the National Statistical Service of the Republic of Armenia.

Table 2.

Indicator	Value						
	2006	2007	2008	2009	2010	2011	2012
Number of forest fires	10	1	9	17	50	50	63
Area under fire, ha	333.6	12.5	19.0	18.7	846.9	472.6	239.3
Plantations, ha	229.2	12.5	15.2	7.5	786.1	421.2	170.4
Bush/shrubs, ha	34.4	-	3.8	11.2	60.8	51.4	68.9
Amount of biomass, ton (t) per ha of forest*	10	10	10	10	10	10	10
Amount of biomass, t/ha of bush/shrubs*	20	20	20	20	20	20	20
Losses of forest (biomass)	2292.0	125	152	75	7861	4212	1704
Losses of bush (biomass)	688	-	76	224	1216	1028	1378
Amount of lost biomass, t	3680	125	228	299	9077	5240	3082
Dioxins releases to air, TEQ/year	3.68	0.125	0.228	0.299	9.077	5.24	3.082
Dioxins releases to soil, TEQ/ year	0.552	0.0187	0.0342	0.0448	1.362	0.786	0.462

Note: * at forest fires the losses make 10 t/ha; at fires of bush/shrubs - 20 t/ha [2; p. 117].

Table 3 presents data corresponding to the period from 2001 to 2012 calculated using both the old [2] and updated [4] TEQs of UNEP. As obvious, the emissions of dioxins into the air and soil significantly decreased, but that is not associated with a decrease in the loss of biomass because of fires; it is conditioned by a decrease in values of coefficients for air from 5 to 1 µgTEQ/t and soil - from 4 to 0.15 µgTEQ/t.

Table 3.

Year	Amount of biomass, t	Emission, mg TEQ/year			
		To air		To land	
		According to UNEP, 2005	According to UNEP, 2013	According to UNEP, 2005	According to UNEP, 2013
2001	4064	20.32	4.062	16.255	0.6086
2002	315	1.575	0.315	1.26	0.047
2003	74	0.570	0.074	0.296	0.011
2004	255	1.275	0.255	1.02	0.038
2005	707	3.535	0.707	2.828	0.106
2006	3680	18.40	3.68	14.72	0.552
2007	125	0.625	0.125	0.5	0.0187
2008	228	1.14	0.228	0.76	0.0342
2009	299	1.495	0.299	1.196	0.0448
2010	9077	45.385	9.077	3.908	1.362

Year	Amount of biomass, t	Emission, mg TEQ/year			
		To air		To land	
		According to UNEP, 2005	According to UNEP, 2013	According to UNEP, 2005	According to UNEP, 2013
2011	5240	26.200	5.24	20.96	0.786
2012	3082	15.410	3.082	12.328	0.462

“6 a 4” Forest fires

Coefficient TEQ = for air –1 µgTEQ/t, for land – 0.15 µgTEQ/t

Earlier applied coefficient: TEQ for air – 5 µgTEQ/t, for land – 4 µgTEQ/t

Year	Cases of fires	Total area covered by fire, ha	including		Amount of biomass	
			plantations	bush/shrubs	plantations x 10 t	bush/shrubs x 20 t
2006	10	333.6	299.2	34.4	2992	688.0
2007	1	12.5	12.5	-	125	-
2008	9	19.0	15.2	3.8	152	76.0
2009	17	18.7	7.5	11.2	75	224.0
2010	50	846.9	786.1	60.8	7861	1216.0
2011	56	472.6	421.2	51.4	4212	1028.0

Amount of biomass (per ha of plantations=10t; for shrubs= 20t)

Year	Biomass, total	Emissions (mgTEQ/year)	
		air	land
2006	2992+688=3680 t	3.680	0.552
2007	125 t	0.125	0.019
2008	152+76=228 t	0.228	0.0342
2009	75+224=299 t	0.299	0.045
2010	7861+1216=9077 t	9.077	1.362
2011	4212+1028=5240 t	5.240	0.786

Agricultural residue burning in the field

Different agricultural residues and wastes might be burnt in the field. Emissions of harmful substances depend on conditions of material burning, the character, in particular – the composition, of crops or residues and the possible presence of pollutants (e.g., the presence of salt at evaporation of salty water or intensive application of pesticides).

No sugar cane burning occurs in Armenia.

Burning might occur during autumn or spring of the next year and this latter hinders quantitative evaluation of the burning-related activity scales.

As supposed, the quantity of agricultural residues that might be burnt during a year depends on the crops yield. According to data of the Ministry of Agriculture of the Republic of Armenia 56% of agricultural residues are burnt.

Data obtained is presented as table 4.

Dioxins and furans releases from this source were calculated according to UNEP Toolkit 2013 [4]⁷.

Table 4.

Indicator	Values						
	2006	2007	2008	2009	2010	2011	2012
Area under crop, thousand ha	310.2	306.0	304.5	300	283.6	286.7	304.2
Area covered by agricultural residue burning, ha (56%)	173.6	171.36	170.52	168.0	158.82	160.55	170.35
Burnt biomass, thousand tons	434.0	428.4	426.3	420.0	397.05	401.37	425.88
Emission, mg TEQ/ year, air	217.0	214.2	213.15	210.0	198.52	200.68	212.94
Emission, mg TEQ/ year, land	21.70	21.42	21.315	21.0	19.85	20.07	21.294

As obvious from Table 4.1, the area of agricultural residues burning, biomass burning, and, appropriately, emissions of dioxins to air and land did not significantly change in a period of 2006-2012.

Table 4.1

Indicator	Values				
	2001	2002	2003	2004	2005
Area under crop, thousand ha	317.1	305.7	314.6	385.2	No data
Area covered by agricultural residue burning, thousand ha	182.49	174.79	177.66	183.7	
Burnt biomass, thousand tons	456.225	436.975	444.15	458.675	
Emission to air, mg TEQ/ year					
- according to UNEP, 2005	13690	13110	13320	13760	
- according to UNEP, 2013	228.11	218.49	222.0	229.33	
Emission to land, mg TEQ/ year					
- according to UNEP, 2005	4560	4370	4440	4590	

⁷the Russian version of UNEP Toolkits was used

- according to UNEP, 2013	22.81	21.85	22.2	22.93	
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Table 4.1 presents comparative data on dioxins emission (mgTEQ/year) calculated according to UNEP Toolkit 2005 [2]. It is evident that in a period of 2001-2012 the arable area under crop and the area covered by agricultural residues burning did not significantly change. However, dioxins emissions decreased due to decreasing of coefficients used in UNEP Toolkit 2013 [3]: coefficient for air by 60 times, while coefficient for land by 200 times.

“6 a 2” Agricultural residue burning in the field (e.g. cereal crops, etc.)

Coefficient of TEQ=0.5 µgTEQ/t for air; 0.05 µgTEQ/t for land

Earlier: TEQ= for air 30 µgTEQ/t; for land - 10 µgTEQ/t

Year	Cultivated area (1000 ha)	Area where burning occurs in the open (56-57%)
2007	306	171.36
2008	304.5	170.52
2009	300	168.00
2010	283.6	158.82
2011	286.7	160.55
2012	304.2	170.35

It is considered that the burned biomass makes 2.5 t/ha.

Year	Burned biomass (t)		
		Air, mgTEQ/year	Land, g TEQ/year
2007	428400	214.20	0.0214
2008	426300	213.15	0.0213
2009	420000	210.00	0.0210
2010	397050	198.52	0.01985
2011	401375	200.688	0.0207
2012	425880	212,94	0.021

Open burning of household (domestic) wastes

Open burning is the most inexpensive, easy-to-implement and the most applicable means to destruct household wastes. This is especially true for people who have to remove the wastes by themselves. Nevertheless, open burning of household wastes is the environmentally unacceptable process, at which chemicals listed in Annex C of the Stockholm Convention are generated, as well as other products, which pollute the environment. Therefore, open burning should be minimized or eliminated, where possible.

Of course, when sanitary-hygienic removal of wastes is required in order to fight with diseases or pests, then open burning is absolutely necessary, if there are no alternative ways to dispose (destruct) wastes. In no case household wastes can be burned in household conditions: in kitchen stoves, fireplaces, ovens or furnaces. Despite the character of burnt materials open burning is always accompanied by smoke and unpleasant smells, odours, which irritate and might be hazardous for human health.

Dioxins generation at household wastes burning depends on wastes composition and combustion conditions. These factors might vary to a very wide extent. For emissions assessment and evaluation the emissions factors, which are mostly close (appropriate) according to composition and conditions of burning, should be selected.

In Armenia, as a rule, unsorted wastes are burnt; apart from combustible (inflammable) materials and glass, ceramics, food waste, tins and aluminum cans, different types of plastics, packaging, paper, cardboard (carton), textile fabrics, biologically decomposed wastes.

The household wastes open burning issue was assessed based on data of the National Statistical Service. As a rule, in Armenia the wastes are not recycled and are entirely burnt in bonfires at random places, sometimes near the residential buildings.

The available data is presented in table 5. Emissions to air and land were assessed taking into account coefficients of UNEP Toolkit 2013 [3]. Table 5 also involves comparative data on emissions calculated with the use of coefficients from UNEP Toolkit 2005 [2].

As evident from the Table the amount of burnt wastes in Yerevan gradually decreases 2395.9 t/year (in 2007) to 0.6 t/year.

“6b. 3” Open (uncontrolled) burning of domestic waste

Emissions: into air - 40 µg TEQ/t; to land 1 µg TEQ/t

Earlier emissions: into air - 300 µg TEQ/t, to residue - 600 µg TEQ/t, to land - 600 µg TEQ/t

Table 5.

Yerevan	Year	Amount of waste	Emissions, mg TEQ/year	
			air	land
	2006	2148.7	85.95	2.15
2007	2395.5	95.84	2.40	
2008	1359.1	54.36	1.36	
2009	436.9	17.48	0.44	
2010	284.1	11.37	0.29	
2011	0.6	0.024	0.0006	
2012	12.0	0.48	0.012	

Ararat	Year	Amount of waste	Emissions, mg TEQ/year	
			air	land
2006	2.0	0.08	0.002	

Armavir	Year	Amount of waste	Emissions, mg TEQ/year	
			air	land
2006	10.0	0.40	0.01	
2008	3.3	0.132	0.0033	
2009	4.0	0.16	0.004	
2012	145.1	5.80	0.145	

Kotayk	Year	Amount of waste	Emissions, mg TEQ/year	
			air	land
2006	111.0	4.44	0.111	
2007	113.0	4.52	0.113	
2008	100.0	4.00	0.100	

Lory	Year	Amount of waste	Emissions, mg TEQ/year	
			air	land
2006	4.4	0.176	0.0044	
2007	4.7	0.188	0.0047	
2009	9.3	0.372	0.0093	
2010	9.3	0.372	0.0093	
2011	8.0	0.32	0.008	
2012	7.9	0.316	0.0079	

Tavush	Year	Amount of waste	Emissions, mg TEQ/year	
			air	land

	2006	8.0	0.32	0.008
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Syunik	Year	Amount of waste	Emissions, mg TEQ/year	
			air	land
	2009	6.9	0.276	0.0069
2010	0.7	0.028	0.0007	
2011	1.0	0.04	0.001	
2012	2.4	0.096	0.0024	

Shirak	Year	Amount of waste	Emissions, mg TEQ/year	
			air	land
	2009	6.0	0.24	0.006
2011	6.0	0.24	0.006	

Gegharkunik	Year	Amount of waste	Emissions, mg TEQ/year	
			air	land
	2010	5.4	0.216	0.0054

TOTAL	Year	Amount of waste	Emissions, mg TEQ/year			
			air		land	
			Toolkit 2005	Toolkit 2013	Toolkit 2005	Toolkit 2013
			2006	2284.1	685.23	91.364
2007	2513.6	754.08	100.544	1508.16	2.514	
2008	1462.4	438.72	58.496	877.44	1.462	
2009	463.1	138.93	18.524	277.86	0.463	
2010	300.3	90.09	12.012	180.18	0.300	
2011	17.3	5.19	0.692	10.38	0.0173	
2012	167.4	50.22	6.696	100.44	0.1674	

Fires at dumpsites

Fires on open-air dumpsites are among the main sources of dioxins and furans.

Currently, in Armenia there are 45 urban and 429 rural dumpsites (organized sites for waste dumping) and countless non-organized dumpsites. The majority (if not the entire number) of those sites do not correspond to sanitary requirements.

Fires at dumpsites are common phenomena. Even in certain European countries there are uncontrolled (illegal) dumpsites of municipal wastes. Frequently the fires at dumpsites are caused by incidental ignition or intended arson (burning) in order to increase the volume capacity of dumpsites. Controlled burning of wastes at dumpsites is done in order to increase the period of the site operation (exploitation).

«Deep» fires constantly occur at almost all dumpsites and unlike the “surface” fires it is practically impossible to identify and extinguish them. Smoldering is that phase of burning that is characterized by the highest amounts of POPs generation. Moreover, the soil of open dumpsites contains great amounts of dioxins.

The main part of chlorine that “enters” to the dumpsite belongs to the polyvinyl chloride from which dioxin might form during dumpsite fires. In Armenia PCB content in soil of the dumpsites varies in the range of 22.3-369.9 mcg/kg. From the polluted areas penetration of hazardous compounds into underground and surface waters, plants, agricultural produce occurs with subsequent penetration to human organism - via foodstuffs: through the trophic chains.

At all dumpsites some amounts of methane (flammable gas) are generated as a result of anaerobic decomposition of organic matter inside the waste dumpsite. The gas easily flammable either by itself or due to human intervention. Methane creates a powerful green-house effect.

Dioxins emissions resulting from fires at dumpsites in a period of 2006-2012 are presented in Table 6. Due to decrease of coefficients for dioxins emissions to air from 1000 µg TEQ/t to 300 µg TEQ/t in UNEP Toolkit 2013 [3] the emissions also significantly decreased (about 3 times). In UNEP Toolkit 2005 [2] emissions to land were not considered, while in 2013 the toxic equivalent was established at 10 µg TEQ/t.

As an example, in Yerevan the changes of emissions resulting from reduced toxic equivalents were as follows:

Year	Amount of waste, t	Emissions, g TEQ/year			
		According to UNEP Toolkit 2005		According to UNEP Toolkit 2013	
		air	land	air	land
2001	1148	1,148	-	0,344	0,011
2002	1244	1,244	-	0,373	0,012
2003	1380	1,38	-	0,414	0,013
2004	3770	3,77	-	1,131	0,037
2005	7247,5	7,248	-	2,174	0,725
2006	342722	342,72	-	102,82	3,43
2007	18187,7	18,188	-	5,456	0,182
2008	8060,9	8,061	-	2,418	0,081
2009	7898,1	7,898	-	2,369	0,079
2010	8541,4	8,541	-	2,562	0,085
2011	9430,8	9,340	-	2,829	0,0943
2012	22317,0	22,317	-	6,695	0,229

“6 b 1” Fires at waste dumps (wet, high organic carbon content (gr. 6b. 1)

Emissions: into air 300 µg TEQ/t; to land 10 µg TEQ/t

(till 2005: the emissions to air were 1000 µg TEQ/t)

Data from the reference of the National Statistical Service for 2011, page. 55

Table 6

	Year	Amount of waste, t	Emissions, g TEQ/year	
			air	land
Yerevan	2006	342722,0	102,82	3,43
	2007	18187,7	5,456	0,1819
	2008	8060,9	2,418	0,08061
	2009	7898,1	2,369	0,07898
	2010	8541,4	2,562	0,08541
	2011	9430,8	2,829	0,09431
	2012	22317,0	6,695	0,22917

Marz	Year	Amount of waste, t	Emissions, g TEQ/year	
			air	land
Aragatsotn	2006	595,4	0,1786	0,00595
	2007	528,6	0,1586	0,00529
	2008	646,6	0,19398	0,006466
	2009	753,6	0,2261	0,007536
	2010	467,4	0,1402	0,00467
	2011	942,9	0,2829	0,00943
	2012	1293,7	0,388	0,01294

Marz	Year	Amount of waste, t	Emissions, g TEQ/year	
			air	land
Ararat	2006	952,4	0,2857	0,00952
	2007	1033,0	0,3099	0,01033
	2008	1834,0	0,5502	0,01834
	2009	1390,5	0,4172	0,013905
	2010	1852,8	0,5588	0,018528
	2011	2304,9	0,6915	0,02305
	2012	1623,3	0,487	0,01623

Marz	Year	Amount of waste, t	Emissions, g TEQ/year	
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			air	land
Armavir	2006	102,2	0,0307	0,00102
	2007	166,7	0,0500	0,00167
	2008	63,7	0,0191	0,00664
	2009	1127,5	0,3383	0,01128
	2010	3679,7	1,1039	0,0368
	2011	6661,0	1,9983	0,0666
	2012	5140,4	1,542	0,0514

Marz	Year	Amount of waste, t	Emissions, g TEQ/year	
			air	land
Gegharkunik	2006	410,0	0,1230	0,0041
	2007	520,0	0,1560	0,0052
	2008	640,0	0,1920	0,0064
	2009	433,0	0,1299	0,0043
	2010	553,5	0,1661	0,0055
	2011	619,0	0,1857	0,0062
	2012	932,4	0,2797	0,0093

Marz	Year	Amount of waste, t	Emissions, g TEQ/year	
			air	land
Lory	2006	643,5	0,1931	0,0064
	2007	824,4	0,2473	0,0082
	2008	809,4	0,2428	0,0081
	2009	1779,1	0,5337	0,0178
	2010	7231,4	2,1694	0,0723
	2011	1388,3	0,4165	0,0139
	2012	1528,2	0,4585	0,01528

Marz	Year	Amount of waste, t	Emissions, g TEQ/year	
			air	land
Kotayk	2006	1770,5	0,5312	0,0177
	2007	1374,7	0,4124	0,0137
	2008	1641,6	0,4924	0,0164
	2009	1641,4	0,4924	0,0164
	2010	5603,3	1,6810	0,0560
	2011	2285,2	0,6856	0,0229
	2012	5393,8	1,618	0,05394

Marz	Year	Amount of waste, t	Emissions, g TEQ/year	
			air	land
Shirak	2006	631,9	0,18957	0,00632
	2007	2756,3	0,82689	0,02756
	2008	888,6	0,26658	0,08886
	2009	16532,5	4,95975	0,16532
	2010	11268,9	3,38067	0,11269
	2011	13440,4	4,03212	0,13440
	2012	2340,0	0,7020	0,0234

Marz	Year	Amount of waste, t	Emissions, g TEQ/year	
			air	land
	2006	11657,3	3,497	0,1166
	2007	10480,2	3,144	0,1048

Syunik	2008	9211,0	2,763	0,0921
	2009	9377,0	2,813	0,0938
	2010	1403,0	0,421	0,0140
	2011	10767,0	3,23	0,1076
	2012	2498,5	0,749	0,02498

Marz	Year	Amount of waste, t	Emissions, g TEQ/year	
			air	land
Vayots Dzor http://www.advantour.com/rus/armenia/vayots-dzor.htm	2006	403,2	0,12096	0,004032
	2007	359,5	0,10776	0,003595
	2008	378,3	0,11349	0,003783
	2009	833,6	0,25008	0,00834
	2010	518,7	0,15561	0,005187
	2011	726,1	0,21783	0,007261
	2012	267,2	0,0802	0,00267

Marz	Year	Amount of waste, t	Emissions, g TEQ/year	
			air	land
Tavush	2006	634,5	0,19035	0,006345
	2007	894,9	0,26847	0,008949
	2008	890,6	0,26718	0,008906
	2009	1050,0	0,31500	0,010500
	2010	1373,5	0,41205	0,013735
	2011	1373,2	0,41196	0,013732
	2012	1239,0	0,3717	0,01239

TOTAL	Year	Amount of waste, t	Emissions, g TEQ/year	
			air	land
	2006	360522,9	108,157	3,605
	2007	37125,3	11,114	0,371
	2008	25064,7	7,519	0,251
	2009	42816,3	12,845	0,428
	2010	42491,6	12,748	0,425
	2011	49938,8	14,982	0,4994
	2012	44573,5	13,372	0,4457

Conclusion

Taking into consideration the results of inventory (before 2004), the country should have taken measures to decrease emissions generated at open burning. These measures include incentives, benefits aimed at diminishing the volume of wastes exposed to open burning, better waste management modes, trainings, awareness-raising, improved infrastructures.

The updated inventory (2013) is aimed to evaluate the achievement obtained as a result of carrying-out the above-mentioned actions.

The results of inventory presented in this report demonstrate that in Armenia no significant changes are observed in respect of open burning. Changes in amount of releases are mainly due to change in the emission factors of the UNEP Toolkit. In some case even a worse situation is observed and this might be objective data on volumes of burnt materials provided by the Ministry of Agriculture and the National Statistical Service of the Republic of Armenia.

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