UNITED
NATIONS

MC

UNEP/MC/COP.3/INF/13

Distr.: General
27 August 2019

English only

United Nations
Environment
Programme

**Conference of the Parties to the
Minamata Convention on Mercury
Third meeting**
Geneva, 25–29 November 2019
Item 5 (d) of the provisional agenda*

Matters for consideration or action by the Conference of the Parties: guidance on the management of contaminated sites

Technical information supplementing the guidance on the management of contaminated sites

Note by the secretariat

As is mentioned in the note by the secretariat on the guidance on the management of contaminated sites (UNEP/MC/COP.3/8), the experts involved in the development of the guidance recommended that some technical information supplementing it, such as a glossary of terms related to the management of contaminated sites and a reference to available technical information, be made available to parties to support the implementation of article 12. That information is set out in the annex to the present note, which has not been formally edited.

* UNEP/MC/COP.3/1.

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Annex

Technical information supplementing the guidance on the management of contaminated sites

1. Draft glossary of terms related to the management of contaminated sites

In the process of developing the guidance on the management of contaminated sites, experts nominated by parties and other stakeholders proposed that a glossary of relevant terms should be developed.

The following is the draft glossary developed by the secretariat on key terms used in the draft guidance, or proposed by experts. This glossary could be finalized by inviting comments from experts on the terms to be included in the glossary, and definitions of those terms. The glossary may be then posted on the Convention website.

Conceptual site model: a visual representation and narrative description of the physical, chemical and biological processes that may occur, are occurring, or have occurred, at a site.

Contaminant-pathway-receptor linkages: A "contaminant" is a substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor, or to cause significant pollution of controlled waters. A "receptor" is something that could be adversely affected by a contaminant, for example a person, an organism, an ecosystem, property, or controlled waters. A "pathway" is a route by which a receptor is or might be affected by a contaminant. (UK Contaminated Land Statutory Guidance[1])

Contaminated site: A location where as a result of human activity an unacceptable hazard to human health and ecosystems exists. Local contamination (contaminated sites) is a problem in restricted areas (or sites) around the source, where there is a direct link to the source of contamination. (European Environment Agency[2])

Exposure assessment: The process of estimating or measuring the intensity, frequency, and duration of exposure to an agent. Ideally, it describes the sources, pathways, routes, magnitude, duration, and patters of exposure; the characteristics of the population exposed; and the uncertainties in the assessment. (European Environment Agency)

Hazard assessment: Process designed to determine factors contributing to the possible adverse effects of contaminants to which a human population or an environmental compartment could be exposed. The process includes three steps: hazard identification, hazard characterisation, and hazard evaluation. (European Environment Agency)

Polluter-pays principle: The principle that those causing pollution should meet the costs to which it gives rise. (European Environment Agency)

Risk assessment: The procedure in which the risks posed by inherent hazards involved in processes or situations are estimated either quantitatively or qualitatively. (European Environment Agency)

Site characterization: Action to determine the contamination levels of and key risks posed by individual site. This involves phased investigation from preliminary site investigation or initial site screening to detailed site investigation.

Site management: A set of actions taken to reduce exposure of humans and the environment to the contaminants present at the site. Site remediation may be one of the management options, but in a narrower sense the word site management may be used to refer to options for controlling exposure other than remediation options.

Site remediation: Actions on the site aimed at the removal, control, containment or reduction of contaminants so that the contaminated site, taking account of its current use and approved future use, no longer poses any significant risk to human health or the environment. (Proposed EU Soil Framework Directive[3])

[1] https://www.gov.uk/government/publications/contaminated-land-statutory-guidance

[2] https://www.eea.europa.eu/help/glossary/eea-glossary

[3] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52006PC0232

2. Existing guidance and technical tools on the management of contaminated sites

Guidance documents and technical tools developed under international or national framework or by research institutions may be helpful for identifying, assessing and managing sites contaminated by mercury or mercury compounds. The following documents and tools have been mentioned by parties and experts.

General or cross-cutting guidance

Canadian Council of Ministers of the Environment (CCME) (2016). *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment.* Available at https://www.ccme.ca/en/resources/contaminated_site_management/assessment.html.

IPEN (2016). *Guidance on the Identification, Management and Remediation of Mercury-Contaminated Sites*. Available at https://ipen.org/documents/guidance-identification-management-and-remediation-mercury-contaminated-sites.

Kovalick W., Montgomery, R., Developing a Program for Contaminated Site Management in Low and Middle Income Countries. The World Bank (2014).

Mediterranean Action Plan/United Nations Environment Programme (MAP/UNEP) (2015). *Guidelines on Best Environmental Practices for Environmentally Sound Management of Mercury-Contaminated Sites in the Mediterranean*. Available at http://wedocs.unep.org/handle/20.500.11822/9917.

World Health Organization. Regional Office for Europe (WHO/EURO) (2013). *Contaminated Sites and Health*. Available at http://www.euro.who.int/__data/assets/pdf_file/0003/186240/e96843e.pdf?ua=1.

Site identification and characterization

Guérin V., Laperche V., Grangeon S., Hubé D. (2014) *Characterisation of Mercury Contaminates Sites*, Project No. SN-03/08. Available at https://snowmannetwork.com/wp-content/uploads/D3.1-SNOWMAN-IMaHg-WP3-characterisation.pdf

National Environmental Protection Council (1999). *NEPM Schedule B (1) - Guideline on Investigation Levels for Soil and Groundwater*. Available at http://www.nepc.gov.au/system/files/resources/93ae0e77-e697-e494-656f-afaaf9fb4277/files/schedule-b1-guideline-investigation-levels-soil-and-groundwater-sep10.pdf.

Risk assessment

ATSDR, Toxic Substances Portal - Mercury : https://www.atsdr.cdc.gov/phs/phs.asp?id=112&tid=24 and factsheet : https://www.atsdr.cdc.gov/mercury/docs/11-229617-E-508_HealthEffects.pdf

Back P-E, Vestin J. (2014) *Risk Assessment of Mercury Contaminated Sites*, Project No. SN-03/08. Available at https://snowmannetwork.com/wp-content/uploads/D3.2-SNOWMAN-IMaHg-WP4-risk-assessment.pdf

World Health Organization (WHO) (2017). "Mercury and health" (website). Available at http://www.who.int/mediacentre/factsheets/fs361/en/.

Site management and remediation

ADEME, BRGM, *Interactive tool for pre-selection of pollution control techniques*, available in French only, http://www.selecdepol.fr/

Merly, C. and Hube, D. (2014). *Remediation of Mercury-Contaminated Sites*. Project No. SN-03/08. Available at https://docplayer.net/18898131-Remediation-of-mercury-contaminated-sites.html.

NICOLE (Network for Industrially Co-ordinated Sustainable Land Management in Europe) (2015) Report: Risk-based Management of Mercury Impacted Sites, http://www.nicole.org/uploadedfiles/WGM%202015-06-10%20NICOLE%20Risk%20based%20Management%20of%20Mercury%20Impacted%20Sites.pdf

United States Environment Protection Agency (US EPA) (2007). *Treatment Technologies for Mercury in Soil, Waste, and Water*. Washington. Available at https://clu-in.org/download/remed/542r07003.pdf.

3. Case studies

The following case studies, submitted by France, are available from the Convention website.[4]

- Case studies on background mercury levels and conceptual model of mercury transfer to the food chain from Laperche V., R. Maury-Brachet, F. Blanchard, Y. Dominique, G. Durrieu, J.-C. Massabuan, H. Bouillard, B. Joseph, P. Laporte, N. Mesmer-Dudons, V. Duflo et L. Callier (2007) "Répartition régionale du mercure dans les sédiments et les poissons de six fleuves de Guyane". Rapport BRGM/RP-55965-FR. http://infoterre.brgm.fr/rapports/RP-55965-FR.pdf
- A case study on Restoration of Surface water bodies contaminated by mercury. State of the art of available methods and applicability in the French Guiana context from Laperche V. Touzé S. (2014) "Restauration de l'état des masses d'eau de surface contaminée par le mercure - Etat de l'art des méthodes existantes et adaptabilité dans le contexte guyanais". Rapport final. BRGM/RP-64032-FR.
- A case study on groundwater Characterisation at chloralkali site

The following references were provided by experts.

- Boudou, A., R. Maury-Brachet, G. Durrieu, M. Coquery and C. Dauta (2006). Chercheurs d'or et contamination par le mercure des systèmes aquatiques continentaux de Guyane – Risques à l'égard des populations humaines. Hydroécol. Appl., EDP Sciences. 15: 1-18.
- Project "Provision of Remedial Solutions for the Boroo Mercury Contaminated Site and Recovery of Mercury" by CTNDM and EMGRISA in Spain in cooperation with POLYECO in Greece from July 2015 to December 2016. Monitoring of surface and groundwater for the remediation of mercury contaminated soils (i.e; phytoremediation, mecury fixation and zero-valent iron nanoparticles, or chemical stabilisation). http://www.ctndm.es/proyectos/7-in.php

4. Technical information on the remediation of dwellings impacted by mercury contamination

Remediation of impacted dwellings where mercury amalgamation (or mercury spills in a non-ASGM setting) has been practised requires a separate process within the overall site identification and management plan. Residential dwellings or commercial buildings (such as gold traders who burn amalgam on site) that are suspected of mercury contamination can initially be screened using a handheld device such as a Jerome Mercury Vapor Analyzer (MVA), Lumex 915+ and Lumex RA-915 Light meters or devices with equivalent sensitivity.). If real time readings exceed assessment and clearance screening levels (ACSL) of 300 ng/m3 then decontamination is required. If levels are highly elevated clean-up workers should wear level C PPE (air-purifying respirators with mercury vapor cartridges).

An (ACSL) of 300 ng/m3is the inhalation reference concentration (RfC) for elemental mercury established by the USEPA estimate of a continuous inhalation exposure concentration to people (including sensitive subgroups) that is likely to be without risk of deleterious effects during a lifetime. Reducing the mercury vapor levels in an occupied dwelling to below the ACSL is critical to the health of the occupants.

Decontaminating the structure and contents requires a combination of approaches[5] including;

[4] http://www.mercuryconvention.org/Meetings/Intersessionalwork/tabid/7857/language/en-US/Default.aspx

[5] Thompson, M. (2012) Mercury Contamination: Review of a Residential Response. Prof Saf. 2012 February; 57(2): 50–58.

- Assessment, inventorying and decontaminating items within the structure (using a decontaminating agent such as HgX) and purpose-built vacuums (such as the Nilfisk SS Mercury Vacuum)[6].
- Heating and ventilating the structure. Heating should be conducted for at least 8 hours duration above 26ºC then lowered to 21ºC with at least 2 hours venting. In some cases, existing heating devices inside the structure combined with open windows is sufficient to bring vapors below the ACSL. If monitoring shows this is ineffective, then portable heaters combined with negative pressure air pumps fitted with activated carbon filters can be effective.
- Household items that cannot be decontaminated below 1,000 ng/m3 can be disposed of as household waste.
- Household items that cannot be decontaminated below 10,000 ng/m3 should be disposed of as hazardous waste.
- Some household items may be removed from the site for decontamination by heating in sealed bags to 32-60ºC and then ventilated for 2 hours. They should then be tested to ensure vapor release is below 1,000 ng/m3.
- More porous items such as mattresses, rugs, leather shoes and plastic toys may not be possible to decontaminate. All food including frozen food should be disposed of.
- Structures built with high porosity building materials may also prove difficult to decontaminate.

5. Examples of legal and regulatory approach for financing site management/remediation

In the Unites States, the polluter pays approach is utilised and a pool of funds has been established for this purpose known as the 'Superfund[7]' which is authorised by a legal framework known as Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA. The money that constitutes the 'Superfund' is based mainly on taxes levied against petroleum and chemical industries in an acknowledgement that generate the majority of contaminated sites in the US.

In New Zealand 'The Contaminated Sites Remediation Fund' is administered by the national government and provides up to a total of 2.6 million NZD each year to local governments to address the ten highest risk sites that are nominated to the fund via an application process[8].

In the UK liability for the costs of land contamination investigation and management are determined according to the "polluter pays principle" defined legally in sections 78J and 78K of the Environmental Protection Act 1990 and statutory guidance (Environment Agency UK 2016).

In South Africa liability for contaminated sites costs is also attributed to the polluter under Section 28 of the NEMA (National Environmental Management Act).

EU member states apply the "polluter pays principle" to the maximum extent, while there are exceptions such as where the polluter cannot be identified or cannot afford to cover the costs of investigation and management/remediation. Within the EU, public funds account for up to 35% of total expenditure on contaminated sites where the responsible polluter cannot be identified or cannot pay for the site works. In some member states such as Czech Republic, Macedonia and Spain public funds account for 100% of clean up costs[9].

[6] Under no circumstances should ordinary household vacuums be used as they become contaminated and liberate mercury vapors through their exhaust for long periods after initial use.

[7] For further information see https://www.epa.gov/sites/production/files/documents/thesuperfundcleanupprogram.pdf

[8] http://www.mfe.govt.nz/more/funding/contaminated-sites-remediation-fund/about-fund

[9] Slovak Environmental Agency (2010) State of the Contaminated sites in Slovakia. Tajovskeho 28, 975 90 Banska Bystrica.

6. Other information submitted by parties and other stakeholders

In the process of developing this guidance, parties and other stakeholders submitted information on national policy, legislation, case studies etc. that may be helpful in decision making on the management of contaminated sites, as compiled in this appendix.

Submissions for COP-1

In preparation for the first meeting of the Conference of the Parties in 2107, governments and others were invited to provide to the interim secretariat input on guidance documents or recommendations in relation to the management of sites contaminated with mercury. Relevant information was submitted by eight governments: Brazil, Canada, the European Union, Japan, Norway, the Republic of Korea, Switzerland and Thailand. These submissions are reproduced below.

International POPs Elimination Network (IPEN), Pure Earth, Syracuse University and the Project by the United Kingdom in Colombia also submitted relevant information. These submissions are available from the Convention website[10].

Brazil

The national framework on the management of contaminated sites is the Resolution of the National Council for environment (CONAMA) Nº 420/2009 - which provides guidelines for the management of contaminated sites by chemicals due to human activities.

The Resolution establishes procedures to ensure the full knowledge of the characteristics of the contaminated sites and the potential impacts that can be caused. The goal is to support, with adequate information, the decision-making process about the most appropriate forms of intervention on the sites.

The contaminated site identification process is developed in stages, ranging from preliminary assessment to confirmatory research, detailed investigation, risk assessment, actions for rehabilitation of the area and environmental monitoring.

In addition, the Resolution presents a table with maximum levels of chemicals allowed for soil and groundwater, which addresses mercury limits, as indicated below:

Table 1: Values on Mercury existing in the Resolution CONAMA Nº 420/2009.

Chemical	Reference Value for Soil (mg/kg)	Prevention Value for Soil (mg/kg)	Investigation Value for soil (mg/kg-¹)			Investigation Value for Groundwater (µg/L)
			Agricultural	Residential	Industrial	
Mercury	E	0,5	12	36	70	1

E = to be stablished by State Level Power.

Canada

Canada has well-established federal, provincial and territorial programs to identify, assess and remediate contaminated sites, including those contaminated by mercury or mercury compounds. Canada has established the Federal Contaminated Sites Inventory as well as the Federal Contaminated Sites Action Plan (FCSAP), which are applicable to federal lands. Furthermore, provinces and territories have legislation, regulations, guidelines and/or a program in place to govern contaminated sites management. The Canadian Council of Ministers of the Environment (CCME) has also developed guidelines to support contaminated site identification and management.

Below, is a selected list of federal, provincial and territorial guidance documents that may be helpful during the development of draft guidance of sites contaminated with mercury.

[10] http://www.mercuryconvention.org/Negotiations/submissionsforCOP1/tabid/5535/Default.aspx

1. FEDERAL/ JOINT FEDERAL/PROVINCIAL/TERRITORIAL:

(a) Site identification and characterization;

Document/Tool Title	Website reference
Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment - Volume I: Guidance Manual (CCME, 2016) - Volume II: Checklists (CCME, 2016)	http://www.ccme.ca/en/resources/contaminated_site_management/assessment.html
Subsurface Assessment Handbook for Contaminated Sites (CCME, 1994)	
Canada–Ontario Decision-Making Framework (DMF) for Assessment of Great Lakes Contaminated Sediment (ECCC and MOE, 2008)	http://publications.gc.ca/site/eng/312560/publication.html

(b) Options for managing the risks posed by contaminated sites;

Document/Tool Title	Website Reference
Guidance and Orientation for the Selection of Technologies (GOST) (PSPC/NRC, 2012; Registration required)	Technologies for the treatment of mercury contaminated water, soil and sediments (http://gost.irb-bri.cnrc-nrc.gc.ca/hm.aspx?ind_lang=en).
FCSAP Decision-Making Framework (2013)	http://www.federalcontaminatedsites.gc.ca/default.asp?lang=En&n=B15E990A-1

(c) Evaluation of benefits and costs

Document/Tool Title	Website Reference
Sustainable Development Tool [SDT] (PSPC, 2016) Available at:	http://sdat.pwgsc.gc.ca

(d) Validation of outcomes.

Document/Tool Title	Website Reference
Guidance for Site Closure Tool for Federal Contaminated Sites (SCT) (FCSAP, 2012) • Including Tool for Risk Assessment Validation (TRAV)	http://www.federalcontaminatedsites.gc.ca/default.asp?lang=En&n=B15E990A-1

2. PROVINCIAL OR TERRITORIAL

Province/Territory	Document/Tool Title	Website Reference
British Columbia	Contaminated Sites: Site Remediation	General contaminated sites management guidance: http://www2.gov.bc.ca/gov/content/environment/air-land-water/site-remediation/guidance-resources
Northwest Territories	Guideline for Contaminated Site Remediation in the NWT	General contaminated sites management guidance: http://www.enr.gov.nt.ca/sites/default/files/guidelines/siteremediation.pdf
Québec	Le ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques : Guide d'intervention - Protection des sols et réhabilitation des terrains contaminés (available in French)	http://www.mddelcc.gouv.qc.ca/sol/terrains/guide-intervention/index.htm

European Union

European Union provided the following reference, in addition to those listed as existing guidance and tools above, those listed as case studies, and those listed in the reference to the draft guidance.

REMCOSITE Sino-German Workshop 2008, Final report available at: https://www.grs.de/sites/default/files/pdf/Remcosite_2008_Chemieabfaelle_0.pdf

IMaHg project - Improved management for Hg-contaminated soils - final-workshop-overheads (2013), more info available at http://snowmannetwork.com/?page_id=256

Mercury Contaminated Sites – NICOLE Technical Meeting Summary Paper (2013)

Mercury Contaminated land management – State of the Art – NICOLE Mercury Working Group Paper (2012), more info available at www.nicole.org

Contaminated Land Rehabilitation Network for Environmental Technologies in Europe - CLARINET (2002) Sustainable Management of Contaminated Land in the EU: An Overview available at https://www.commonforum.eu/Documents/DOC/Clarinet/rblm_report.pdf

Workshop "Training on mercury management and remediation of contaminated sites", Almadén (Spain), 18-19th November 2015, organized by UNEP/MAP and SCP/RAC in the framework of the Horizon 2020 Programme of the European Union. It was dedicated to the management and remediation of mercury contaminated sites, with particular focus on the implementation of the Regional Plan of the Barcelona Convention (Protocol for the protection of the Mediterranean Sea against pollution from Land-Based Sources and activities). In the frame of this Workshop, different initiatives on management and remediation of mercury contaminated sites were presented, such as the reconditioning of the "Cerco de San Teodoro" slag heap (Almadén, Ciudad Real, Spain) and "La Soterraña" mercury mine (Asturias, Spain). http://www.cprac.org/es/archivo-de-noticias/genericas/training-on-mercury-management-and-remediation-of-contaminated-soils-a

The general approach to dealing with contaminated land within the UK is exemplified in Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance which is available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/223705/pb13735cont-land-guidance.pdf.

Japan

In order to contribute to the further work required in preparation for the first meeting of the Conference of the Parties to the Minamata Convention, the Government of Japan submits herewith relevant information on Article 12 – Contaminated sites.

Legal Measures

Article 12, paragraph 1 of the Minamata Convention stipulates that each party shall endeavor to develop appropriate strategies for identifying and assessing sites contaminated by mercury or mercury compounds.

Japan's legislation ensures the identification and assessment of contaminated sites with the following processes:

Soil Contamination Countermeasures Act requires the owner, manager, or occupier (hereinafter referred to as the "Owner, etc.") of the land to have a Designated Investigation Institution to conduct an investigation and to report the results to the prefectural governor: i) when a factory, etc. in which Designated Hazardous Substances including mercury (Article 2, Paragraph 1 of the Soil Contamination Countermeasures Act), have been used is shut down (Article 3 of the Soil Contamination Countermeasures Act), ii) when the Owner, etc. intends to excavate and make other change to the Form or Nature of land with an area exceeding particular size (more than or equal to 3000m2) and the prefectural governor finds that the said land is in danger of being contaminated (Article 4 of the Soil Contamination Countermeasures Act), or iii) when the prefectural governor finds the existence of land which possibly poses harm to human health due to soil contamination by a Designated Hazardous Substance (Article 5 of the Soil Contamination Countermeasures Act).

If the level of the reported contamination exceeds the standard value, the prefectural governor shall designate the reported site, based on the health risk, as an Area which Requires Action11 (Article 6 of the Soil Contamination Countermeasures Act), or as an Area for which Changes to Form or Nature Require Notification12 (Article 11 of the Soil Contamination Countermeasures Act). The Owner, etc. may request the prefectural governor to designate an area of the site when it voluntarily surveys the site and finds soil contamination (Article 14 of the Soil Contamination Countermeasures Act).

Ministry of the Environment conducts annual survey on the implementation of Soil Contamination Countermeasures Act, which includes designation status of the area such as Area which Requires Action, etc. A guideline has been formulated for the method of investigation and countermeasures and it is widely utilized on site.

Based on Article 15 of the Water Pollution Control Act, prefectures, etc. are undertaking groundwater monitoring of hazardous substances including mercury.

Article 12, paragraph 2 of the Convention stipulates that any action to reduce the risks posed by such sites shall be performed in an environmentally sound manner incorporating, where appropriate, an assessment of the risks to human health and the environment from the mercury or mercury compounds they contain.

Japan's legislation ensures the measures to reduce the risk of contaminated sites with the following instruments:

For Area which Requires Action where health risk may be caused, prefectural governor shall instruct the Owner, etc. of the land to take measures such as groundwater monitoring, soil containment and removal (hereinafter referred to as an "Action for Removal, etc."), which would be determined in consideration of the level of the soil contamination and the status of land use by the Owner, etc. of the area (Article 7 of the Soil Contamination Countermeasures Act). For Area for which Changes to Form or Nature Require Notification, when the Owner, etc. of the area intends to excavate and make other change to the Form or Nature of the area, prefectural governor shall be notified of Changes to Form or Nature of Land. The notification includes the method by which the changes will be made, such as prevention of dispersion and flowing out of the contaminated soil, as stipulated in Article 12 of the Soil Contamination Countermeasures Act.

When contaminated soil is removed from Area which Requires Action etc., its notification shall be submitted to the prefectural governor in advance (Article 16 of the Soil Contamination Countermeasures Act), and persons permitted processing contaminated soil must be entrusted to undertake the processing contaminated soil (Article 18 of the Soil Contamination Countermeasures Act).

A guideline is formulated for the method of Action for Removal, etc. and it is widely applied at a site.

Based on Article 14-3 of the Water Pollution Control Act, if human health damage has occurred or is likely to occur due to the perforation of hazardous substances including mercury into soil at a factory or a business establishment, the prefectural governor may order decontaminating measures to its Owner,etc.

With regard to soil contamination countermeasures in mines, Article 19, item (ix) of the Ordinance for Enforcement the Mine Safety Act requires conformity to the standards prescribed by Ordinance of the Ministry of the Environment as stipulated in Article 6, paragraph (1), item (i) of the Soil Contamination Countermeasures Act. In the case where the contaminated site does not comply with the said standards, Article 46, paragraph (1) of the Ordinance for Enforcement the Mine Safety Act requires the holder of mining right to report to the Director-General of the Industrial Safety and Inspection Department, and he/she may order the holder of mining right to make necessary improvement (Article 36 of the Mine Safety Act). In addition, under Article 39 of the Mine Safety Act the holder of mining right may be ordered to install necessary equipment to prevent mining pollution for five years after extinction of the mining right.

[11]Area which Requires Action : Area that has the intake route of contamination so that measures such as the removal of contamination, prevention of the dispersion of contamination , etc. are needed lest it should cause health damage, Article 6 of the Soil Contamination Countermeasures Act.

[12]Area for which Changes to Form or Nature Require Notification : Area that does not have the intake route of contamination (or the area where the intake route of contamination is interrupted) so that measures such as the removal of contamination, prevention of the dispersion of contamination, etc. are needed lest it should not cause health damage, Article 11 of the Soil Contamination Countermeasures Act.

Designated Hazardous Substance and its standard

Designated Hazardous Substance and its standard are determined from risks such as (1) ingestion of groundwater (corresponding to Soil Leachate Standard), (2) direct ingestion (corresponding to Soil Concentration Standard).

Soil Leachate Standard is set for all Designated Hazardous Substance, but Soil Concentration Standard is set for only 9 substances (class 2: heavy metals) in Designated Hazardous Substances.

Designated hazardous substance		Designation standard	
		Soil Leachate Standard	Soil Concentration Standard
Class 1 (VOCs)	Carbon tetrachloride	≤ 0.002mg / L	
	1,2－Dichloroethane	≤ 0.004mg / L	
	1,1－Dichloroethylene	≤ 0.1mg / L	
	cis－1,2－Dichloroethylene	≤ 0.04mg / L	
	1,3－Dichloropropene	≤ 0.002mg / L	
	Dichloromethane	≤ 0.02mg / L	
	Tetrachloroethylene	≤ 0.01mg / L	
	1,1,1－Trichloroethane	≤ 1mg / L	
	1,1,2－Trichloroethane	≤ 0.006mg / L	
	Trichloroethylene	≤ 0.03mg / L	
	Benzene	≤ 0.01mg / L	
Class 2 (Heavy Metals, etc.)	Cadmium and its compounds	≤ 0.01mg / L	≤ 150mg / kg
	Hexavalent Chromium compounds	≤ 0.05mg / L	≤ 250mg / kg
	Cyanides compounds	< detection limit	As isolated cyanides ≤ 50mg / kg
	Mercury and its compounds	≤ 0.0005mg /L Alkyl Mercury less than detection limit	≤ 15mg / kg
	Selenium and its compounds	≤ 0.01mg / L	≤ 150mg / kg
	Lead and its compounds	≤ 0.01mg / L	≤ 150mg / kg
	Arsenic and its compounds	≤ 0.01mg / L	≤ 150mg / kg
	Fluorine and its compounds	≤ 0.08mg / L	≤ 4000mg / kg
	Boron and its compounds	≤ 1mg / L	≤ 4000mg / kg
Class 3 (Agrochemicals and PCBs)	Simazine	≤ 0.003mg / L	
	Thiuram	≤ 0.006mg / L	
	Thiobencarb	≤ 0.02mg / L	
	PCB	<detection limit	
	Organic phosphorus compounds	<detection limit	

Norway

In Norway, clean-up of contaminated sediments and soil containing mercury, is part of an overall effort made to prevent hazardous substances from damaging health and the environment. Norwegian Environment Agency 30 October 2016

We have national focus on remediation of prioritized sites, clean soil in kindergartens and day-care centers, assessing industries with high probability of contaminating soil and safe handling of contaminated soil. Further information can be found in the Government-report "Working together towards a non-toxic environment and a safer future" (White Paper nr. 14 2006-2007 pg. 96-100, chapter 10.2-10.3):

https://www.regjeringen.no/contentassets/abe386e25e0e4d788e868d5f7f991362/en-gb/pdfs/stm200620070014000en_pdfs.pdf

Threshold value and guidance value The current national threshold value defining clean/contaminated soil for mercury is 1 mg/ kg DW. This is an ecotoxicological-based value (10 % bioavailability including me-Hg). For sediments (coastal), the value is 0.52 mg/kg DW.

Norway applies guidelines that divide soil into different classes of soil condition (based on concentrations of hazardous substances). The categorization shows which classes are acceptable for soil on a given site. Guidelines also includes the absolute minimum number of samples necessary to determine the condition of the soil.

Guidelines are available here (in Norwegian only):
http://www.miljodirektoratet.no/old/klif/publikasjoner/2553/ta2553.pdf

Guidance values for Hg for different land use criteria:

Classification of soil condition based on health risk/ pollutant (mg/kg DW)	1 Very Good (clean soil)	2 Good (i.e. housing, playgrounds)	3 Moderate (central areas, offices and stores)	4 Bad (traffic, industry)	5 Very Bad (upper limit defines max [x] acceptable at any site)
Hg	< 1	1-2	2-4	4-10	10-100

The full version of the national guidelines on risk assessment of contaminated sites "Guidelines for the Risk Assessment of Contaminated Sites" (for 58 substances including mercury), can be found here (in English): http://www.miljodirektoratet.no/old/klif/publikasjoner/andre/1691/ta1691.pdf

The web portal Environment.no provides further information on management of contaminated sites in Norway in general. State of the environment-Norway on contaminated sites: http://www.environment.no/topics/hazardous-chemicals/contaminated-soil/

National database The Norwegian Environment Agency has created a database that gives information about sites where there is contaminated soil or reason to suspect contamination. The database gives information on the site, type of contamination and assessments if measures have been taken on the area. There is also a possibility to report sites where one suspects that the ground is contaminated. http://grunn.miljodirektoratet.no/ (in Norwegian only)

Lastly, in regards to contaminated sites, Norway would like to draw the attention to the extensive and informative guidance document provided by the NGO IPEN "Guidance on the Identification, Management and Remediation of Mercury Contaminated Sites", dated March 2016. Norway would like this document to be included in the compilation provided by the Secretariat. (http://ipen.org/documents/ipen-guidance-identification-management-and-remediation-mercury-contaminated-sites)

Republic of Korea

3. Recommendation in relation to the management of sites contaminated with mercury

In Korea, there is no specific guideline for the management of sites contaminated with mercury. However, there are several thresholds on mercury concentrations in soil, which trigger control actions including site remediation. Polluters shall remediate and restore the sites if mercury concentration of the soils in site is above 12 mg/kg according to the guidelines of soil remediation under the Soil Environment Conservation Act.

Switzerland

Governments and others are invited to provide to the interim secretariat input on guidance documents or recommendations in relation to the management of sites contaminated with mercury. The interim secretariat will prepare a compilation to be used as a basis for a draft guidance document on the management of mercury-contaminated sites, and an outline of its structure and content together with a roadmap for consideration by the Conference of the Parties at its first meeting, using the submitted documents as the basis of its work and including the elements described in paragraph 3 of Article 12 and taking also into account paragraph 4 of Article 12. Article 22 - Effectiveness evaluation

Governments, regional and subregional monitoring programmes and partnerships, the World Health Organization, regional representatives, regional and national institutions, academia, industry, civil society and others as appropriate are invited to submit to the interim secretariat information on existing monitoring programmes and how they can contribute to an overall monitoring approach, including availability of baseline information. Submissions that would complement the information provided by Governments and relevant organizations in follow up to INC6, compiled in document

UNEP(DTIE)/Hg/INC.7/12 and available at http://mercuryconvention.org/Negotiations/INC7/INC7submissions/tabid/4754/Default.aspx, are particularly encouraged. They are further invited to provide contact details for any individual whom they would designate to participate in consultations conducted via electronic means for the development of a roadmap as well as a report on effectiveness evaluation.

In Switzerland a polluted site has to be registered in the cataster if the concentration of mercury in soil exceeds 0.5 mg/kg.

The concentration values for mercury in soil were established 2013 (the reports in French and German can be found here (French) http://www.bafu.admin.ch/altlasten/01611/index.html?lang=fr) :

For agricultural soil:

- Trigger value 0.5 mg/kg

- Clean-up value 20 mg/kg

Between 0.5 and 20 mg/kg, a risk assessment has to show if restriction of uses are necessary. Above 20 mg/kg, the soil has to be remediated and its utilization is forbidden until the remediation has taken place.

For sites in private gardens and allotments, children's playgrounds and other places where children play regularly:

- Clean-up value 2 mg/kg.

- there is no trigger value, because restrictions of use for children are not acceptable.

Between 0,5 and 2 mg/kg, there is no restriction for children, but it is recommended to cultivate only vegetables that don't accumulate mercury.

A study about the relevance of methyl-mercury was performed in 2013 and is also available here (in French): http://www.bafu.admin.ch/altlasten/01611/index.html?lang=fr

The risk for groundwater is difficult to define. When the concentration in the soil does not exceed 2 mg/kg, there is no risk for groundwater. But studies that will be completed in 2016-2017 will have to show from which concentration in the soil onwards, there is an effective risk for groundwater.

If the concentration of mercury in groundwater exceeds 0.5 µg Hg/l (for usable groundwater) or 2 µg Hg/l (for other groundwater), there is a need of remediation.

Switzerland, as many other countries, has a step-by-step approach for the management of contaminated sites (available in French and English): http://www.bafu.admin.ch/altlasten/12163/12168/index.html?lang=en

This approach is useful to fix priorities and permits to remediate the very problematic sites first.

Thailand

(1) To protect human health, Thailand determines the mercury level in soil quality standard for habitat and agriculture purposes should not more than 23 mg/kg and for other purposes should not more than 310 mg/kg as well as mercury level in ground water quality standard should not more than 0.001 mg/l.

(2) In Thailand's guideline on mercury contaminated site in industrial areas, it is recommended that industries should control the contamination of pollutants including mercury in soil and groundwater inside their own area under the reference standard which is defined by the health risk assessment. If mercury level exceeds the standard level, it is recommended that industries should do remediate

their sites and conduct the soil and groundwater monitor programmes every 3 years and every year, respectively, after remediation.

(3) The interim Secretariat on Minamata Convention should develop the mercury contaminated site remediation guideline by using the information both from Guidance for Mercury – Contaminated Network and Guidance which developed under the Barcelona Convention for the protection of the Mediterranean Sea against Pollution and from the countries having experiences on mercury contaminated sites, for example Japan.

Submissions for COP-3

The Conference of the Parties in its decision MC-2/8 requests the secretariat to call for parties and stakeholders to submit additional comments and information to complement and further improve the draft guidance, calling in particular for information and comments, including case studies, on:

(i) Situations that are site-specific to mercury that parties may face, such as the decommissioning of chlor-alkali plants and addressing contamination due to artisanal and small-scale gold-mining activities, etc.;

(ii) The role played by inventories of contaminated sites in strategies and policies relating to contaminated sites;

(iii) Prioritization for further action on contaminated sites based on risk assessment;

(iv) The interface between contaminated site policies and land-use planning policies;

(v) Existing procedures for the characterization of contaminated sites, including approaches and techniques for sampling and analysis;

(vi) The existing range of proven and emerging remediation techniques, including situations in which certain techniques may or may not be appropriate, environmental advantages and drawbacks and costs;

(vii) Socioeconomic and cultural considerations during the remediation of contaminated sites;

(viii) Information on approaches to financing work on and building capacity for the identification, assessment, remediation and risk management of contaminated sites, including frameworks for domestic financing.

In response to the call for submissions, Chile, France, Uruguay, Common Forum on Contaminated Land in Europe, International Council on Mining on Metals, International POPs Elimination Network (IPEN), Prof. Svetoslava Todorova of Syracuse University submitted comments on the draft guidance.

Secretariat of the Barcelona Convention submitted its Guidelines on Best Environmental Practices for the environmental sound management of mercury contaminated sites.

Canada, Japan, Switzerland submitted information relevant to the points (i) – (viii) above. These submissions are reproduced below.

Canada

Information submitted by the Government of Canada to complement and further improve the draft guidance on contaminated sites, as called for in Decision MC 2/8.

Canada has well-established federal, provincial and territorial programs to identify, assess and remediate contaminated sites, including those contaminated by mercury or mercury compounds. Canada has established the Federal Contaminated Sites Inventory[13] as well as the Federal

[13] http://www.tbs-sct.gc.ca/fcsi-rscf/home-accueil-eng.aspx

Contaminated Sites Action Plan (FCSAP)[14], which are applicable to federal lands. Furthermore, provinces and territories have legislation, regulations, guidelines and/or a program in place to govern contaminated sites management. The Canadian Council of Ministers of the Environment (CCME) has also developed guidelines to support contaminated site identification and management.

Canada has already provided information on items (ii), (iii), (v), and (vi) in its submission prior to the first Conference of the Parties3[15]. Additional resources on these topics were provided to the Secretariat during the intersessional expert group review of the contaminated sites document following COP1. We suggest that the Secretariat review these documents for additional information that would be helpful continued work on the guidance document.

The submission below presents information from the FSCI, as well as from experiences with contaminated sites within Quebec (a provincial jurisdiction):

(i) Situations that are site-specific to mercury that parties may face

- Hydrometric monitoring stations using servo-manometers: Prior to 1997, Quebec hydrometric monitoring stations were operated using mercury servo-manometers. Due to large fluctuations in water levels, mercury was, in some cases, released from the instrument and ended up in the nearby sediments. Since 1997, all hydrometric sites in southern Quebec have been decontaminated.[16]
- Chlor-alkali facilities: Due to the absence of environmental regulations prior to the 1970s, the lands of former industrial plants in Quebec could be contaminated with mercury. At one chlor-alkali production facility, 360,000 cubic metres of mercury-contaminated soil was treated using a physical separation process to recover liquid mercury and placed in a specially constructed containment cell located on the same property. As sediments of the river downstream of the facility were also found to be contaminated with mercury, they were dredged and added to the containment cell.5[17]
- Harbours and lighthouses: The surrounding soils and sediments around lighthouses and harbours may be contaminated with mercury due to the use of mercury containing products (e.g. paint, fungicide, lightbulbs, batteries) used in the construction, operation, and use of these structures. In many cases, the soils and dredged sediments are placed in specialized containment cells on or offsite.
- A description of the successful remediation of certain federal contaminated sites in Canada can be found on this website: https://www.canada.ca/en/environment-climate-change/services/federal-contaminated-sites/success-stories.html. While these sites are not all mercury-contaminated sites, they may be helpful case studies to draw upon when preparing the draft guidance document.

(ii) The role played by inventories of contaminated sites in strategies and policies relating to contaminated sites

Between 2000 and 2002, the Treasury Board of Canada approved a policy framework for the management of federal contaminated sites. The framework was a collection of policies and best practices to guide federal organizations (custodians) in the management of federal contaminated sites and was accompanied by the public release of the FCSI.

The FSCI includes information on all known federal contaminated sites under the custodianship of departments, agencies and consolidated Crown corporations as well as those that are being or have been investigated to determine whether they have contamination arising from past use that could pose a risk to human health or the environment. The inventory also includes non-federal contaminated sites for which the Government of Canada has accepted some or all financial responsibility. It does not include sites where contamination has been caused by, and which are under the control of, enterprise Crown corporations, private individuals, firms or other levels of government.

[14] https://www.canada.ca/en/environment-climate-change/services/federal-contaminated-sites/action-plan.html

[15] http://mercuryconvention.org/Negotiations/submissionsforCOP1/tabid/5535/Default.aspx

[16] For more information see Service des lieux contaminés – MDDEP, 2006. Programme de réhabilitation des stations hydrométriques contaminées au mercure (Période 2003-2005).

[17] For more information see Dessau, Soprin (2004). Projet conjoint PPG Canada inc. et Alcan inc. Restauration d'un tronçon de la rivière Saint-Lois, Beauharnois, Québec. Étude d'impact sur l'environnement déposée au ministre de l'Environnement.

To date, departments, agencies and consolidated Crown corporations have identified and classified over 22,000 contaminated or suspected contaminated sites in urban, rural and remote areas across Canada, using the CCME's National Classification System for Contaminated Sites (NCSCS).

In accordance with the Government of Canada's Treasury Board Policy, the Treasury Board Secretariat administers the FCSI, where federal organizations (custodians) are required to report specified data on their known or suspected contaminated sites. Each reporting organization is responsible for their own data in the FSCI and maintaining their own internal records.

The FCSI displays a standard set of basic and annually-updated information for federal contaminated sites. Each site record includes information such as the location of the site, the severity of contamination, the contaminated medium, the nature of the contaminant, progress made to date in identifying and addressing contamination, and how much liquid and solid-based media have been treated. The FCSI offers a variety of search criteria, such as site name, province or territory, Census Metropolitan Area, Federal Electoral District, and contaminants; the results can be displayed as a table or on an interactive map.

The FSCI complements the Federal Contaminated Sites Action Plan (FSCAP) and assists the federal government in setting work plans and prioritizing sites for remediation. The objective of FCSAP is to reduce environmental and human health risks from known federal contaminated sites and associated federal financial liabilities, while focusing on highest priority sites. The FSCI assists the development of strategies for individual contaminated sites by informing decision makers on which types of approaches should be taken to address contamination.

Information contained in the FSCI also enables the Treasury Board of Canada to assess departmental performance in implementing the FSCAP through the integration of real property and financial information and linkages to program objectives. The assessment of departmental performance allows the Secretary of the Treasury Board to make recommendations to the deputy head of a department and to Treasury Board. These recommendations may result in an increase in transactional approval limits to acknowledge improved performance or capacity, or conversely, a decrease in authorities in the event of performance falling short.

In Quebec, information on contaminated sites is managed in the système de gestion des lieux contaminés (GTC). In general, the data in the GTC system is used to better understand contaminated sites in order to develop guidance and to provide the government with strategic information such as reports, statistics, thematic maps and lists. The database is available online at: www.environnement.gouv.qc.ca/sol/terrains/terrains-contamines/recherche.asp.

(iii) Prioritization for further action on contaminated sites based on risk assessment;

The FCSAP takes a risk-based approach to addressing contaminated sites in Canada. This approach involves assessing the risks to human health and the environment of each site and prioritizing the allocation of resources within federal custodians to deal with highest priority contaminated sites.

Information about the 10-step process used to assess, classify, and manage federal contaminated sites is outlined in the guidance document A Federal Approach to Contaminated Sites[18]. A decision-making framework[19] was developed to assist federal custodians and their consultants in making the most informed decisions at each step of the 10-step process.

Federal contaminated sites are classified and prioritized based on the NCSCS and the Aquatic Site Classification System (ASCS) developed by FCSAP. The FCSAP Secretariat provides scientific and technical assistance that allows custodians to prioritize their contaminated. Using the NCSCS and ASCS, priority is assessed by scoring sites as high (with a score of 70 - 100), medium (with a score of 50 - 69.9), or low risk (with a score of 37 - 49.9), according to their current or potential adverse impacts to human health and/or the environment. The NCSCS guidance document is available at: https://www.ccme.ca/en/resources/contaminated_site_management/management.html

(iv) The interface between contaminated site policies and land use planning policies

[18] https://www.canada.ca/content/dam/eccc/migration/fcs-scf/8DF3AC07-5A7D-483F-B263-6DE03104319A/fa-af-eng.pdf

[19] https://www.canada.ca/en/environment-climate-change/services/federal-contaminated-sites/decision-making-framework.html

The federal Treasury Board Secretariat's (TBS) Policy on Management of Real Property[20], dictates the federal government's land use planning. It states that known and suspected contaminated sites are assessed and classified and risk management principles are applied to determine the most appropriate and cost-effective course of action for each site. Priority must be given to sites posing the highest human health and ecological risks. Management activities (including remediation) must be undertaken to the extent required for current or intended federal land use.

Quebec's Land Protection and Rehabilitation Regulation established thresholds for contaminants in soil, including mercury, that are dependent on intended land use (e.g. agriculture, residential, commercial or industrial). Based on the intended land use, these limits are also used as the objective of restoration activities. The Regulations may be found at: www.legisquebec.gouv.qc.ca/fr/ShowDoc/cr/Q-2,%20r.%2037/

(e) Existing procedures for the characterization of contaminated sites, including approaches and techniques for sampling and analysis

The CCME has a number of guidelines available for environmental site characterization and approaches to sampling and analysis of contaminated sites, which are available at: https://www.ccme.ca/en/resources/contaminated_site_management/assessment.html

The Government of Canada also developed the Guidance and Orientation for the Selection of Technologies (GOST) tool to provide guidance to contaminated sites managers on best approaches for site management. The GOST tool can assist contaminated sites managers by providing: the average cost for the analysis of a laboratory sample, a glossary of contaminants and decontamination technologies, as well as a range of resources related to decontamination and the environment. More information on GOST is available at: http://gost.tpsgc-pwgsc.gc.ca/index.aspx?lang=eng

In Quebec, site characterization, sampling, and lab analyses must be carried out according to the Guide de characterisation de terrain. This guide also suggests contaminants that are likely to be found in soils and water by activity or industrial sector using SCIAN cod using the Système de Classification des Industries de l'Amérique du Nord (SCIAN) codes. More information may be found at the links below:

- Site characterization: www.environnement.gouv.qc.ca/sol/terrains/guide/guidecaracterisation.pdf.
- Evaluation of sediment quality and applications to prevention, dredging, and restoration: www.planstlaurent.qc.ca/fileadmin/publications/diverses/Qualite_criteres_sediments_f.pdf
- Sampling methods: www.ceaeq.gouv.qc.ca/documents/publications/echantillonnage.htm.
- Laboratory methods: www.ceaeq.gouv.qc.ca/methodes/list_sols.htm.

(vi) The existing range of proven and emerging remediation techniques, including situations in which certain techniques may or may not be appropriate, environmental advantages and drawbacks and costs;

Canada has previously submitted information on remediation techniques in its submission prior to COP1, specifically, the link to the GOST tool. This tool can also help contaminated sites manager to determine the applicable decontamination technology(ies) for specific sites, or, more generally, compare key elements of the decontamination technology or various contaminants.

(vii) Socioeconomic and cultural considerations during the remediation of contaminated sites;

Risk management for contaminated sites is a balancing act of many diverse factors. Each site is managed on a case-by-case basis due to unique site-specific features that require evaluation of risk management approaches in order to choose the most appropriate and cost-effective plan of action. The NCSCS uses a weighted approach to evaluation of contaminated sites, where a significant weight is given to the reliance of local people on natural resources for survival (i.e. food, water, shelter, etc.) which complements the human exposure evaluation section. This inclusion acknowledges potential risks associated with socioeconomic conditions and cultural practices.

(viii) Information on approaches to financing work on and building capacity for the identification, assessment, remediation and risk management of contaminated sites, including frameworks for domestic financing.

[20] http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=12042

As mentioned above, the FCSAP, a 15-year, $4.54 billion program that was established in 2005 by the Government of Canada, aims to reduce the liability at federal contaminated sites which pose the highest risks to human health and the environment, through remediation and risk management.

Remediation activities have been conducted at 2,170 sites and assessment activities were conducted at 10,840 sites across Canada, since the establishment of the program (as of March 2018).

FCSAP provides three types of funding: 1) assessment; 2) remediation and risk management; and 3) program management. Assessment and remediation/risk-management funding allow custodians to perform work at contaminated sites. Program management funding is provided to assist custodians with the management of their site portfolios through activities such as procurement, contract management, expert support and reporting.

To receive FCSAP funding, federal custodians must ensure that their sites meet funding-eligibility requirements. Therefore, custodians must first have grounds to suspect that a site is contaminated (normally based on historical activities at the site) before environmental site-assessment activities can be funded. The FCSAP Secretariat has developed a prioritization tool to assist custodians in determining the priority of sites that should undergo assessment, considering that funds or resources might not be available to assess all sites at the same time. Guidance on the eligibility of project costs ensures that remediation or risk-management activities focus on reducing risks associated with contaminants.

- FCSAP provides funding to custodians for the remediation of sites that:
- Meet the Treasury Board definition of a contaminated site;
- Have been contaminated through activities that occurred prior to April 1, 1998;
- Are on lands owned or leased by the federal government (or if it is non-federal lands, the federal government must have accepted full responsibility).
- Have a financial liability associated with the site (reported within the FSCI)

The province of Quebec has two programs that can assist in financing work on contaminated sites. The ClimatSol-Plus fund encourages restoration and reutilization of contaminated sites located on municipally owned or privately owned properties (for which the province is not responsible for the contamination) www.environnement.gouv.qc.ca/programmes/climatsol-plus/index.htm. The program InnovEnSol offers financial solutions for innovative decontamination businesses for soil and groundwater. This program aims to reduce the environmental impacts of contaminated sites, notably by the in-situ treatment and valorization of sediments www.environnement.gouv.qc.ca/programmes/innovensol/index.htm.

Japan

(i) Situations that are site-specific to mercury that parties may face, such as the decommissioning of chlor-alkali plants and addressing contamination due to artisanal and small-scale gold-mining activities, etc.;

It is highly probable that the ASGM sites are highly contaminated, thus they should be regarded as the sites which needs to be addressed.

The sites where chlor-alkali plants or other facilities that produce, use or process mercury are located may also be contaminated with mercury due to the leakages.

The extent and the level of contamination depend on the site-specific conditions including historical accidents.

Risks may arise when decommissioning plants or facilities where mercury was used or reusing such lands, thus it is necessary to assess the site contamination before such actions.

In addition, as described in paragraph 17 of the 2nd draft, such sites as properly managed waste disposal sites would present no risk of spreading contamination unless they change the land terrain, thus they do not need to be regarded as the sites to be addressed.

(ii) The role played by inventories of contaminated sites in strategies and policies relating to contaminated sites

Inventory is for assessing all possible contaminated sites in each country. And it provides the basic information for prioritizing and taking countermeasures. It should be noted that inventory may include the sites where the primary survey will indicate no further actions to be addressed.

In addition, as described in paragraph 17 of the 2nd draft, an exhaustive approach that a party compiles a countrywide inventory may be effective when developing a comprehensive national plan for countermeasures against mercury-contaminated sites. On the other hand, the individual approach which do not necessarily require compiling a countrywide inventory is particularly effective and efficient if a country has already identified some degree of contaminated sites where environmentally appropriate management measures are implemented.

(iii) Prioritization for further action on contaminated sites based on risk assessment;

There are two steps in prioritization.

The 1st step is the prioritization based on the type of land use history. Specifically, the ASGM sites are given the highest priority as the sites are highly probable in their high contamination. In addition, high priority can also be given to such sites as the chlor-alkali plants where large amount of mercury have been used.

The 2nd step is the prioritization based on the individual contamination condition in each site. Specifically, high priority will be given to the sites where high concentration is detected in result of sampling and analysis and the sites considered to be with high risk according to land use situation or groundwater use situation.

(iv) The interface between contaminated site policies and land use planning policies;

When justifying the implementation of countermeasures, the likelihood level of health risk affected from soil contamination is a key factor.

The health risk depends on not only mercury concentration but also land use plan, actual land use, groundwater use, etc.

If health effects is likely, countermeasures should be taken. It should be noted that the countermeasures are not limited to decontamination operations but can include site management methodologies such as on site pollution containment or fencing (physical barrier). Moreover, modifying land use plan is also one of the possible approaches.

If no health effects is expected, no immediate actions is necessary, however, modifying land terrain or carrying out the soil have the risks to diffuse the contaminant, thus proper management is necessary for such sites.

(v)Existing procedures for the characterization of contaminated sites, including approaches and techniques for sampling and analysis;

In Japan, the surveyor firstly covers the evaluating site with 10 meter grid and collects soil samples from each grid. For the area where the soil contamination is less likely given the land use history indicates, the samples will be collected from 30 meter grid.

The soil up to 50 cm in depth from surface of the top soil or bottom of pipes is collected. This sampling protocol comes from the characteristic of mercury which does not permeate deep into soil very much.

For analytical method, Japan adopts both leaching test and content test (leaching test with hydrochloric acid assuming absorption from stomach) and sets standards for each test.

Japan does not apply the Conceptual Site Model (CSM) shown in 2nd draft. CSM may be useful for some parties, however, it would not necessarily be useful for parties that have already established scheme other than CSM. Moreover, it should be noted that CSM requires certain expertise for officials in competent authority in each party who should judge the validity of the result of CSM evaluation. Therefore, it should be clearly described in the guidance that CSM is one of the evaluation methods.

(vi) The existing range of proven and emerging remediation techniques, including situations in which certain techniques may or may not be appropriate, environmental advantages and drawbacks and costs;

Japan stipulates legitimate countermeasures as follows:

- in-situ containment by sheet piles

- soil excavation and reburial in on-site seepage control work

- soil excavation and reburial in on-site concrete box

- groundwater pumping

- groundwater treatment with purifying screen

- soil excavation and removal

- on-site treatment including biological decomposition, chemical decomposition, soil washing, etc.

- insolubilization (on-site or off-site)

- pavement

- fencing

- soil inversion

- earth filling/embankment

Insolubilization cannot be applied for high level contamination.

Pavement, fencing, soil inversion or earth filling cannot be applied for the sites where the soil contamination may affect groundwater.

Soil excavation and reburial in on-site seepage control work, soil excavation and reburial in on-site concrete box and soil excavation and removal are very expensive and they have risks of diffusing pollution when excavating soil.

Soil excavation and reburial in on-site concrete box, groundwater pumping and biological decomposition need long time for completion.

For soil excavation and removal, removed soil should be transported and processed at treatment facilities by washing, extraction, heat treatment, stabilization and so on.

Regarding emerging techniques, only well proven technologies should be provided in the guidance. If emerging techniques such as electrokinetic are listed in the guidance, it may mislead readers as if such emerging techniques are well proven.

Instead, it should be noted in the guidance that the emerging techniques should be examined its possibility of application before applying

(vii) Socioeconomic and cultural considerations during the remediation of contaminated sites;

Risk communication between landowners, land users and neighbouring residents is important.

In risk communication, following contents, for example, are desirable to be communicated.

· Result of investigation (sample collection date, collection points, concentration)

· Assumed impact on human health and surrounding environment, possibility of spreading pollution

· Short- and long-term actions in future

· Detail of countermeasures (if taken) and reasons for selecting the countermeasures

And the timing of risk communication would be, for example, as follows.

· when contamination was detected but countermeasure has not started (to explain the investigation result and countermeasure plan)

· when the countermeasures are implementing (to explain the work progress)

· when the countermeasures are completed (to explain the result of the countermeasure)

(viii) Information on approaches to financing work on and building capacity for the identification, assessment, remediation and risk management of contaminated sites, including frameworks for domestic financing;

Polluter-pays principle is the basic concept for costing.

However, there are cases where polluter are unknown or nonexistent. Therefore, it is important to stipulate in the national legislation about the person who should bear the costs. In such cases, establishing a foundation by each country could be effective.

As for capacity building, Japan has established a legal system that only approved companies with state-qualified engineers are supposed to investigate the site. With this system, quality and reliability of the investigation results are ensured.

Switzerland

(i) Situations that are site-specific to mercury that parties may face, such as the decommissioning of chlor-alkali plants and addressing contamination due to artisanal and small-scale gold-mining activities, etc.;

A major chlor-alkali plant of the CABB Company is situated in Pratteln in the canton of Basel-Landschaft. It is the only one in Switzerland that is still in use. Since about 2015, however, mercury has no longer been used for the chlor-alkali process.

At Lonza site in the canton of Valais, mercury was mainly used in the production of acetaldehyde from acetylene.

http://quecksilber.lonza.com/quecksilber/wofuer-hat-lonza-quecksilber-genutzt

(ii) The role played by inventories of contaminated sites in strategies and policies relating to contaminated sites;

In Switzerland, inventories play an important role. In particular as a basis for the further processing of a polluted site. Currently, all cantons have completed their inventories (called "catasters" or "registers") and made them available online.

A site does not have to be examined before it is entered in the register. A high probability of a contamination is sufficient for an entry. Where possible, the entries in the register shall contain the following information:

a.location;

b.type and quantity of waste delivered to the site;

c.period of disposal of waste, period of operation, or time of accident;

d.investigations and measures already taken for the protection of the environment;

e.effects that have already been ascertained;

f.endangered environmental areas;

g.particular events such as waste incineration, landslides, floods, fires or major accidents.

There is an enforcement aid for the creation and maintenance of the register: https://www.bafu.admin.ch/bafu/fr/home/themes/sites-contamines/publications-etudes/publications/etablissement-du-register-sites-pollues.html (in French)

Among other things, it contains industry-specific decision trees for deciding whether a polluted site must be entered in the register or not. (E.g. timber industry: p. 45).

(iii) Prioritization for further action on contaminated sites based on risk assessment;

In Switzerland, the authorities must prioritise both the investigation and the remediation of contaminated sites based on a risk assessment:

- For contaminated sites in need of investigation, the authorities must establish a priority order for the investigations. In doing so, they take into account the type and quantity of waste at the site, the likelihood of releasing pollutants and the importance of the environmental areas (receiving environments) affected.
- In the case of polluted sites requiring remediation, the objectives and urgency of the remediation are determined by a detailed investigation. In particular, the following information must be determined and evaluated in a risk assessment:
- type, location, quantity and concentration of the environmentally hazardous substances at the polluted site; - type, load and temporal development of the existing and possible impacts on the environment; - location and importance of the environmental areas at risk.

Further information:

https://www.bafu.admin.ch/bafu/en/home/topics/contaminated-sites/info-specialists/remediation-of-contaminated-sites/contaminated-sites-management---step-3--detailed-investigation.html

(iv) The interface between contaminated site policies and land use planning policies;

The coordination with the structure and land use planning is specified in art. 6a of the Swiss Contaminated Sites Ordinance (CSO): The authorities shall take account of the Register in their

structure and land use planning. https://www.admin.ch/opc/en/classified-compilation/19983151/index.html#a6a

The legal basis for construction projects and contaminated sites is defined in art. 3 of the CSO

(https://www.admin.ch/opc/en/classified-compilation/19983151/index.html#a3):

Polluted sites may be modified by the construction or alteration of buildings and installations only if:

a. they are not in need of remediation and the project does not make their remediation necessary; or

b. their later remediation is not seriously hampered, or, insofar as they are modified by the project, they are remediated at the same time.

https://www.bafu.admin.ch/bafu/en/home/topics/contaminated-sites/info-specialists/remediation-of-contaminated-sites/contaminated-sites-management---step-4--remediation/remediation-with-or-without-construction-project--coordinating-c.html

There is also an enforcement aid on this topic:

https://www.bafu.admin.ch/bafu/fr/home/themes/sites-contamines/publications-etudes/publications/projets-de-construction-et-sites-pollues.html (in French)

The conditions and procedures listed in this publication must be adhered to for construction projects on top of polluted sites.

(v) Existing procedures for the characterization of contaminated sites, including approaches and techniques for sampling and analysis;

In Switzerland, the investigation of a polluted site normally consists of a historical and a technical investigation.

The technical investigation determines whether the polluted site has harmful or annoying effects on the protected natural goods groundwater, surface water, soil or air.

The Swiss Contaminates Sites Ordinance (Annexes 1 to 3) contains concentration values for various pollutants for the assessment of these four protected natural goods: https://www.admin.ch/opc/en/classified-compilation/19983151/index.html#app1

There is an enforcement aid for measuring methods for waste and contaminated sites:

https://www.bafu.admin.ch/bafu/fr/home/themes/sites-contamines/publications-etudes/publications/methodes-analyse-domaine-dechets-sites-pollues.html (in French)

It contains instructions and prescriptions for the investigation of solid and liquid samples taken from waste or contaminated sites. It describes the state of the art in the field of waste and contaminated site analysis.

Specific enforcement aids exist also for sampling the protected natural goods groundwater and air:

https://www.bafu.admin.ch/bafu/fr/home/themes/eaux/publications/publications-eaux/prelevements-eau-souterraine-relation-sites-pollues.html (in French)

https://www.bafu.admin.ch/bafu/fr/home/themes/sites-contamines/publications-etudes/publications/air-interstitiel%20.html (in French)

(vi) The existing range of proven and emerging remediation techniques, including situations in which certain techniques may or may not be appropriate, environmental advantages and drawbacks and costs;

In Switzerland, different remediation techniques are in use. For the different in situ remediation techniques a specific implementation aid exists: https://www.bafu.admin.ch/bafu/fr/home/themes/sites-contamines/publications-etudes/publications/assainissement-in-situ.html (in French)

The mercury contamination in the soils near Visp in the canton of Valais is currently the only large Hg-case in Switzerland. Here, the contaminated material is excavated (in residential areas: soil > 2 mg Hg /kg) and is firstly treated in a soil washing facility; afterwards depending on the contamination level it is put either to landfill or to thermal treatment.

(vii) Socioeconomic and cultural considerations during the remediation of contaminated sites;

In major remediation cases, transparency and participation are essential for the population. In particular, health concerns of the local population must be addressed.

In the Hg-case in Visp in the canton of Valais, in addition to the usual investigations of the soil, groundwater, surface water and air, a wide range of additional research campaigns were carried out; for example:

- the food and feed plants in fields and gardens were also analyzed

- an epidemiological study was carried out on the local population (analysis of Hg in blood and hair): https://www.vs.ch/documents/19415/1246066/Gutachten_Gesundheit_20.06.2016.pdf/775f7148-b1f0-430b-b9f8-0383e9fff95e (in German)

Furthermore, since the beginning of the investigations there is a platform with regular meetings between the authorities, experts, industry, NGOs and the local population: https://www.vs.ch/fr/web/sen/dokumentation (in French)

Switzerland has to face complex contaminated sites (without mercury) that cost hundreds of millions of Swiss francs to remediate. A guide to understand these complex sites has been developed (in French): https://www.bafu.admin.ch/bafu/fr/home/themes/sites-contamines/publications-etudes/publications/gestion-projets-assainissement-complexes.html

It takes into account social, political, communication and other aspects.

(viii) Information on approaches to financing work on and building capacity for the identification, assessment, remediation and risk management of contaminated sites, including frameworks for domestic financing;

In Switzerland the polluter has to bear the costs of remediation – polluter-pays-principle. If there is more than one polluter in a remediation case, each bears the cost in proportion to his share of responsibility. Thus, the polluter is primarily liable, and the owner only secondarily.

There is no joint and several liability between the polluter(s) and owner(s). Thus, in remediation cases where the polluter cannot be called upon to bear the costs (in cases where the company does not exist anymore or is in failure), the remediation costs cannot simply be passed on to the owner or the other parties involved. Any shortfalls that arise in such cases must be borne by the community. In such cases, and in the remediation of landfills for municipal waste or shooting ranges, the canton can request partial repayment of 30 or 40% of the remediation costs from the federal government on the basis of the Ordinance relating to Charges for the Remediation of Contaminated Sites (OCRCS, in French: OTAS) https://www.admin.ch/opc/en/classified-compilation/20071746/index.html (in English)

This Ordinance stipulates that the requisite funds are to be raised by means of a charge on the disposal of Swiss wastes in landfills in Switzerland and abroad in case of export of waste. This financing instrument is designed to enable dangerous contamination to be cleaned up as quickly as possible and not passed on to future generations for lack of funds. The Ordinance also promotes the environmentally sound and economical remediation of contaminated sites in accordance with the current state of technology.

https://www.bafu.admin.ch/bafu/en/home/topics/contaminated-sites/info-specialists/financing-remediation-of-contaminated-sites/bearing-the-costs.html

https://www.bafu.admin.ch/bafu/en/home/topics/contaminated-sites/info-specialists/financing-remediation-of-contaminated-sites/what-is-the-ocrcs-contamination-fund-.html