Comments on the draft guidance on managing contaminated sites

Yusuke NAKAMURA, Tomoya TAIDE
(Ministry of the Environment, Japan)

Introductory part (Paragraph 1 to 16) seems to be too long. It includes redundant information which is not so specific to contaminated site issue. It is recommendable to shorten the description less relevant to the contaminated site as shown in the table below.

Paragraph 18 states, "This approach can be supplemented by identification of individual contaminated sites, such as when changing the character of the land." However, the individual identification is an approach that is substitutable for the systematic approach. Actually, Japan, for example, takes only the individual identification approach for risk management on contaminated sites. Therefore, to clarify the relationship between the two approaches, the modification of this sentence to the following is suggested:

> *There is another approach that can be substitutable for the systematic approach by identifying individual contaminated sites, such as when changing the character of the land.*

Paragraph 30 describes the outline of the conceptual site model (CSM). It should be noted that all elements listed in this outline are not necessarily addressed. There is also a fundamental concern that the development of the CSM, especially addressing the latter elements, requires certain expertise for the technician performing the survey and the authority responsible for determining the effectiveness of the survey, but such experts are very limited especially in the developing countries. Thus, each party should develop CSM depending on the each party's circumstances and site situations, and some alternative methods can be introduced. Therefore, an additional paragraph following the paragraph 30 is suggested:

> *It should be noted that all elements listed above are not necessarily needed to be addressed. Especially, addressing the latter elements require certain amount of expertise for the technician performing the survey and the authority responsible for determining the effectiveness of the survey. CSM should be developed depending on the each party's circumstances and site situations, and alternative methods can be conducted as well.*

Paragraph 47 states, "Effects of elemental mercury, inorganic mercury compounds and methylmercury on human health, terrestrial animals and aquatic biota are to be addressed." Although the impact on animals and aquatic biota is meaningful and important to be addressed, their situation is diverse and the evaluation methods have not been well established. Thus, higher priority on human health than that on animals and aquatic biota may be considered as a response to individual situation. Therefore, an additional sentences following the paragraph 47 is suggested:

> *As for the first stage, it should be noted that animals and aquatic biota are very diverse, and*

the evaluation methods have not been well established. Thus, putting higher priority on addressing human health may be considered depending on the individual situation.

Paragraph 59 states, "If this option is chosen, the Party would need to ensure that any receiving facility would be able to manage the waste in accordance with the provisions of the environmentally sound management of mercury wastes, as set out in article 11 of the Convention." However, individual legal system of each country may require less contaminated soil than the threshold value of mercury contaminated waste to be excavated. Therefore, the following modification of this paragraph is suggested:

If this option is chosen, the Party would need to ensure that any receiving facility would be able to manage the soil in accordance with the environmental regulation under each jurisdiction. And more, the soil exceeding the threshold of mercury contaminated waste should be managed in accordance with the provisions of the environmentally sound management of mercury wastes, as set out in article 11 of the Convention.

Suggested text	Original text
5. Once released into the environment, mercury can travel long distances and persist in the environment, circulating between air, water, sediments, soil and living organisms until it is eventually deposited to deep ocean sediments or mineral soils. Mercury exists in various forms: elemental (metallic), inorganic and organic. The environmental behaviour and toxicological properties of different mercury compounds vary.	5. <u>Mercury is a global threat to human health and the environment.</u> Once released into the environment, mercury can travel long distances and persist in the environment, circulating between air, water, sediments, soil and living organisms until it is eventually deposited to deep ocean sediments or mineral soils. Mercury exists in various forms: elemental (metallic), inorganic and organic. The environmental behaviour and toxicological properties of different mercury compounds vary. <u>Methylmercury presents the greatest risk to human health and wildlife. It is mostly produced in anaerobic aquatic ecosystems through natural bacterial process under certain conditions.</u>
6. Methylmercury, <u>the most toxic form of mercury,</u> bioaccumulates and biomagnifies, concentrating as it moves up the food chain, so that the highest levels are found in predatory species such as tuna, marlin, swordfish, sharks, marine mammals and humans.	6. Methylmercury, bioaccumulates and biomagnifies, concentrating as it moves up the food chain, so that the highest levels are found in predatory species such as tuna, marlin, swordfish, sharks, marine mammals and humans. <u>There can be serious impacts on ecosystems, including reproductive effects on birds and predatory mammals. High acute or chronic exposure to mercury and mercury compounds is a serious risk to human health and the environment.</u>
7. In workplaces where mercury is used, people may be at risk of inhaling mercury vapour or of dermal exposure from normal work practices (in industrial, medical or dental settings or ASGM) or from spills. For the general population, however, the most usual form of direct exposure is through consuming fish and seafood contaminated with methylmercury.	7. <u>Effects on human health include effects on the brain, heart, kidneys, lungs and immune system of individuals of all ages. Elevated levels of methylmercury in the bloodstream of unborn babies and young children can harm the developing nervous system. Neurological and behavioural disorders in humans may be signs of significant mercury exposure, with symptoms including tremors, insomnia, memory loss, neuromuscular</u>

	effects, headaches, and cognitive and motor dysfunction. In workplaces where mercury is used, people may be at risk of inhaling mercury vapour or of dermal exposure from normal work practices (in industrial, medical or dental settings or ASGM) or from spills. For the general population, however, the most usual form of direct exposure is through consuming fish and seafood contaminated with methylmercury. Once ingested, 95 per cent of the chemical is absorbed through the gastrointestinal tract.
[Paragraph deleted]	10. A wide range of mercury-added products are still produced globally, including batteries, lamps, measuring devices (such as thermometers), cosmetics and pesticides. The level or quantity of mercury in these products is generally very low; however, mishandling of large quantities of such materials as products or waste can result in releases to the environment. Mercury amalgam is still widely used in dentistry, which can result in mercury releases to waste water from dental offices and to air from crematoria.
11. Industrial processes that use mercury have the potential to contaminate the production site as a result of the process itself, spills resulting from poor handling or accidents or mismanagement of the mercury waste generated by the process.	11. Industrial processes that use mercury either as a catalyst or as part of an electrical circuit are also still in use globally. These processes include chlor-alkali production, where very large volumes of mercury are sometimes used on site, resulting in facilities that can be heavily contaminated with mercury. Mercury has also been used in acetaldehyde production. Other industrial processes that may use mercury include vinyl chloride monomer production (for use in polyvinyl chloride), sodium or potassium methylate or ethylate production and polyurethane production. Any of these manufacturing processes has the potential to contaminate the production site as a result of the process itself, spills resulting from poor handling or accidents or mismanagement of the mercury waste generated by the process.
12. Mercury is used extensively in ASGM, where it is mixed with gold-bearing ore. The informal nature of many small-scale gold mining operations means that there are few, if any, controls on mercury use and release, often resulting in high levels of worker exposure and site contamination.	12. Mercury is used extensively in ASGM, where it is mixed with gold-bearing ore. The mercury binds to the gold, forming an amalgam that is then heated to release the mercury as a vapour, leaving the gold. The informal nature of many small-scale gold mining operations means that there are few, if any, controls on mercury use and release, often resulting in high levels of worker exposure and site contamination. Additionally, entire families or groups of people can be exposed to mercury vapour in the house or warehouse where processing takes place and in the surroundings.
13. Mercury can also be emitted by a number of industrial-scale activities where it is a contaminant in feedstock materials or a by-product of production. Most of this mercury can be captured through pollution control measures; however, this in turn produces mercury-contaminated solid and liquid wastes that need to be managed safely.	13. Mercury can also be emitted by a number of industrial-scale activities where it is a contaminant in feedstock materials or a by-product of production. Examples include coal burning (in power plants and industrial boilers), non-ferrous metal smelting and roasting, cement clinker production and waste incineration. Most of this

Mismanagement of waste, particularly waste water, can result in releases of mercury to water, land and soil. Industrial-scale mining activities, particularly where the ore has a high mercury content, can also result in releases of mercury to air, land and water systems, while the mine tailings may be heavily contaminated with mercury.	mercury can be captured through pollution control measures; however, this in turn produces mercury-contaminated solid and liquid wastes that need to be managed safely. Mismanagement of waste, particularly waste water, can result in releases of mercury to water, land and soil. Industrial-scale mining activities, particularly where the ore has a high mercury content, can also result in releases of mercury to air, land and water systems, while the mine tailings may be heavily contaminated with mercury.
14. The 2018 Global Mercury Assessment indicated that the largest sources of anthropogenic emissions of mercury to air are ASGM and coal combustion (UNEP, 2019), followed by the production of ferrous and non-ferrous metals and cement production. The 2018 assessment also evaluated mercury releases to water from point sources of mercury emissions, contaminated sites and ASGM sites. The assessment found that global anthropogenic emissions of mercury to air in 2015 were estimated at 2,220 metric tons, while anthropogenic releases to water and soil were at least 1,800 metric tons. Contaminated sites were estimated to release 8–33 metric tons of mercury per year to water and 70–95 metric tons of mercury to air, therefore contributing a relatively small amount to the global total. [Data will be updated after the publication of the technical background document for Global Mercury Assessment 2018.] Other studies (Kocman et al, 2013) have found higher levels of releases to water, estimated at 67–165 metric tons of mercury per year.	14. The 2018 Global Mercury Assessment indicated that the largest sources of anthropogenic emissions of mercury to air are ASGM and coal combustion (UNEP, 2019), followed by the production of ferrous and non-ferrous metals and cement production. The 2018 assessment also evaluated mercury releases to water from point sources of mercury emissions, contaminated sites and ASGM sites. The assessment found that global anthropogenic emissions of mercury to air in 2015 were estimated at 2,220 metric tons, while anthropogenic releases to water and soil were at least 1,800 metric tons. Contaminated sites were estimated to release 8–33 metric tons of mercury per year to water and 70–95 metric tons of mercury to air, therefore contributing a relatively small amount to the global total. [Data will be updated after the publication of the technical background document for Global Mercury Assessment 2018.] Other studies (Kocman et al, 2013) have found higher levels of releases to water, estimated at 67–165 metric tons of mercury per year. These figures indicate that local communities can have significant exposure to mercury from contaminated sites.
18. A systematic approach may be taken for the identification of contaminated site. It starts with the implementation of a nationwide review of historical land use and the creation of an initial list of potentially contaminated sites. The list is then prioritized and the sites that require further investigation are identified. This approach can be effective when developing a comprehensive national plan for countermeasures against mercury-contaminated sites. There is another approach that can be substitutable for the systematic approach by identifying individual contaminated sites, such as when changing the character of the land. Individual identification of contaminates sites can be effective and efficient when a country has performed some degree of contaminated site identification and applied environmentally appropriate management measures.	18. A systematic approach may be taken for the identification of contaminated site. It starts with the implementation of a nationwide review of historical land use and the creation of an initial list of potentially contaminated sites. The list is then prioritized and the sites that require further investigation are identified. This approach can be effective when developing a comprehensive national plan for countermeasures against mercury-contaminated sites. This approach can be supplemented by identification of individual contaminated sites, such as when changing the character of the land. Individual identification of contaminates sites can be effective and efficient when a country has performed some degree of contaminated site identification and applied environmentally appropriate management measures.
30. The development of a conceptual site model for the site can be a useful step. A conceptual site model is a visual representation and narrative	30. The development of a conceptual site model for the site can be a useful step. A conceptual site model is a visual representation and narrative

description of the physical, chemical and biological processes that may occur, occurring, or that have occurred, at a site. Its specific elements may include the following (CCME, 2016): • An overview of historical, current, and planned future land uses; • A detailed description of the site and its physical setting that is used to form hypotheses about the release and ultimate fate of contamination at the site; • Sources of contamination at the site, the potential chemicals of concern, and the media (soil, groundwater, surface water, sediments, soil vapour, indoor and outdoor air, country foods, or biota) that may be affected; • The distribution of chemicals within each medium including information on the concentration, mass and/or flux; • How contaminants may be migrating from the source(s), the media and pathways through which migration and exposure of potential human or ecological receptors could occur, and information needed to interpret contaminant migration such as geology, hydrogeology, hydrology and possible preferential pathways; • Information on climate and meteorological conditions that may influence contamination distribution and migration; • Where relevant, information pertinent to soil vapour intrusion into buildings including construction features of buildings (e.g., size, age, foundation depth and type, presence of foundation cracks, entry points for utilities), building heating, ventilation and air conditioning design and operation, and subsurface utility corridors; and, • Information on human and ecological receptors and activity patterns at the site or at areas impacted by the site. <u>It should be noted that all elements listed above are not necessarily needed to be addressed. Especially, addressing the latter elements require certain amount of expertise for the technician performing the survey and the authority responsible for determining the effectiveness of the survey. CSM should be developed depending on the each party’s circumstances and site situations, and alternative methods can be conducted as well.</u>	description of the physical, chemical and biological processes that may occur, occurring, or that have occurred, at a site. Its specific elements may include the following (CCME, 2016): • An overview of historical, current, and planned future land uses; • A detailed description of the site and its physical setting that is used to form hypotheses about the release and ultimate fate of contamination at the site; • Sources of contamination at the site, the potential chemicals of concern, and the media (soil, groundwater, surface water, sediments, soil vapour, indoor and outdoor air, country foods, or biota) that may be affected; • The distribution of chemicals within each medium including information on the concentration, mass and/or flux; • How contaminants may be migrating from the source(s), the media and pathways through which migration and exposure of potential human or ecological receptors could occur, and information needed to interpret contaminant migration such as geology, hydrogeology, hydrology and possible preferential pathways; • Information on climate and meteorological conditions that may influence contamination distribution and migration; • Where relevant, information pertinent to soil vapour intrusion into buildings including construction features of buildings (e.g., size, age, foundation depth and type, presence of foundation cracks, entry points for utilities), building heating, ventilation and air conditioning design and operation, and subsurface utility corridors; and, • Information on human and ecological receptors and activity patterns at the site or at areas impacted by the site.
47. Risk assessment can be carried out in four clearly defined stages with specific objectives: • Identification and characterization of what is at risk. Effects of elemental mercury, inorganic mercury compounds and methylmercury on human health, terrestrial animals and aquatic biota are to be addressed. Other contaminants may be addressed in the risk assessment. • Analysis of the hazard level and toxicity. The hazards of mercury are well recognized, with	47. Risk assessment can be carried out in four clearly defined stages with specific objectives: • Identification and characterization of what is at risk. Effects of elemental mercury, inorganic mercury compounds and methylmercury on human health, terrestrial animals and aquatic biota are to be addressed. Other contaminants may be addressed in the risk assessment. • Analysis of the hazard level and toxicity. The hazards of mercury are well recognized, with

extensive scientific information available on the effects of exposure to mercury (WHO, 2017). The environmental effects of mercury exposure, particularly on high-level predators with potentially high dietary exposure, can include decreased reproductive success and impaired hunting ability. • Analysis of exposure. The aim is to estimate the rate of contact with the identified contaminants. The analysis is based on a description of exposure scenarios, as well as characterization of the nature and extent of the contamination. This may involve exposure measurements such as the scalp hair and urine. • Analysis of risks. The results of the previous stages are combined to objectively estimate the likelihood of adverse effects on the protected elements under the specific conditions of the site. • Other contaminants besides mercury may have an impact. Therefore, if there is evidence that other contaminants are present at the site, those who are responsible for the process must take the decision to include them in the study and assessment. As for the first stage, it should be noted that animals and aquatic biota are very diverse, and the evaluation methods have not been well established. Thus, putting higher priority on addressing human health may be considered depending on the individual situation.	extensive scientific information available on the effects of exposure to mercury (WHO, 2017). The environmental effects of mercury exposure, particularly on high-level predators with potentially high dietary exposure, can include decreased reproductive success and impaired hunting ability. • Analysis of exposure. The aim is to estimate the rate of contact with the identified contaminants. The analysis is based on a description of exposure scenarios, as well as characterization of the nature and extent of the contamination. This may involve exposure measurements such as the scalp hair and urine. • Analysis of risks. The results of the previous stages are combined to objectively estimate the likelihood of adverse effects on the protected elements under the specific conditions of the site. • Other contaminants besides mercury may have an impact. Therefore, if there is evidence that other contaminants are present at the site, those who are responsible for the process must take the decision to include them in the study and assessment.
59. If in situ treatment of the contaminated soil to remove the contamination is not feasible, another option is to excavate the contaminated soil and remove it from the site for treatment off site. It can be sent to an approved site or storage facility for later treatment. If this option is chosen, the Party would need to ensure that any receiving facility would be able to manage the soil in accordance with the environmental regulation under each jurisdiction. And more, the soil exceeding the threshold of mercury contaminated waste should be managed in accordance with the provisions of the environmentally sound management of mercury wastes, as set out in article 11 of the Convention. Off-site treatment of the excavated soil aims to either remove the contaminant or reduce the associated hazard to an acceptable level. If possible, the treated soil is then sent back to the site or to another site. Soil treatment residues would presumably contain high mercury concentrations and would need to be managed as mercury waste. Note, too, that when contaminated soil is treated and disposed of off site, the conditions of the waste management unit can have an impact on treatment effectiveness.	59. If in situ treatment of the contaminated soil to remove the contamination is not feasible, another option is to excavate the contaminated soil and remove it from the site for treatment off site. It can be sent to an approved site or storage facility for later treatment. If this option is chosen, the Party would need to ensure that any receiving facility would be able to manage the waste in accordance with the provisions of the environmentally sound management of mercury wastes, as set out in article 11 of the Convention. Off-site treatment of the excavated soil aims to either remove the contaminant or reduce the associated hazard to an acceptable level. If possible, the treated soil is then sent back to the site or to another site. Soil treatment residues would presumably contain high mercury concentrations and would need to be managed as mercury waste. Note, too, that when contaminated soil is treated and disposed of off site, the conditions of the waste management unit can have an impact on treatment effectiveness.