出國報告（出國類別：出席國際會議）

出席「巴塞爾公約第 12 次締約國大會」

服務機關：行政院環境保護署
姓名職稱：洪榮勳 專業研究員
派赴國家：瑞士
出國期間：104 年 5 月 6 日至 5 月 14 日
報告日期：104 年 6 月 5 日

摘要

聯合國環境署巴塞爾公約、鹿特丹公約及斯德哥爾摩公約聯合秘書處，於西元（下同）2015 年 5 月 4 日至 5 月 15 日在瑞士日內瓦召開「巴塞爾第 12 次、鹿特丹第 7 次及斯德哥爾摩第 7 次三公約聯合締約國」大會。

本屆大會會議重點包括：

一、卡塔基納廢棄物預防宣言

二、舊廢電子廢棄物越境轉移技術指引—區隔廢棄物及非廢棄物（草案）

三、國家報告

四、法律用語明確性

五、2016 至 2017 年工作計畫

本次代表團主要參與巴塞爾公約締約國大會(5/8 - 5/12)之會議，並關注本屆討論議題，同時透過周邊會議、雙邊會談等機會，與各國代表針對廢棄物輸出入管理政策、電子廢棄物管理及電腦設備夥伴計畫(Partnership for Action on Computing Equipment, PACE)轉型等議題進行交流。

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附錄 2-3 電子廢棄物境外轉移技術準則

附錄 2-4 關於對由汞或汞化合物構成、含有此類物質或受其污染的廢物實行無害環境管理的增訂技術準則

壹、目的

國際間對於有害廢棄物跨國轉移日漸重視，為了避免不當的廢棄物轉移造成環境污染，西元（下同）1989 年聯合國環境署在瑞士巴塞爾召開管制有害廢棄物跨國境移動及處理公約簽定大會，與會國共 116 國締結「巴塞爾公約」，迄今已有 182 國締結此公約。

我國雖非公約締約國，然而國內產業製程中有許多潛在的有害廢棄物，為了避免在跨國轉移時造成跨境污染，且為善盡國際義務，我國遵依巴塞爾公約規定，落實源頭減量、降低廢棄物越境轉移風險，減少非法輸出（入）案件發生，並以務實態度進行技術議題之參與。

本署自 2000 年起，每年派員出席公約締約國大會以及其他開放式工作組會議，以瞭解國際間對廢棄物越境管理之發展脈絡，並維持國際人脈，以建立廢棄物輸出入後之聯繫管道。近年來為配合國內有害廢棄物管理需求，與會同時亦積極拓展雙邊會談等各式周邊會議，與各締約國探討未來我國在有害廢棄物境外轉移的合作空間。

貳、過程

一、公約簡介

1989 年，聯合國環境署(United Nations Environment Programme, UNEP)召開管制有害廢棄物跨國境移動及處理公約簽定大會，此公約並於 1992 年 5 月 5 日生效，並簡稱為「巴塞爾公約」。從初期 116 參與國簽署迄今，全球已超過 182 個國家及組織簽署。

本公約成立目的在於管制國際間對於特定廢棄物輸出入，希望藉由公約的效力，減少有害廢棄物非法越境轉移問題，並確保所有越境轉移之有害廢棄物最終可以得到妥善的處理，降低其對環境衝擊。

巴塞爾公約目的：

（一）減少有害廢棄物之產生，並避免跨國運送時造成環境污染。

（二）提倡就地處理有害廢棄物，以減少跨國運送。

（三）妥善管理有害廢棄物之跨國運送，防止非法運送行為。

（四）提升有害廢棄物處理技術，促進無害環境管理之國際共識。

公約組織分為三大架構，包含締約國大會、秘書處與附屬機構。此公約最高決策機構為締約國大會，並於每 2 年舉辦 1 次，連同今年之大會，迄今已舉辦過 12 次。藉由締約國大會的舉辦，審查評估世界各國對於本公約執行的成果，以及審議並通過對本公約相關之修正方案與成立執行公約所需之附屬機構。

二、行前準備

本次大會會議期間為 2015 年 5 月 8 日至 5 月 12 日，本團團員參與會議時間為 5 月 6 日至 5 月 14 日。與會成員、與會行程及行前準備摘要如后。

（一） 與會成員：如表 1 所示。

表 1 廢棄物管理處與會成員

姓名	單位	職稱	任務分工
洪榮勳	環保署廢棄物管理處	專業研究員	國際交流、專題參與
黃拯中	財團法人環境資源研究發展基金會	顧問	國際交流、法律議題
黃嘉玟	財團法人環境資源研究發展基金會	副研究員兼組長	國際交流、專題參與（國際合作、協調與夥伴關係）
廖培雁	財團法人環境資源研究發展基金會	助理研究員	行政協助、專題參與（周邊會議）

（二） 與會行程：如表 2 所示。

表 2 與會行程（5 月 6 日-14 日）

日期	地點	內容
5 月 6 日	臺北→法國巴黎戴高樂	啟程
5 月 7 日	法國巴黎戴高樂→瑞士日內瓦	報到
5 月 8 日-12 日	瑞士日內瓦	與會
5 月 13 日	瑞士日內瓦→英國倫敦希斯洛	返程
5 月 14 日	英國倫敦希斯洛→臺北	抵臺

（三） 行前準備

1. **取得大會資訊：**至巴塞爾公約網站下載相關會議文件，以掌握本次會議重點，相關會議時間，以及我國關切議題資訊。

2. 蒐集國內完整資訊

(1) 蒐集國內相關資訊，以簡報彙整我國電子廢棄物管理情形。

(2) 搭配會議議題及規劃研析議題，彙整國內資訊。

(3) 依據安排之雙邊會談預先進行主題研究，說明國內現況及問題，同時請教該國作法及對策。

3. 維繫國際人脈：規劃透過周邊會議與雙邊會談，與各國代表團分享交流廢棄物管理施行成果，同時維繫國際人脈。

三、巴塞爾公約締約國大會議程

（一）會議開幕

（二）通過議程

（三）組織事項：

1. 選舉主席團成員
2. 安排工作
3. 關於第 12 次締約國大會與會代表全權證書的報告

（四）與執行《公約》有關的事項：

1. 策略議題
   (1) 提高《巴塞爾公約》成效倡議（印尼-瑞士國家領導）
   (2) 策略架構
   (3) 《預防、減量及再利用有害廢棄物卡塔基納宣言》
2. 科學和技術事項
   (1) 技術準則
   (2) 對《巴塞爾公約》各項附件的修正
   (3) 廢棄物分類及有害特性
   (4) 國家報告
3. 法律、遵約及執行事項
   (1) 《巴塞爾公約》履約和遵約促進機制管理委員會
   (2) 國家立法、通知書、《公約》的強制執行，以及打擊非法販運的努力
4. 技術援助
   (1) 能力建設
   (2) 《巴塞爾公約》區域中心和協調中心
   (3) 關於擴大“協助需要技術援助的發展中國家及其它國家執行《巴塞爾公約》信託基金”範圍的第 V/32 號決定的執行情況
5. 國際合作、協調與夥伴關係
   (1) 《巴塞爾公約》夥伴關係方案
   (2) 船舶無害拆解

(3) 與國際海事組織之間的合作

(4) 其它國際合作與協調

6. 財務資源

7. 開放式工作組 2016–2017 年工作計畫

（五） 工作方案和預算

（六） 第 13 次締約國大會地點和日期

（七） 其他事項

（八） 通過報告

（九） 會議閉幕

四、出席狀況

據大會 2015 年 5 月 16 日之新聞稿統計數據，本次締約國大會共計有來自 171 個國家、超過 1200 位與會出席者。包括締約國(Parties to the Convention)、非締約國(States Not Party to the Convention)、聯合國架構下的組織(Observers from the United Nations bodies)及其他(Non-governmental Organizations, Private-sector Organizations and Others)[1]。

[1]http://synergies.pops.int/Implementation/MediaResources/PressReleases/2015TripleCOPsdrewtoaclose/tabid/4514/language/en-US/Default.aspx

五、會議實錄

（一） 會議進行方式

每日大會(Plenary)區分 10：00-13：00 與 15：00-18：00 二時段進行，締約國大會會議議程如附錄 1-1。同時，大會於休息時間安排多場次周邊會議(Side Event)（時間為 13：15-14：45 及 18：15-19：45），與會者可視任務目標與議題關聯程度自由參加周邊會議，周邊會議議程如附錄 1-2。

另原於 2013 年三公約聯合會議期間舉行之高階會議(High-Level Segment)與非一般形式會議(Extraordinary Meeting)，本屆會議不予召開[2]。今(2015)年 5 月 4-15 日三公約聯合會議期間，同時舉辦主題為「從科學到行動，為更安全的明天工作(From science to action, working for a safer tomorrow)」之科學競賽(Science Fair)，與會代表可自由出席參加

（二） **書面資料：**為節省資源，本次會議採無紙化會議，臨時新增文件則統一放置於會議專網以利下載。

（三） **科學壁報競賽：**本次除了巴塞爾公約大會、周邊會議與各締約國間的雙邊會談之外，較歷屆締約國大會不同之處，為本次大會同時舉辦科學競賽，由來自世界各國學術與研究單位對廢棄物再生利用等相關最新科技進行靜態的壁報展覽。本次科學競賽由芬蘭協助贊助舉辦，共計超過上百位參賽單位，提供大會對於有害廢棄物管理的科學基礎[3]。

[2]資料來源：Decision BC-11/20, RC-6/12 及 SC-6/25

[3] http://synergies.pops.int/Implementation/MediaResources/NewsFeatures/tabid/2716/language/en-US/Default.aspx

圖 1　科學競賽展區（中國）

圖 2　科學競賽展區

六、會議主要重點

本次會議重點包括：新增 4 項管制化學物品、發布含汞廢棄物與持久性有機汙染物技術準則，及舊廢電子設備越境轉移技術準則，以協助世界各國對於這些舊廢電子設備的管理、修復、回收能有統一準則。

（一）本次大會發布多項用於管理有害廢棄物之技術準則，同時新增 4 項管制化學物品（其中 3 項列於斯德哥爾摩公約：多氯化萘、六氯丁二烯、五氯苯酚以及其塩類與酯類，1 項列於鹿特丹公約：甲胺磷）。

本屆巴塞爾公約發布的多份技術準則，主要期望用來協助各締約國能更有效的管理廢棄物，並且建立健全的環境管理辦法(Environmentally sound management, ESM)。準則中將含汞廢棄物與持久性有機污染物列入其中。同時針對電子相關廢棄物(E-waste)在本屆公約的技術準則也一併涵蓋。

（二）本屆巴塞爾公約大會相當重視對於 E-waste 之處理與相關技術準則的發布。大會針對如何定義 E-waste 以及廢棄產品在國際間轉移的狀況進行諸多討論，期望降低非法之越境轉移。據聯合國環境組織(UNEP)簡報數據資料，聯合國估計全世界約有 90%之電子廢棄物目前是被非法棄置，造成了世界各國每年花費共計 188 億美金處理，同時也危害數以百計的人民健康與環境破壞，尤其以非洲國家最為嚴重。

（三）關於如百草枯、倍硫磷、三氯磷酸酯等有毒化學農藥，在本次大會中也進行相關討論。會議之締約國一致認為需要更多技術規範與研究來尋找替代這些有毒化學農藥的方法以及尋求完整的害蟲管理準則(integrated pest management, IPM)，以達到農業與生態的永續平衡。

（四）由於與會締約國對於大會所列出之各項化學物品無法達成一致的共識，本大會執行部長 Mr. Rolph Payet 在會議最後表示本大會公約之精神在於保護地球環境，尤其現今有超過十億人口生活在絕對貧窮的環境中，先進國家不應背離我們的道德與政治責任，需要為這些弱勢人口設想，建構更完善

的永續環境與更安全的明天。因此未來大會將針對化學物品之管理架構進行研擬，尋求世界各國共識。

七、周邊會議

巴塞爾公約、斯德哥爾摩與鹿特丹三公約議題眾多，各國代表受時間及資源制，僅能參與部分議題，大會為使出席者能增加對相關議題之瞭解與討論，通常於大會休息時間舉行多場周邊會議(side event)。相關周邊會議主題、主辦單位及重點整理如下。

（一）Partnership for Action on Computing Equipment (PACE) outcomes and outlook
電腦設備夥伴計畫的過去與展望

主辦單位：電腦設備夥伴計畫

時間：5/11，15:30-16:30

1. PACE 因階段性任務完成，將結束本計畫，對於後續的相關執行事項，將另成立行動計畫負責。

2. 多數國家代表發言認為家庭廢棄物的處理問題很大，應該予以重視，建議應成立行動計畫來解決相關處理問題。

（二）1st Global E-waste Monitor and the Specific Situation in the Latin American region

主辦單位：聯合國環境署

時間：5/11，18:15-19:45

會議中各國代表針對電子廢棄物之定義進行熱烈討論，日本代表並表示目前許多電子廢棄物以二手商品的認定方式來規避廢棄物的管理，另因各國的發展情形與需求不同，故最後並無較具體之結論。

（三）Bringing synergies to the regions for ESM of wastes and chemicals

主辦單位：中美洲與墨西哥區域中心

時間：5/12，18:15-21:00

由各區域中心代表針對他們今年在「健全的環境管理辦法」(ESM)的工作成果進行簡報，簡報結束後在會議現場充分交換意見。

圖 3　PACE 周邊會議現場與會情形

圖 4　巴塞爾區域中心聯合會

八、雙邊會談及與會交流

本次除了參與締約國大會、周邊會議，以瞭解目前國際上針對廢棄物的處理方法外，也透過雙邊會談的方式，與史瓦濟蘭代表、巴塞爾公約中美洲區域中心代表以及瓜地馬拉代表進行深度交流，以瞭解他國在廢棄物管理上的作法，同時建立未來兩國在廢棄物處理上的共識與合作管道。

（一） 史瓦濟蘭廢棄物管理經驗交流：雙方認同臺灣與史瓦濟蘭未來可以有合作夥伴關係，針對廢棄物的管理、有害化學物質的管制及其他各項環保議題，有進一步的交流、甚至技術移轉等。史方並希望臺灣環保署或相關單位可以邀請史國官員到臺灣考察或學習。

（二） 中美洲區域中心、瓜地馬拉代表討論未來行動小組參與方式：鑑於 PACE 即將轉型，我國未來應尋求以觀察員身分加入行動小組之可行性。

圖 5　與史瓦濟蘭代表團進行雙邊會談

圖 6　與巴塞爾公約中美洲區域中心及瓜地馬拉代表進行雙邊會談

參、心得與建議

一、心得

（一）參與巴塞爾公約

我國自 2002 年以來，便積極參與巴塞爾公約及相關國際性會議，以爭取我國在國際舞台交流之機會。

（二）國際上的人脈關係

本次雙邊會談與史瓦濟蘭代表及中美洲區域中心代表進行討論與意見交換，充分感受到國際上對我國資源回收與廢棄物管理政策的重視與關注。

（三）PACE 後續動作

PACE 的行動計畫預計於本年下半年度達成階段性任務，本代表團充分掌握此計畫動態，期望未來能藉由國際友邦協助參與後續延伸計畫。

二、建議

（一）本次大會發布多項有害廢棄物技術準則，並著重電子廢棄物的管理處置，建議我國應針對電子廢棄物相關技術準則進行瞭解。

（二）由於 PACE 的行動計畫將結束，我國應針對此行動計畫未來後續發展進行瞭解，若有其他後續組織成立，也應充分向其相關組織表達我國積極參與之意願。

（三）對於向來與我國友好的國際友人，應繼續保持密切聯繫，未來亦可針對事業廢棄物境外轉移處理方式進行資訊分享與交流。

附錄

附錄一
會議議程相關資料

附錄 1-1
巴塞爾公約第 12 次締約國大會議程

UNITED NATIONS

UNEP

Food and Agriculture Organization of the United Nations

BC
RC
SC

UNEP/CHW.12/INF/2
UNEP/FAO/RC/COP.7/INF/2
UNEP/POPS/COP.7/INF/2

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal

Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade

Stockholm Convention on Persistent Organic Pollutants

Distr.: General
26 January 2015

English only

Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal
Twelfth meeting
Geneva, 4–15 May 2015
Item 3 (b) of the provisional agenda*
Organizational matters: organization of work

Conference of the Parties to the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade
Seventh meeting
Geneva, 4–15 May 2015
Item 3 (b) of the provisional agenda**
Organizational matters: organization of work

Conference of the Parties to the Stockholm Convention on Persistent Organic Pollutants
Seventh meeting
Geneva, 4–15 May 2015
Item 3 (b) of the provisional agenda***
Organizational matters: organization of work

Tentative schedule of work of the meetings of the conferences of the parties to the Basel, Rotterdam and Stockholm conventions

Note by the Secretariat

The annexes to the present note contain a tentative schedule of work of the meetings of the conferences of the parties to the Basel, Rotterdam and Stockholm conventions (annex I) and information on possible contact groups (annex II). The tentative schedule, which was agreed to by the bureaux of the conferences of the parties to the three conventions at their joint meeting on 11–12 November 2014, is provisional and could be subject to changes before or during the two weeks of the meetings.[1] The present note, including its annexes, has not been formally edited.

* UNEP/CHW.12/1.
** UNEP/FAO/RC/COP.7/1.
*** UNEP/POPS/COP.7/1.

[1] Participants may wish to take into account that each of the sessions of the conferences of the parties may last longer or begin earlier, subject to the decisions taken by the bureaux, which would be expected to meet each morning from 8 a.m. to 9 a.m. to agree on the order of business for the day. Delegates are therefore advised to allow for a certain level of flexibility when making travel arrangements.

Annex I: Tentative schedule of work of the meetings of the conferences of the parties to the Basel, Rotterdam and Stockholm conventions from 4 to 15 May 2015 in Geneva[1]

	Mon, 4 May 2015	Tue, 5 May 2015	Wed, 6 May 2015	Thu, 7 May 2015	Fri, 8 May 2015	Sat, 9 May 2015
Morning session 10 a.m.–1 p.m.	**BC Item 1: Opening of the meeting** **BC Item 2: Adoption of the agenda**	*Reports of contact and other groups*	*Reports of contact and other groups*	*Reports of contact and other groups*	*Reports of contact and other groups*	*Reports of contact and other groups*
	RC Item 1: Opening of the meeting **RC Item 2: Adoption of the agenda**	**Joint session of the three COPs:**	**Session of SC COP-7:**	**Session of SC COP-7:**	**Session of BC COP-12:**	**Session of BC COP-12:**
	SC Item 1: Opening of the meeting **SC Item 2: Adoption of the agenda**	**RC Item 5 (cont.)** (c) Non-compliance **SC Item 5 (cont.)** (j) Non-compliance	**Item 5 (cont.)** (a) Measures to reduce or eliminate releases from intentional production and use: (ii) DDT (iii) Polychlorinated biphenyls (iv) Brominated diphenyl ethers and perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	*Consideration of the outcomes of the contact groups and draft decisions* **Item 5 (cont.)** (h) Reporting pursuant to Article 15 (i) Effectiveness evaluation (a) Measures to reduce or eliminate releases from intentional production and use: (v) Evaluation of the continued need for the procedure under paragraph 2(b) of Article 3	**Item 4 (cont.)** (b) Scientific and technical matters: (i) Technical guidelines (excluding POPs wastes) (a) Strategic issues: (i) Follow-up to the Indonesian-Swiss country-led initiative to improve the effectiveness of the Basel Convention (ii) Strategic framework (iii) Cartagena Declaration	**Item 4 (cont.)** (c) Legal, compliance and governance matters: (i) Committee for Administering the Mechanism for Promoting Implementation and Compliance of the Basel Convention (ii) National legislation, notifications, enforcement of the Convention and efforts to combat illegal traffic (g) Operations and work programme of the OEWG for 2016–2017
	Joint session of the three COPs: **BC Item 3; RC Item 3; SC Item 3: Organizational matters** (b) Organization of work **BC Item 3; RC Item 3; SC Item 3 (cont.)** (a) Election of officers **BC Item 3; RC Item 3; SC Item 3 (cont.)** (c) Credentials **BC Item 4: Matters related to the implementation of the Convention** (b) Scientific and technical matters: (i) Technical guidelines (only POPs wastes) **SC Item 5: Matters related to the implementation of the Convention** (c) Measures to reduce or eliminate releases from wastes	**RC Item 5 (cont.)** (e) International cooperation, coordination and partnerships: (iv) Other international cooperation and coordination **RC Item 5 (cont.)** (f) International cooperation and coordination **SC Item 5 (cont.)** (k) International cooperation and coordination **BC Item 5; RC Item 6; SC Item 6: Programme of work and budget** **BC Item 6; RC Item 7; SC Item 7: Venue and date of the next COPs** **BC Item 7; RC Item 8; SC Item 8: Other matters** (only admission of observers and development of draft MOUs)				
Afternoon session 3–6 p.m.	**Joint session of the three COPs:** **BC Item 4 (cont.)** (d) Technical assistance: (i) Capacity-building (ii) Basel Convention regional and coordinating centres **RC Item 5: Matters related to the implementation of the Convention** (d) Technical assistance **SC Item 5 (cont.)** (f) Technical assistance **BC Item 4 (cont.)** (f) Financial resources **RC Item 5 (cont.)** (e) Financial resources **SC Item 5 (cont.)** (g) Financial resources and mechanisms	**Session of SC COP-7:** **Item 4: Rules of procedure** **Item 5 (cont.)** (j) Non-compliance (cont.) (e) Listing of chemicals (chlorinated naphthalenes, hexachlorobutadiene, pentachlorophenol and its salts and esters) (a) Measures to reduce or eliminate releases from intentional production and use: (i) Exemptions	**Session of SC COP-7:** **Item 5 (cont.)** (b) Measures to reduce or eliminate releases from unintentional production (d) Implementation plans	**Session of SC COP-7:** *Consideration of the outcomes of the contact groups and draft decisions* **Item 8 (cont.)** (excluding admission of observers and development of a draft MOU)	**Session of SC COP-7:** *Consideration of the outcomes of the contact groups and draft decisions* **Item 9: Adoption of the report** **Adoption of the section of the reports on the joint sessions of the meetings of the COPs**[2]	**Session of BC COP-12:** **Item 4 (cont.)** (b) Scientific and technical matters: (ii) Amendments to the annexes to the Basel Convention (iii) Classification and hazard characterization of wastes (iv) National reporting (d) Technical assistance: (iii) Implementation of decision V/32 on the enlargement of the scope of the Trust Fund

[1] Items listed in the tentative schedule are from the provisional agendas of the meetings (UNEP/CHW.12/1; UNEP/FAO/RC/COP.7/1; UNEP/POPS/COP.7/1).

[2] The conferences of the parties will meet in joint sessions to adopt the section of their respective report covering the joint sessions held on Monday, 4 May 2015 and on the morning of Tuesday, 5 May 2015. The timing of this adoption is subject to change if the bureaux of the three conferences of the parties so decide.

	Sun, 10 May 2015	Mon, 11 May 2015	Tue, 12 May 2015	Wed, 13 May 2015	Thu, 14 May 2015	Fri, 15 May 2015
Morning session 10 a.m.–1 p.m.	**No formal meetings**	*Reports of contact and other groups*	*Reports of contact and other groups*	*Reports of contact and other groups*	*Reports of contact and other groups*	*Reports of contact and other groups*
		Session of BC COP-12: *Consideration of the outcomes of the contact groups and draft decisions* **Item 4: (cont.)** (e) International cooperation, coordination and partnerships: (i) Basel Convention Partnership Programme (ii) Environmentally sound dismantling of ships (iii) Cooperation with the International Maritime Organization	**Session of RC COP-7:** **Item 4: Rules of procedure** **Item 5 (cont.)** (c) Non-compliance (cont.) (b) Chemicals for inclusion in Annex III (methamidophos, fenthion formulation, trichlorfon, paraquat dichloride formulation, chrysotile asbestos)	**Session of RC COP-7:** **Item 5 (cont.)** (b) Chemicals for inclusion in Annex III (cont.) (a) Status of implementation	**Session of RC COP-7:** *Consideration of the outcomes of the contact groups and draft decisions* **Item 8 (cont.)** (excluding admission of observers and development of a draft MOU)	**Joint session of the three COPs:** *Consideration of the outcomes of the joint contact groups and discussions of outstanding joint issues*
Afternoon session 3–6 p.m.	**No formal meetings**	**Session of BC COP-12:** *Consideration of the outcomes of the contact groups and draft decisions* **Item 7 (cont.)** (excluding admission of observers and development of a draft MOU)	**Session of BC COP-12:** *Consideration of the outcomes of the contact groups and draft decisions* **Item 8: Adoption of the report**	**Session of RC COP-7:** *Consideration of the outcomes of the contact groups and draft decisions*	**Session of RC COP-7:** *Consideration of the outcomes of the contact groups and draft decisions* **Item 9: Adoption of the report**	*Adoption of budget and other BC COP decisions* *Adoption of budget and other RC COP decisions* *Adoption of budget and other SC COP decisions* **BC Item 9; RC Item 10; SC Item 10: Closure of the meeting**

Basel Convention Conference of the Parties (BC COP)	
Rotterdam Convention Conference of the Parties (RC COP)	
Stockholm Convention Conference of the Parties (SC COP)	
Joint sessions of the meetings of the conferences of the parties	
Report of joint and convention-specific contact and other groups	

Annex II

Possible contact and other groups at the meetings of the conferences of the parties to the Basel, Rotterdam and Stockholm conventions in May 2015

The following contact and other groups have been tentatively identified by the bureaux during their deliberations on the matter at their joint meeting on 11–12 November 2014. These suggested groups may be established during the two-week meetings, with the understanding that they do not have to work simultaneously and that some of them may be short-lived. The total number of groups meeting at any one time would need to be limited to ensure that there is adequate opportunity for the interests of all delegations to be factored into the discussions.

1) Joint contact and other groups:

- Joint contact group on technical assistance and financial resources/mechanisms
  - This group could start its work as early as Monday, 4 May 2015 and meet as needed throughout the two-week period. It is not expected to meet every day, but during allocated timeslots, as decided upon by the bureaux of the conferences of the parties in consultation with the co-chairs of the contact group.
  - This group is to complete its work on convention-specific issues during the timeframe of each Conference of the Parties according to the following schedule:
    - Stockholm Convention: by closure of business on Thursday, 7 May 2015;
    - Basel Convention: by closure of business on Monday, 11 May 2015;
    - Rotterdam Convention: by close of business on Wednesday, 13 May 2015.
- Joint contact group on programme of work and budget
- Joint friends-of-the-presidents group on the terms of reference for the review of the synergies arrangements

  The two groups on programme of work and budget and on the terms of reference for the review of the synergies arrangements could start their work on Tuesday, 5 May 2015 and meet as needed throughout the two-week period. The budget group is expected to meet less often the first week and more often the second week.

  These two groups are to complete their work not later than by close of business on Thursday, 14 May 2015.

2) Stockholm Convention-specific contact and other groups:

- Friends-of-the-President group on compliance
  - This group could start its work as early as Tuesday, 5 May 2015. The schedule of its work is to be determined.
- Contact group on listing of chemicals
  - This group could start its work on Tuesday, 5 May 2015 and complete it by close of business on Thursday, 7 May 2015.

3) Basel Convention-specific contact and other groups:

- Contact group on technical matters
  - This group could start its work on Monday, 4 May 2015 to address the technical guidelines on POPs wastes.
  - The Conference of the Parties to the Basel Convention is expected to add other mandates to the group after having considered the other technical matters on its agenda on Friday, 8 May 2015.
- Contact group on strategic matters
  - This group could start its work on Friday, 8 May 2015.
- Contact group on compliance and legal matters
  - This group could start its work on Saturday, 9 May 2015.

These groups are to complete their work by close of business on Monday, 11 May 2015.

4) Rotterdam Convention-specific contact and other groups:

- Friends-of-the-President group on compliance
  - This group could start its work as early as Tuesday, 5 May 2015. The schedule of its work is to be determined.
- Contact group on chemicals for inclusion in Annex III
  - This group could start its work on Tuesday, 12 May 2015 and complete it by close of business on Wednesday, 13 May 2015.

UNITED NATIONS

UNEP

BC

UNEP/CHW.12/1

Distr.: General
16 September 2014

Original: English

BASEL CONVENTION

Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal
Twelfth meeting
Geneva, 4–15 May 2015

Provisional agenda

1. Opening of the meeting.
2. Adoption of the agenda.
3. Organizational matters:
   - (a) Election of officers;
   - (b) Organization of work;
   - (c) Report on the credentials of representatives to the twelfth meeting of the Conference of the Parties.
4. Matters related to the implementation of the Convention:
   - (a) Strategic issues:
     - (i) Follow-up to the Indonesian-Swiss country-led initiative to improve the effectiveness of the Basel Convention;
     - (ii) Strategic framework;
     - (iii) Cartagena Declaration on the Prevention, Minimization and Recovery of Hazardous Wastes and Other Wastes;
   - (b) Scientific and technical matters:
     - (i) Technical guidelines;
     - (ii) Amendments to the annexes to the Basel Convention;
     - (iii) Classification and hazard characterization of wastes;
     - (iv) National reporting;
   - (c) Legal, compliance and governance matters:
     - (i) Committee for Administering the Mechanism for Promoting Implementation and Compliance of the Basel Convention;
     - (ii) National legislation, notifications, enforcement of the Convention and efforts to combat illegal traffic;
   - (d) Technical assistance:
     - (i) Capacity-building;
     - (ii) Basel Convention regional and coordinating centres;

(iii) Implementation of decision V/32 on the enlargement of the scope of the Trust Fund to Assist Developing and Other Countries in Need of Technical Assistance in the Implementation of the Basel Convention;

(e) International cooperation, coordination and partnerships:

(i) Basel Convention Partnership Programme;

(ii) Environmentally sound dismantling of ships;

(iii) Cooperation with the International Maritime Organization;

(iv) Other international cooperation and coordination;

(f) Financial resources;

(g) Operations and work programme of the Open-ended Working Group for 2016–2017.

5. Programme of work and budget.

6. Venue and date of the thirteenth meeting of the Conference of the Parties.

7. Other matters.

8. Adoption of the report.

9. Closure of the meeting.

附錄 1-2
周邊會議議程大綱

As of 17 April 2015

Tentative schedule of side events at the meetings of the conferences of the parties to the Basel, Rotterdam and Stockholm conventions, 4-15 May 2015, Geneva, Switzerland

	Mon, 4 May 2015	Tue, 5 May 2015	Wed, 6 May 2015	Thu, 7 May 2015	Fri, 8 May 2015	Sat, 9 May 2015
Lunch time events 1:15-2:45 p.m.	**GEF Event** *Room 3*	**The links: Persistent Organic Pollutants and Endocrine Disrupting Chemicals** UNEP Chemicals, WHO and BRS *Room 3*	**Global Monitoring Plan of POPs – Updates for new and initial POPs** UNEP Chemicals, RECETOX *Room 3*	**Opening of the Science Fair** *Exhibition area*	**Science Fair Panel Discussion** *Exhibition area*	**Science Fair Side Event: Mainstreaming of science in the sound management of chemicals and wastes** *Room 3*
				Science Fair Booth Events *Exhibition area*	**Science Fair Booth Events** *Exhibition area*	**Science Fair Booth Events** *Exhibition area*
	PCB Information Sharing Meeting UNEP Chemicals *Room 4*	**Linkages between human rights and hazardous substances and wastes** BRS Secretariat, UNEP ROE, Special Rapporteur *Room 4*	**Waste and Synergies between Basel and Stockholm Conventions: Understanding the Links and Implications** IPEN *Room 4*	**Regional Chemicals Management and Metal Recycling** BCRC-China and UNEP Chemicals *Room 4*	**A Song for You: Combating POPs - China's Action Towards a POPs-free Future** China *Room 4*	**Countering Illegal Trade of Waste of Electrical and Electric Equipment** INTERPOL *Room 4*
Evening events 6:15-7:45 p.m.	**Reception hosted by Switzerland** *Cafeteria*	**Stimulating industry and private sector engagement in POPs management** UNIDO *Room 15*	**Highly Hazardous Pesticides in the SAICM context: Developing a proposal for future action** FAO, SAICM Secretariat, WHO and UNEP *Room 15*	**Science Fair Booth Events** *Exhibition area*	**Science Fair Booth Events** *Exhibition area*	**Closure of the Science Fair** *Exhibition area*
		Third Assembly of the Global Alliance for Alternatives to DDT and DDT Information Sharing Meeting UNEP Chemicals *Room 16*		**Facilitating information exchange and collaboration between MEAs: Where do we stand and where do we want to go?** UNEP *Room 15*	**Addressing Hazardous Substance within the Life-Cycle of Electrical and Electronic Products - Efforts till date AND E- Waste management in developing and transition countries** UNEP and UNIDO *Room 15*	
		Movie "E-waste Tragedy" Basel Action Network *Room (to be confirmed)*	**Automotive industry and the Basel Convention guidelines – global implications on circular economy** APRA (Automotive Parts Remanufacturers Association) and CLEPA (European Association of Automotive Industry) *Room 16*	**Sharing the experience and lesson learnt of Stockholm Convention from Vietnam** Vietnam *Room 16*	**Roadmap toward effective implementation of the Bamako Convention** UNEP DELC *Room 16*	

As of 17 April 2015

	Sun, 10 May 2015	Mon, 11 May 2015	Tue, 12 May 2015	Wed, 13 May 2015	Thu, 14 May 2015	Fri, 15 May 2015
Lunch time events 1:15-2:45 p.m.	**Boat trip organized by Switzerland** **9:00 am**	**Combating illegal traffic under the Basel Convention: The work of ENFORCE** Members of ENFORCE *Room 3*	**Addressing pesticide risks in the Former Soviet Union** Pesticide Action Network UK *Room 3*	**Asbestos – who pays the cost? Testimonies and dialogue** Rotterdam Convention Alliance and Women in Europe for a Common Future *Room 3*	**Implementing Chemical Safety: How International Organizations are Assisting Countries" to "IOMC Toolbox: Resources from international organizations to assist countries with the sound management of chemicals - Linking science to policies, legislation, and practice** IOMC *Room 3*	
			Launching event: Rapid Response Assessment on Waste Crimes: Low Risks – High Profits GRID-Arendal /UNEP DELC *Level 2, espace Motta*			
		PACE outcomes and outlook Switzerland and BCCC-Nigeria *Level 2, espace Motta*	**Paraquat: New insights on risks and alternatives** Berne Declaration, Pesticide Action Network and International Union of Food (IUF) *Room 4*	**Considering socio-economic impacts of chemicals and waste management; protecting vulnerable groups from hazardous pesticides and waste** ILO, FAO , SAICM Secretariat, BRS Secretariat *Room 4*	**The Global Gender and Environment Outlook (GGEO) – Exploring chemicals, gender and environment nexus** UNEP *Room 4*	
Evening events 6:15-7:45 p.m.	**Boat trip organized by Switzerland** **2:00 pm**	**Ratification and early implementation of the Minamata Convention and of Basel Convention Ban Amendment: Opportunities for cost-effective actions** UNITAR *Room 15*	**UNECE tools and good practices for preventing industrial accidents, especially those with transboundary consequences** Slovenia, UNECE, Secretariat to the UNECE Convention on the Transboundary Effects of Industrial Accidents *Room 15*	**Labour Unions and Chrysotile: International experience** International Alliance of Trade Union Organizations "Chrysotile" *Room 15*	**MOOC and online training at the BRS Secretariat – Partnering with universities for online education** BRS Secretariat *Room 15*	**X**
		1st Global E-waste Monitor and the Specific Situation in the Latin American region UNU and ITU *Room 16*	**Launching event: Gender Heroes** BRS Secretariat 6:15-7:15 pm *Level 2, espace Motta*		**Chemical Leasing- Sustainable Chemicals Service Solutions for industry** UNIDO *Room 16*	
			Bringing synergies to the regions for ESM of wastes and chemicals BCRC-Central America and Mexico *Room 16*			

附錄二
巴塞爾公約第 12 次締約國大會重要文件

附錄 2-1
技術準則：
關於電子和電器廢物以及廢舊電器和電子設備的越境轉移

UNITED NATIONS

UNEP

BC

UNEP/CHW.12/1/Add.1

Distr.: General
5 March 2015

Original: English

BASEL CONVENTION

Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal
Twelfth meeting
Geneva, 4–15 May 2015
Item 3 (b) of the provisional agenda*
Organizational matters: organization of work

Annotations to the provisional agenda

Item 1

Opening of the meeting

1. The twelfth ordinary meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal will be held at the Geneva International Conference Centre, 17 rue de Varembé, Geneva, from 4 to 15 May 2015, back-to-back with the seventh meeting of the Conference of the Parties to the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade and the seventh meeting of the Conference of the Parties to the Stockholm Convention on Persistent Organic Pollutants. The meetings will feature joint sessions on joint issues. The meetings will be opened at 10 a.m. on Monday, 4 May 2015, by the three presidents of the conferences of the parties.

2. Opening and welcoming statements will be delivered.

Item 2

Adoption of the agenda

3. Subject to the rules of procedure, the Conference of the Parties may wish to adopt its agenda, amended as appropriate, on the basis of the provisional agenda set forth in document UNEP/CHW.12/1.

Item 3

Organizational matters

(a) Election of officers

4. The Conference of the Parties has before it a note by the Secretariat on the election of officers (UNEP/CHW.12/2). The Conference of the Parties may wish to take note of the information provided and consider the possible action proposed therein.

5. Under rule 21 of the rules of procedure,[1] at each ordinary meeting, a President and nine Vice-Presidents, one of whom will serve as Rapporteur, are to be elected from among the representatives of the parties present at the meeting. They will commence their terms of office at the

* UNEP/CHW.12/1.

[1] As adopted in decision I/1 and amended in decisions VII/37, BC-10/1 and BC-11/24.

closure of the meeting at which they are elected and remain in office until the closure of the next ordinary meeting of the Conference of the Parties, for which they will serve as the Bureau, including for any intervening extraordinary meeting.

6. The Conference of the Parties may therefore wish to encourage the United Nations regional groups to meet during the course of the meeting to elect officers to serve on the Bureau from the end of the twelfth meeting until the end of the thirteenth meeting and to inform the Conference of the Parties of the results of such elections.

(b) Organization of work

7. The Conference of the Parties has before it a scenario note for the meetings of the conferences of the parties to the Basel, Rotterdam and Stockholm conventions (UNEP/CHW.12/INF/1-UNEP/FAO/RC/COP.7/INF/1-UNEP/POPS/COP.7/INF/1)[2] and a tentative schedule of work (UNEP/CHW.12/INF/2-UNEP/FAO/RC/COP.7/INF/2-UNEP/POPS/COP.7/INF/2), prepared by the Secretariat in consultation with the presidents and the bureaux of the conferences of the parties.

8. The Conference of the Parties may wish to decide to meet from 10 a.m. to 1 p.m. and from 3 p.m. to 6 p.m., subject to adjustments as necessary.

9. The Conference of the Parties may wish to establish contact groups and other groups, as deemed necessary, and specify their mandates.

(c) Report on the credentials of representatives to the twelfth meeting of the Conference of the Parties

10. The Conference of the Parties has before it a note by the Secretariat on the status of ratification of the Basel, Rotterdam and Stockholm conventions (UNEP/CHW.12/INF/44-UNEP/FAO/RC/COP.7/INF/30-UNEP/POPS/COP.7/INF/50). The Conference of the Parties may wish to take note of the information provided therein.

11. Rule 18 of the rules of procedure for the Conference of the Parties to the Basel Convention provides that the credentials of representatives and the names of alternate representatives and advisers should be submitted to the Executive Secretary of the meeting, if possible not later than 24 hours after the opening of the meeting. Any change thereafter in the composition of a delegation must be reported to the Secretariat and the credentials for any new member must also be submitted to the Secretariat. The credentials should be issued either by the head of State or Government, by the minister of foreign affairs or, in the case of a regional political or economic integration organization, by the competent authority of the organization. If a delegation submits credentials prior to the meeting by copy or by fax, it should submit the original upon registration. Please note that the submission of credentials before the meeting would greatly facilitate the advance clearing process by the Secretariat.

12. The bureaux of the conferences of the parties to the Basel, Rotterdam and Stockholm conventions, during their joint meeting held on 11 and 12 November 2014, agreed on the approach they will follow when preparing the reports on credentials for the meetings of the conferences of the parties to the Basel, Rotterdam and Stockholm conventions in 2015. The bureaux agreed that when examining the credentials received, they would accept original credentials in good order and copies of credentials in good order, on the understanding that the original would be submitted as soon as possible.

13. Representatives of parties may participate in the meeting pending a decision by the Conference of the Parties on their credentials.

14. The Bureau, with the assistance of the Secretariat, will examine the credentials of the representatives of the parties at the meeting and report thereon to the Conference of the Parties, for its consideration.

[2] Documents that have three document symbols, such as the scenario note, are joint documents that are submitted for consideration by the conferences of the parties to the Basel, Rotterdam and Stockholm conventions.

Item 4

Matters related to the implementation of the Convention

15. The Conference of the Parties will consider several sub-items under this agenda item. The sub-items are listed below in the order in which they appear in the provisional agenda, which is not necessarily the order of priority for consideration by the Conference of the Parties.

(a) Strategic issues

(i) Follow-up to the Indonesian-Swiss country-led initiative to improve the effectiveness of the Basel Convention

16. The Conference of the Parties has before it notes by the Secretariat on the follow-up to the Indonesian-Swiss country-led initiative to improve the effectiveness of the Basel Convention (UNEP/CHW.12/3), on a report on the activities and the draft work programme of the expert working group on environmentally sound management (UNEP/CHW.12/3/Add.1), on a set of practical manuals for the promotion of the environmentally sound management of wastes (UNEP/CHW.12/3/Add.2), on fact sheets on specific waste streams and a report assessing possible incentives to encourage the private sector to invest in environmentally sound management (UNEP/CHW.12/INF/6), on providing further legal clarity (UNEP/CHW.12/INF/52), and on comments from parties and others on the draft glossary of terms (UNEP/CHW.12/INF/55).

17. The Conference of the Parties may wish to take note of the information provided in the notes and consider the possible action proposed in document UNEP/CHW.12/3.

(ii) Strategic framework

18. The Conference of the Parties has before it notes by the Secretariat on a report on progress in the implementation of the strategic framework (UNEP/CHW.12/4) and on an updated report on the creation of a baseline for the mid-term and final evaluations of the strategic framework (UNEP/CHW.12/INF/5).

19. The Conference of the Parties may wish to take note of the information provided in the notes and consider the possible action proposed in document UNEP/CHW.12/4.

(iii) Cartagena Declaration on the Prevention, Minimization and Recovery of Hazardous Wastes and Other Wastes

20. The Conference of the Parties has before it a note by the Secretariat on a road map for action on the implementation of the Cartagena Declaration (UNEP/CHW.12/10).

21. The Conference of the Parties may wish to take note of the information provided and to consider the possible action proposed therein.

(b) Scientific and technical matters

(i) Technical guidelines

22. The Conference of the Parties has before it a note by the Secretariat on technical guidelines (UNEP/CHW.12/5).

23. The Conference of the Parties also has before notes by the Secretariat on technical guidelines on transboundary movements of electronic and electrical waste and used electrical and electronic equipment, in particular regarding the distinction between waste and non-waste under the Basel Convention (UNEP/CHW.12/5/Add.1 and UNEP/CHW.12/INF/7).

24. The Conference of the Parties also has before it notes by the Secretariat on updated general technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants (UNEP/CHW.12/5/Add.2 and UNEP/CHW.12/INF/9), on technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF) (UNEP/CHW.12/5/Add.3 and UNEP/CHW.12/INF/10), on updated technical guidelines on the environmentally sound management of wastes containing or contaminated with unintentionally produced polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans, hexachlorobenzene, polychlorinated biphenyls or pentachlorobenzene (UNEP/CHW.12/5/Add.4 and UNEP/CHW.12/INF/11), on updated technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with polychlorinated biphenyls (PCBs), polychlorinated terphenyls (PCTs) or polybrominated biphenyls (PBBs), including hexabromobiphenyl (HBB) (UNEP/CHW.12/5/Add.5 and UNEP/CHW.12/INF/12), on technical

guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with hexabromodiphenyl ether and heptabromodiphenyl ether, and tetrabromodiphenyl ether and pentabromodiphenyl ether (UNEP/CHW.12/5/Add.6 and UNEP/CHW.12/INF/13), on technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with hexabromocyclododecane (UNEP/CHW.12/5/Add.7 and UNEP/CHW.12/INF/14), and on technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with the pesticides aldrin, chlordane, chlordecone, dieldrin, endosulfan, endrin, heptachlor, hexachlorobenzene (HCB), lindane (HCH), mirex, perfluorooctane sulfonate, toxaphene or with HCB as an industrial chemical (UNEP/CHW.12/INF/15).

25. The Conference of the Parties also has before it notes by the Secretariat on updated technical guidelines for the environmentally sound management of wastes consisting of, containing, or contaminated with mercury or mercury compounds (UNEP/CHW.12/5/Add.8 and UNEP/CHW.12/INF/8).

26. The Conference of the Parties may wish to consider the information provided in the notes and the possible action proposed in document UNEP/CHW.12/5.

(ii) Amendments to the annexes to the Basel Convention

27. The Conference of the Parties has before it a note by the Secretariat on applications for new entries to Annex IX to the Basel Convention (UNEP/CHW.12/6).

28. The Conference of the Parties may wish to take note of the information provided and to consider the possible action proposed therein.

(iii) Classification and hazard characterization of wastes

29. The Conference of the Parties has before it a note by the Secretariat on the classification and hazard characterization of wastes: review of cooperation with the World Customs Organization and its Harmonized System Committee (UNEP/CHW.12/7).

30. The Conference of the Parties may wish to take note of the information provided and to consider the possible action proposed therein.

(iv) National reporting

31. The Conference of the Parties has before it notes by the Secretariat on national reporting (UNEP/CHW.12/8), on a draft reporting format for Basel Convention national reporting (UNEP/CHW.12/INF/16), on additional information on national reporting (UNEP/CHW.12/INF/17), and on a compilation of comments received from parties on revising the reporting format for Basel Convention national reporting (UNEP/CHW.12/INF/48).

32. The Conference of the Parties may wish to consider the information provided in the notes and the possible action proposed in document UNEP/CHW.12/8.

(c) Legal, compliance and governance matters

(i) Committee for Administering the Mechanism for Promoting Implementation and Compliance of the Basel Convention

33. The Conference of the Parties has before it notes by the Secretariat on the Committee for Administering the Mechanism for Promoting Implementation and Compliance of the Basel Convention (UNEP/CHW.12/9), on a methodological guide for the development of inventories of hazardous wastes and other wastes under the Basel Convention (UNEP/CHW.12/9/Add.1), on guidance on the implementation of the Basel Convention illegal traffic take-back provision (paragraph 2 of article 9) (UNEP/CHW.12/9/Add.2), on a guide to the control system (UNEP/CHW.12/9/Add.3), on a manual for the implementation of the Basel Convention (UNEP/CHW.12/9/Add.4), on the operation of the implementation fund (UNEP/CHW.12/INF/18), on national reporting on individual compliance performance (UNEP/CHW.12/INF/19), and on membership of the Committee for Administering the Mechanism for Promoting Implementation and Compliance of the Basel Convention (UNEP/CHW.12/INF/30).

34. The Conference of the Parties may wish to consider the information provided in the notes and the possible action proposed in document UNEP/CHW.12/9.

(ii) National legislation, notifications, enforcement of the Convention and efforts to combat illegal traffic

35. The Conference of the Parties has before it notes by the Secretariat on national legislation, notifications, enforcement of the Convention and efforts to combat illegal traffic (UNEP/CHW.12/11) and on an analysis on possible synergies in preventing and combating illegal traffic and trade in hazardous chemicals and wastes (UNEP/CHW.12/INF/51).

36. The Conference of the Parties may wish to take note of the information provided in the notes and consider the possible action proposed in document UNEP/CHW.12/11.

(d) Technical assistance

(i) Capacity-building

37. The Conference of the Parties has before it notes by the Secretariat on technical assistance and capacity-building for the implementation of the Basel, Rotterdam and Stockholm conventions (UNEP/CHW.12/13-UNEP/FAO/RC/COP.7/13-UNEP/POPS/COP.7/13), on capacity-building and training activities organized by the Secretariat from May 2013 to December 2014 (UNEP/CHW.12/INF/22-UNEP/FAO/RC/COP.7/INF/14-UNEP/POPS/COP.7/INF/17), on capacity-building and training activities planned by the Secretariat for 2015 (UNEP/CHW.12/INF/23-UNEP/FAO/RC/COP.7/INF/15-UNEP/POPS/COP.7/INF/18), on a report on the technical assistance needs of developing country parties and parties with economies in transition for the implementation of the Basel Convention and the technical assistance available from developed countries and others (UNEP/CHW.12/INF/24), and on a technical assistance programme for the implementation of the Basel, Rotterdam and Stockholm conventions over the biennium 2016–2017 (UNEP/CHW.12/INF/25-UNEP/FAO/RC/COP.7/INF/17-UNEP/POPS/COP.7/INF/16).

38. The Conference of the Parties may wish to take note of the information provided in the notes and consider the possible action proposed in document UNEP/CHW.12/13-UNEP/FAO/RC/COP.7/13-UNEP/POPS/COP.7/13.

(ii) Basel Convention regional and coordinating centres

39. The Conference of the Parties has before it notes by the Secretariat on the Basel Convention regional and coordinating centres (UNEP/CHW.12/12), on a draft evaluation report on the performance and sustainability of the regional centres under the Basel and Stockholm conventions (UNEP/CHW.12/INF/21-UNEP/POPS/COP.7/INF/13), and on a report on the activities of the Basel and Stockholm conventions regional centres (UNEP/CHW.12/INF/20-UNEP/POPS/COP.7/INF/14).

40. The Conference of the Parties may wish to take note of the information provided in the notes and consider the possible action proposed in document UNEP/CHW.12/12.

(iii) Implementation of decision V/32 on the enlargement of the scope of the Trust Fund to Assist Developing and Other Countries in Need of Technical Assistance in the Implementation of the Basel Convention

41. The Conference of the Parties has before it a note by the Secretariat on the implementation of decision V/32 on the enlargement of the scope of the Trust Fund to Assist Developing and Other Countries in Need of Technical Assistance in the Implementation of the Basel Convention (UNEP/CHW.12/14).

42. The Conference of the Parties may wish to take note of the information provided and to consider the possible action proposed therein.

(e) International cooperation, coordination and partnerships

(i) Basel Convention Partnership Programme

43. The Conference of the Parties has before it notes by the Secretariat on the Partnership for Action on Computing Equipment (UNEP/CHW.12/15), on a progress report by the co-chairs of the Partnership for Action on Computing Equipment Working Group (UNEP/CHW.12/INF/26), and on additional documents developed by the Partnership for Action on Computing Equipment (UNEP/CHW.12/INF/27).

44. The Conference of the Parties also has before it notes by the Secretariat on the Environmental Network for Optimizing Regulatory Compliance on Illegal Traffic (UNEP/CHW.12/16) and on a progress report by the chair of the Environmental Network for Optimizing Regulatory Compliance on Illegal Traffic (UNEP/CHW.12/INF/28).

45. The Conference of the Parties may wish to take note of the information provided in the notes and consider the possible action proposed in documents UNEP/CHW.12/15 and 16.

(ii) Environmentally sound dismantling of ships

46. The Conference of the Parties has before it a note by the Secretariat on the environmentally sound dismantling of ships (UNEP/CHW.12/17).

47. The Conference of the Parties may wish to take note of the information provided and to consider the possible action proposed therein.

(iii) Cooperation with the International Maritime Organization

48. The Conference of the Parties has before it notes by the Secretariat on cooperation between the Basel Convention and the International Maritime Organization (UNEP/CHW.12/18) and on an assessment prepared by the public waste agency of Flanders, on behalf of Belgium, on how far the Basel Convention technical guidelines cover wastes covered by the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto and as further amended by the Protocol of 1997 (MARPOL) (UNEP/CHW.12/INF/29).

49. The Conference of the Parties may wish to take note of the information provided in the notes and consider the possible action proposed in document UNEP/CHW.12/18.

(iv) Other international cooperation and coordination

50. The Conference of the Parties has before it notes by the Secretariat on international cooperation and coordination (UNEP/CHW.12/19-UNEP/FAO/RC/COP.7/15-UNEP/POPS/COP.7/31), on a report on activities pertaining to international cooperation and coordination (UNEP/CHW.12/INF/31-UNEP/FAO/RC/COP.7/INF/20-UNEP/POPS/COP.7/INF/41), on section I of resolution 1/5 of the United Nations Environment Assembly of the United Nations Environment Programme on strengthening the sound management of chemicals and wastes in the long term (UNEP/CHW.12/INF/32-UNEP/FAO/RC/COP.7/INF/21-UNEP/POPS/COP.7/INF/23) and on integrating chemicals and wastes management into the post-2015 United Nations development agenda and the sustainable development goals (UNEP/CHW.12/INF/54-UNEP/FAO/RC/COP.7/INF/39-UNEP/POPS/COP.7/INF/58).

51. The Conference of the Parties may wish to consider the information provided in the notes and the possible action proposed in document UNEP/CHW.12/19-UNEP/FAO/RC/COP.7/15-UNEP/POPS/COP.7/31.

(f) Financial resources

52. The Conference of the Parties has before it notes by the Secretariat on facilitating financial resources for chemicals and wastes (UNEP/CHW.12/20/Rev.1-UNEP/FAO/RC/COP.7/14/Rev.1-UNEP/POPS/COP.7/26/Rev.1), on a checklist on the integrated approach to financing options for chemicals and wastes for use by Secretariat staff (UNEP/CHW.12/INF/33-UNEP/FAO/RC/COP.7/INF/18-UNEP/POPS/COP.7/INF/34) and on terms of reference for the special programme to support institutional strengthening at the national level for implementation of the Basel, Rotterdam and Stockholm conventions, the Minamata Convention and the Strategic Approach to International Chemicals Management (UNEP/CHW.12/INF/34-UNEP/FAO/RC/COP.7/INF/19-UNEP/POPS/COP.7/INF/35).

53. The Conference of the Parties may wish to consider the information provided in the notes and the possible action proposed in document UNEP/CHW.12/20/Rev.1-UNEP/FAO/RC/COP.7/14/Rev.1-UNEP/POPS/COP.7/26/Rev.1.

(g) Operations and work programme of the Open-ended Working Group for 2016–2017

54. The Conference of the Parties has before it notes by the Secretariat on the work programme and operations of the Open-ended Working Group for the biennium 2016–2017 (UNEP/CHW.12/21) and on a compilation of comments on the arrangements that were made for the ninth meeting of the Open-ended Working Group (UNEP/CHW.12/INF/35).

55. The Conference of the Parties may wish to consider the information provided in the notes and the possible action proposed in document UNEP/CHW.12/21.

Item 5

Programme of work and budget

56. The Conference of the Parties has before it notes by the Secretariat entitled "Programmes of work and proposed budgets for the biennium 2016–2017: combined proposal including joint activities" (UNEP/CHW.12/22-UNEP/FAO/RC/COP.7/16-UNEP/POPS/COP.7/32), "Programmes of work and proposed budgets for the biennium 2016–2017: proposed operational budgets for the two funding scenarios" (UNEP/CHW.12/INF/36-UNEP/FAO/RC/COP.7/INF/22-UNEP/POPS/COP.7/INF/42), and "Programmes of work and proposed budgets for the biennium 2016–2017: budget activity fact sheets" (UNEP/CHW.12/INF/38-UNEP/FAO/RC/COP.7/INF/24-UNEP/POPS/COP.7/INF/44). As was the case with the programmes of work and budgets of the Basel, Rotterdam and Stockholm conventions for the biennium 2014–2015, the programmes of work and proposed budgets for 2016–2017 have been developed jointly and are presented in a harmonized format in a single document. The budget for the proposed joint activities for the biennium 2016–2017 is an integral part of those documents.

57. The Conference of the Parties has before it notes by the Secretariat on information on financial matters (UNEP/CHW.12/INF/39), on updated information on financial matters (UNEP/CHW.12/INF/40), on options for incentives and measures related to arrears in core budget contributions (UNEP/CHW.12/INF/41-UNEP/FAO/RC/COP.7/INF/27-UNEP/POPS/COP.7/INF/47), on a report on cost savings resulting from synergies among the Basel, Rotterdam and Stockholm conventions for the period 2012–2013 (UNEP/CHW.12/INF/42-UNEP/FAO/RC/COP.7/INF/28-UNEP/POPS/COP.7/INF/48), on a report on the audit of the Secretariat of the Basel, Rotterdam and Stockholm conventions by the Office of Internal Oversight Services (UNEP/CHW.12/INF/43-UNEP/FAO/RC/COP.7/INF/29-UNEP/POPS/COP.7/INF/49), and on contributions to the technical cooperation and voluntary special trust funds of the Basel, Rotterdam and Stockholm conventions in the biennium 2014–2015 (UNEP/CHW.12/INF/3-UNEP/FAO/RC/COP.7/INF/4-UNEP/POPS/COP.7/INF/59).

58. The Conference of the Parties has before it notes by the Secretariat on enhancing cooperation and coordination among the Basel, Rotterdam and Stockholm conventions (UNEP/CHW.12/23/Rev.1-UNEP/FAO/RC/COP.7/17/Rev.1-UNEP/POPS/COP.7/33/Rev.1), on a report on the implementation of joint and convention-specific activities contained in the 2014–2015 programme budgets of the Basel, Rotterdam and Stockholm conventions (UNEP/CHW.12/INF/45-UNEP/FAO/RC/COP.7/INF/31-UNEP/POPS/COP.7/INF/51), on mainstreaming gender in the Secretariat (UNEP/CHW.12/INF/49-UNEP/FAO/RC/COP.7/INF/33-UNEP/POPS/COP.7/INF/54), on information on the organizational structure of the Secretariat as at 8 December 2014 (UNEP/CHW.12/INF/37-UNEP/FAO/RC/COP.7/INF/35-UNEP/POPS/COP.7/INF/55), and on a strategy for mainstreaming science in the implementation of the Basel, Rotterdam and Stockholm conventions (UNEP/CHW.12/INF/53-UNEP/FAO/RC/COP.7/INF/38-UNEP/POPS/COP.7/INF/57).

59. The Conference of the Parties also has before it notes on the clearing-house mechanism for information exchange (UNEP/CHW.12/26-UNEP/FAO/RC/COP.7/20-UNEP/POPS/COP.7/35) and on a draft strategy for further development and operation of the joint clearing-house mechanism for the Basel, Rotterdam and Stockholm conventions (UNEP/CHW.12/INF/50–UNEP/FAO/RC/COP.7/INF/36–UNEP/POPS/COP.7/INF/56).

60. The Conference of the Parties may wish to consider the information provided in the notes and the possible action proposed in documents UNEP/CHW.12/22-UNEP/FAO/RC/COP.7/16-UNEP/POPS/COP.7/32, UNEP/CHW.12/23/Rev.1-UNEP/FAO/RC/COP.7/17/Rev.1-UNEP/POPS/COP.7/33/Rev.1 and UNEP/CHW.12/26-UNEP/FAO/RC/COP.7/20-UNEP/POPS/COP.7/35.

Item 6

Venue and date of the thirteenth meeting of the Conference of the Parties

61. The Conference of the Parties may wish to consider the venue and date of its thirteenth meeting, taking into account rules 3 and 4 of the rules of procedure for the Conference of the Parties.

Item 7

Other matters

62. The Conference of the Parties has before it a note by the Secretariat on the admission of observers (UNEP/CHW.12/24), and notes by the Secretariat entitled “Admission of observers: report on experiences with using the application forms and practices followed” (UNEP/CHW.12/INF/46-UNEP/FAO/RC/COP.7/INF/32-UNEP/POPS/COP.7/INF/53), and “Admission of observers: bodies or agencies requesting admission to participate in meetings of the Conference of the Parties to the Basel Convention” (UNEP/CHW.12/INF/47).

63. The Conference of the Parties may wish to consider the information provided in the notes and the possible action proposed in document UNEP/CHW.12/24.

64. The Conference of the Parties also has before it a note by the Secretariat on a draft memorandum of understanding between the United Nations Environment Programme and the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (UNEP/CHW.12/25).

65. The Conference of the Parties may wish to take note of the information provided and to consider the possible action proposed therein.

66. The Conference of the Parties may also wish to consider other matters raised during the course of the meeting.

Item 8

Adoption of the report

67. At the last separate session of its meeting, the Conference of the Parties will be invited to consider and adopt the draft report on its work prepared by the Rapporteur.

Item 9

Closure of the meeting

68. It is expected that the meeting will be closed by the President by 6 p.m. on Friday, 15 May 2015.

附錄 2-2
計算機設備行動夥伴關係

UNITED NATIONS

UNEP

BC

UNEP/CHW.12/15

Distr.: General
15 December 2014

Original: English

BASEL CONVENTION

Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal
Twelfth meeting
Geneva, 4–15 May 2015
Item 4 (e) (i) of the provisional agenda*

Matters related to the implementation of the Convention: international cooperation, coordination and partnerships: Basel Convention Partnership Programme

Partnership for Action on Computing Equipment

Note by the Secretariat

I. Introduction

1. In its decision BC-11/15, the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal agreed to extend the mandate of the Partnership for Action on Computing Equipment (PACE) until the end of 2015 and requested the Open-ended Working Group to consider, at its ninth meeting, the report of the Partnership, including its recommendations, and based on these and the outcome of its discussions thereon to submit recommendations to the Conference of the Parties at its twelfth meeting for its consideration and possible adoption.

2. In paragraph 3 of decision BC-11/15, the Conference of the Parties adopted sections 1, 2, 4 and 5 of the guidance document on environmentally sound management of used and end-of-life computing equipment developed by the Partnership (UNEP/CHW.11/6/Add.1/Rev.1, annex). The guidance document summarizes the information compiled by the Partnership and provided in the report on environmentally sound management criteria recommendations (UNEP/CHW.10/INF/25, annex); the revised guidelines on environmentally sound testing, refurbishment and repair of used computing equipment (UNEP/CHW.11/INF/12/Rev.1, annex); and the revised guidelines on environmentally sound material recovery and recycling of end-of-life computing equipment (UNEP/CHW.11/INF/13/Rev.1, annex).

3. In paragraph 4 of decision BC-11/15, the Conference of the Parties confirmed that section 3 of the guidance document, which deals with transboundary movements of used and end-of-life computing equipment, could only be revised following the adoption of the technical guidelines on transboundary movements of electronic and electrical waste, in particular regarding the distinction between waste and non-waste, in order to avoid duplications or discrepancies. Given that the technical guidelines are still under development, this task will be undertaken at a later stage following the finalization and adoption of those technical guidelines.

4. At its ninth meeting, the Open-ended Working Group discussed the report of the Partnership, welcomed in its decision OEWG-9/9 the progress made in the implementation of the Partnership and

* UNEP/CHW.12/1.

the report and recommendations thereon, and encouraged the Partnership to continue the implementation of its work programme for 2014–2015 and to report on progress in the activities undertaken to the Conference of the Parties at its twelfth meeting.

II. Implementation

5. In the Partnership work programme for 2014–2015, as adopted by decision BC-11/15, the Conference of the Parties identified a set of tasks to be undertaken by the Partnership Working Group, including organizing pilot projects, webinars and awareness-raising and training workshops and developing manuals and a report on lessons learned that would assist countries, in particular developing countries and countries with economies in transition, in managing used and end-of-life computing equipment in an environmentally sound manner. A progress report by the co-chairs of the Partnership Working Group on the implementation of the work programme is set out in the annex to document UNEP/CHW.12/INF/26**.**

6. The following additional documents have been developed by the Partnership for submission to the Conference of the Parties for its consideration in document UNEP/CHW.12/INF/27:

(a) Report on strategies, actions and incentives to promote environmentally sound management of used and end-of-life computing equipment;

(b) Concept note on strengthening the use of the guidelines and reports developed by the Partnership at the regional and national levels.

III. Proposed action

7. The Conference of the Parties may wish to adopt a decision along the following lines:

The Conference of the Parties

1. *Takes note* of the progress made in the implementation of the Partnership for Action on Computing Equipment and welcomes the report submitted by the co-chairs of the Partnership Working Group;[1]

2. *Expresses its appreciation* for the financial and in-kind contributions made to the Partnership by parties, signatories, industry, non-governmental organizations and other stakeholders;

3. *Recognizes* the significant role of the Partnership as a public-private partnership within the framework of the Basel Convention in achieving successful outputs in the environmentally sound management of used and end-of-life computing equipment;

4. *Emphasizes* the need to further develop and implement strategies for the environmentally sound management of used and end-of-life computing equipment in particular, but also electronic and electrical waste in general, at the regional and national levels;

5. *Invites* parties and signatories to use the guidance document on the environmentally sound management of used and end-of-life computing equipment, and the guidelines and reports produced by the Partnership;

6. *Decides* that the Partnership Working Group has successfully completed its mandate and is hereby disbanded, and that any follow-up tasks that may be required in the future will be carried out by a Partnership ad hoc follow-up group, with the participation of interested parties, signatories, industry, non-governmental organizations and other stakeholders;

7. *Requests* the Partnership ad hoc follow-up group to complete any outstanding tasks including:

(a) The revision of section 3 of the guidance document on the environmentally sound management of used and end-of-life computing equipment, which deals with transboundary movements of such equipment, following the adoption of the technical guidelines on transboundary movements of electronic and electrical waste, in particular regarding the distinction between waste and non-waste, by the Conference of the Parties. The

[1] See UNEP/CHW.12/INF/26.

Partnership ad hoc follow-up group should take into account the adopted technical guidelines and any additional information provided, and submit the revised section 3 of the guidance document to the Open-ended Working Group for its consideration;

(b) The development of a strategy and workplan for the implementation of concrete actions at the regional and national levels based on the concept note on strengthening the use of the guidelines and reports developed by the Partnership;[2]

(c) The finalization of ongoing pilot projects and the development of a report on lessons learned;

8. *Requests* the Open-ended Working Group at its tenth meeting to consider the revised section 3 of the guidance document developed in accordance with paragraph 7 (a) of the present decision and to submit it, amended as appropriate, to the Conference of the Parties at its thirteenth meeting for its consideration and possible adoption;

9. *Requests* the Basel Convention regional and coordinating centres to disseminate the guidance document on the environmentally sound management of used and end-of-life computing equipment, and the guidelines and reports produced by the Partnership, and, subject to the availability of funding, to initiate training and outreach activities and to take the lead in the implementation of activities as identified in paragraph 7 (b) of the present decision;

10. *Encourages* parties and other stakeholders to make financial and/or in-kind contributions:

(a) To support the Basel Convention regional and coordinating centres in their efforts to implement the activities identified in paragraph 9 of the present decision;

(b) To facilitate the participation of developing countries and countries with economies in transition in the implementation of activities as identified in the strategy and workplan described in paragraph 7 (b) of the present decision;

(c) To facilitate the implementation of projects on the collection and management of end-of-life computing equipment from the informal sector in developing countries and countries with economies in transition;

(d) To facilitate the identification of actions and incentives that can be taken to promote the environmentally sound reuse, refurbishment, repair, recycling and material recovery of used and end-of life computing equipment;

11. *Requests* the Secretariat:

(a) To facilitate and provide expertise to the Partnership ad hoc follow-up group;

(b) To report on progress in the activities undertaken by the Partnership ad hoc follow-up group to the Open-ended Working Group at its tenth meeting and to the Conference of the Parties at its thirteenth meeting.

[2] UNEP/CHW.12/INF/27, annex II.

附錄 2-3
電子廢棄物境外轉移技術手冊

UNITED NATIONS

UNEP

BC

UNEP/CHW.12/INF/7

Distr.: General
14 April 2015

English only

BASEL CONVENTION

Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal
Twelfth meeting
Geneva, 4–15 May 2015
Item 4 (b) (i) of the provisional agenda*
Matters related to the implementation of the Convention: scientific and technical matters: technical guidelines

Technical guidelines on transboundary movements of electrical and electronic waste and used electrical and electronic equipment, in particular regarding the distinction between waste and non-waste under the Basel Convention

Note by the Secretariat

As referred to in the note by the Secretariat on technical guidelines (UNEP/CHW.12/5) and its addendum UNEP/CHW.12/5/Add.1, the annex to the present note contains the final draft technical guidelines on transboundary movements of electrical and electronic waste and used electrical and electronic equipment, in particular regarding the distinction between waste and non-waste under the Basel Convention. This final draft has been revised, based on the text set out in the annex to document UNEP/CHW.12/5/Add.1, taking into account comments received by parties and others by 6 March 2015, as well as the outcome of the face-to-face meeting of the small intersessional working group for the development of technical guidelines on electronic and electrical wastes held on 19 and 20 January 2015 in Konstanz, Germany. Because of the extensive modifications made to the previous draft, it was not possible to show the tracked changes in the final draft in a manner that would be clear to the reader. The present note, including its annex, has not been formally edited.

* UNEP/CHW.12/1.

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Annex

Draft technical guidelines on transboundary movements of electrical and electronic waste and used electrical and electronic equipment, in particular regarding the distinction between waste and non-waste under the Basel Convention

(Draft of 4 April 2015)

Note to the reader

The current draft is based on the version of the technical guidelines dated 20 November 2014 that was published on the web-site of the Secretariat as a pre-session document for the twelfth meeting of the Conference of the Parties (COP 12) with reference number UNEP/CHW.12/5/Add 1. The text takes into account the discussions during the physical meeting of the Small Intersessional Working Group on E-waste (SIWG) in Konstanz, Germany from 19 to 20 January 2015, written comments made by parties and other stakeholders received by 6 March 2015 and the suggestions made by members of the SIWG in March 2015.

The proposed paragraphs 26b and Alt 26b were first introduced and discussed during the ninth session of the Open-ended Working Group (OEWG9) in September 2014. The current paragraph 26b contains 6 criteria on which there is not yet agreement within the SIWG. Developing these criteria was indicated by the Open-ended Working Group as being the preferred option. The text included in Alt 26b is proposed in case it would not be possible to reach consensus on these criteria. It is intended as a temporary measure pending the formulation and adoption of definitive text for paragraph 26b.

More background on the discussions that took place in Konstanz can be found in the report of that meeting that is published on the Basel Convention website under http://www.basel.int/Implementation/Ewaste/TechnicalGuidelines/DevelopmentofTGs/tabid/2377/Default.aspx. This report as well as the written contributions made by parties and other stakeholders that were received after 20 November 2014 contain explanations and considerations that may be useful when considering the texts of the guidelines that have not yet been agreed and that are presented as bracketed texts within this document.

Table of contents

Acronyms and abbreviations

AQSIQ	Administration of Quality Supervision, Inspection and Quarantine of China
BAN	Basel Action Network
BC	Basel Convention
BCRC-SEA	Basel Convention Regional Centre for South-East Asia
BFR	Brominated flame retardant
CCIC	China Certification & Inspection Group
CFCs	Chlorofluorocarbons
CMR	Convention relative au contrat de transport international de marchandises par route (Convention on the Contract for the International Carriage of Goods by Road)
CRT	Cathode ray tubes
EC	European Community
ESM	Environmentally sound management
EU	European Union
HS	Harmonized Commodity Description and Coding System (or short form Harmonized System)
HSA	Health and Safety Authority
ICT	Information and communications technologies
ILO	International Labour Organization
kg	Kilogram
LCD	Liquid crystal display
mg	Milligram
MPPI	Mobile Phone Partnership Initiative
OECD	Organization for Economic Cooperation and Development
OHS	Occupational health and safety
OHSAS	Occupational health and safety assessment series
PACE	Partnership for Action on Computing Equipment
PBBs	Polybrominated biphenyls
PCBs	Polychlorinated biphenyls
PCNs	Polychlorinated naphthalenes
PCTs	Polychlorinated terphenyls
PVC	Polyvinylchloride
RCA	Root Cause Analysis
RoHS	Restrictions of the use of certain Hazardous Substances in electrical and electronic equipment
StEP	Solving the e-waste problem
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNU	United Nations University
TBM	Transboundary movement
WCO	World Customs Organization

I. Introduction

A. Scope

1. The present technical guidelines provide guidance on [the application of the transboundary movements provisions to] [transboundary movements of] waste electrical and electronic equipment (e-waste) and used electrical and electronic equipment (used equipment) that may or may not be e-waste, in particular on the distinction between waste and non-waste, pursuant to decisions IX/6, BC-10/5, BC-11/4 [and BC-12/…] of the Conference of the Parties to the Basel Convention on the control of Transboundary Movement of Hazardous Wastes and Their Disposal (the Convention).

2. [These guidelines focus on clarifying aspects related to transboundary movements of e-waste and used equipment that may or may not be e-waste.] [Interpreting and deciding how the transboundary movement provisions of the Basel Convention apply to e-waste and used equipment in a transparent and consistent manner continues to be a challenge under the Basel Convention. Parties and others are asked to identify and assess a complex set of parameters involving the scope of articles and equipment, the determination of hazard characteristics, the suitability of the disposal or recycling operations and varying national legislation to determine if and how the transboundary movement provisions of the Convention apply to their circumstance. To support this process, additional guidance has been requested by Parties to help define when e-waste is considered a hazardous waste or "other waste" and when used equipment destined for reuse, repair, or refurbishment is to be considered a waste and therefore subject to the Convention.] [It is difficult to define and evaluate the distinction between waste and non waste when considering used equipment destined e.g. for [[failure analysis] [root cause analysis] or for repair or refurbishment [with the intention of reuse] or [intended for] direct reuse. [Certain Parties may consider used equipment destined for repair, refurbishment or upgrading without proper assurances to be waste, while others may not]. Further these guidelines consider which e-waste is hazardous waste or "other waste" and therefore would fall under the provisions of the Convention. Without such distinctions it is difficult for enforcement agencies to assess if the provisions of the Basel Convention for transboundary movements apply, as the Convention only applies to hazardous wastes and other wastes.]]

2bis. Only the transboundary transport of whole used equipment and components that can be removed from equipment, be tested for functionality and either be subsequently directly reused or reused after repair or refurbishment is considered in these guidelines. For the purpose of these guidelines, the term equipment also covers such components[1] [The transboundary movement of materials removed or derived from e-waste and used equipment e.g. metals, plastics, PVC-coated cables or activated glass, that are waste is not addressed in these guidelines, whether or not it falls under the provisions of the Convention.] [The transboundary transport of equipment that is means of transport for persons or goods or of equipment which is specifically designed and installed as part of such means of transport is not included in the scope of these guidelines.]

3. These guidelines provide:

(a) Information on the relevant provisions of the Convention applicable to transboundary movements of e-waste;

(b) Guidance on the distinction between waste and non-waste when used equipment is moved across borders;

(c) Guidance on the distinction between hazardous waste and non-hazardous waste when used equipment is moved across borders;

(d) General guidance on transboundary movements of hazardous e-waste and used equipment and enforcement of the control provisions of the Convention.

4. These guidelines are intended for government agencies including enforcement agencies that wish to implement, control and enforce legislation and provide training regarding transboundary movements. They

[1] Definitions and explanations regarding the terms used in these guidelines are included in a glossary of terms in appendix I to the present document.

are also intended to inform all actors involved in the management of e-waste and used equipment so they can be aware of the application of the Basel Convention and other considerations when preparing or arranging for transboundary movements of such items.

5. Their application should help reduce transboundary movements of e-waste in the scope of the Convention to the minimum consistent with the environmentally sound and efficient management of such wastes and reduce the environmental burden of e-waste that currently may be exported to countries and facilities that cannot handle it in an environmentally sound manner.

6. These guidelines do not address other aspects of environmentally sound management of e-wastes such as collection, treatment and disposal. These aspects may be covered where appropriate in other guidance documents. In particular a series of guidelines were developed in the context of the following public-private partnership initiatives under the Basel Convention (on the decisions of the Conference of the Parties regarding these guidelines, see decisions BC-10/20, BC-10/21 and BC-11/15):

(a) Mobile Phone Partnership Initiative (MPPI):

(i) Revised guidance document on the environmentally sound management of used and end-of-life mobile phones (UNEP/CHW.10/INF/27/Rev.1);

(ii) Awareness-raising and design considerations (MPPI, 2009a);

(iii) Collection (MPPI, 2009b);

(iv) Transboundary movement (MPPI, 2009 c);

(v) Refurbishment (MPPI, 2009 d);

(vi) Material recovery and recycling (MPPI, 2009 e);

(b) Partnership for Action on Computing Equipment (PACE):

(i) Sections 1, 2, 4 and 5 of the guidance document on the environmentally sound management of used and end-of-life computing equipment (UNEP/CHW.11/6/Add.1/Rev.1);

(ii) Environmentally sound management criteria recommendations;

(iii) Guidelines on environmentally sound testing, refurbishment, and repair of used computing equipment;

(iv) Guidelines on environmentally sound material recovery and recycling of end-of-life computing equipment;

(v) Guidelines on transboundary movement (TBM) of used and end-of-life computing equipment.

B. About e-waste

7. The volume of e-waste being generated is growing rapidly, due to the wide use of equipment, both in developed countries and in developing countries. The total amount of global e-waste generated in 2005 was estimated to be 40 million tonnes (StEP, 2009). The latest estimates indicate that in 2012 an amount of 48.9 million tonnes of e-waste was generated globally (Huisman, 2012). The amount of e-waste in the European Union was estimated at between 8.3 and 9.1 million tonnes in 2005 and expected to reach some 12.3 million tonnes in 2020 (United Nations University, 2007). Currently e-waste is exported to countries that are not likely to possess the infrastructure and societal safety nets to prevent harm to human health and the environment, due to factors such as exports being less expensive than managing the waste domestically, the availability of markets for raw materials or recycling facilities and the location of manufacturers of electrical and electronic equipment. However, there are also examples of formal recycling facilities in developing countries and economies in transition that are repairing, refurbishing and recycling used equipment and e-waste in an environmentally sound manner. However, in some cases the conditions outside the facility, e.g. the downstream waste management may not provide environmentally sound management.

8. [As a result of the EU Directive on Restrictions of the use of certain Hazardous Substances in electrical and electronic equipment (RoHS) and similar national legislation elsewhere, the use of hazardous substances in various electrical and electronic equipment has been greatly reduced or eliminated in recent years[2].] However, certain types of [e-waste][electrical and electronic equipment] may still contain hazardous substances such as lead, cadmium, mercury, POPs, asbestos and CFCs that pose risks to human health and the environment when improperly disposed of or recycled and that require specific attention as to their environmentally sound waste management. In most developing countries and countries with economies in transition, the capacity to manage the hazardous substances in e-waste is lacking. As an example, as regards the informal recovery industry in Asia there is clear evidence that the practice exploits women and child labourers who cook circuit boards, burn cables and submerge equipment in toxic acids to extract precious metals such as gold (Schmidt, 2006) and subjects them and their communities to damaged health and a degraded environment. Moreover, the techniques used by the informal sector are not only damaging human health and the environment, often they also perform poorly in recovering valuable resources, squandering precious resources such as critical metals for future use. Even management of non-hazardous wastes can cause significant harm to human health and the environment if not undertaken in an environmentally sound manner.

9. E-waste contains valuable materials that can be recovered for recycling including iron, aluminium, copper, gold, silver, platinum, palladium, indium, gallium and rare earth metals, thus contributing to sustainable resource management. The extraction of all of these metals from the Earth has a significant environmental impact. The recovery and use of such materials as raw materials after they have become waste can increase the efficiency of their use and lead to conservation of energy and reduction in greenhouse gas emissions when adequate technologies and methods are applied.

10. Direct reuse or reuse after repair or refurbishment can contribute even more to sustainable development. Reuse extends the life of equipment, which reduces the environmental footprint of the resource-intensive production processes of the equipment. It may also provide access to such equipment for groups in society that otherwise would not have access to it due to reduced costs of second-hand equipment. [In many instances, there are regional facilities that are specialized and have trained personnel in order to properly repair or refurbish used equipment. As these facilities are not present in all countries, used equipment destined for repair or refurbishment may need to be moved across borders prior to reuse.][Repair, refurbishment and remanufacturing operations are very often established in central repair facilities in the same countries where the products have been manufactured. Movements of products and spare parts for proper repair, refurbishment or remanufacturing to these facilities are an essential element to provide these services at a price that will not prevent the customer from choosing a repair over scrapping the defective product and disposing of it.]

10bis. Failure to handle equipment properly can have negative impacts and often entail disposal when parts are replaced and discarded. The lack of clarity in defining when used equipment is waste and when it is not has led to a number of situations where such equipment is exported to, in particular, developing countries ostensibly for reuse but where a large percentage of these goods are in fact not suitable for further use or are not marketable and must be disposed of in the developing country as waste.

II. Relevant provisions of the Basel Convention

A. General provisions of the Basel Convention

11. The Basel Convention aims to protect human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous and other wastes.

12. Paragraph 1 of Article 2 (“Definitions”) of the Basel Convention defines wastes as “substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law”. In paragraph 4 of that Article, it defines disposal as “any operation specified in Annex IV” to the Convention. In paragraph 8, it defines the environmentally sound management of hazardous wastes or other wastes as “taking all practicable steps to ensure that hazardous wastes or other

[2] A citation is needed for this statement.

wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes".

13. Article 4 ("General obligations"), paragraph 1, establishes the procedure by which parties exercising their right to prohibit the import of hazardous wastes or other wastes for disposal shall inform the other parties of their decision. Paragraph 1 (a) states: "Parties exercising their right to prohibit the import of hazardous or other wastes for disposal shall inform the other parties of their decision pursuant to Article 13". Paragraph 1 (b) states: "Parties shall prohibit or shall not permit the export of hazardous or other wastes to the parties which have prohibited the import of such waste when notified pursuant to subparagraph (a) above".

14. Article 4, paragraphs 2 (a) to (e) and 2 (g), contain key provisions of the Basel Convention pertaining to environmentally sound management, transboundary movement, waste minimization and waste disposal practices that mitigate adverse effects on human health and the environment:

> "Each party shall take the appropriate measures to:
>
> (a) Ensure that the generation of hazardous wastes and other wastes within it is reduced to a minimum, taking into account social, technological and economic aspects;
>
> (b) Ensure the availability of adequate disposal facilities, for the environmentally sound management of hazardous wastes and other wastes, that shall be located, to the extent possible, within it, whatever the place of their disposal;
>
> (c) Ensure that persons involved in the management of hazardous wastes or other wastes within it take such steps as are necessary to prevent pollution due to hazardous wastes and other wastes arising from such management and, if such pollution occurs, to minimize the consequences thereof for human health and the environment;
>
> (d) Ensure that the transboundary movement of hazardous wastes and other wastes is reduced to the minimum consistent with the environmentally sound and efficient management of such wastes, and is conducted in a manner which will protect human health and the environment against the adverse effects which may result from such movement".
>
> (e) Not allow the export of hazardous wastes or other wastes to a State or group of States belonging to an economic and/or political integration organization that are parties, particularly developing countries, which have prohibited by their legislation all imports, or if it has reason to believe that the wastes in question will not be managed in an environmentally sound manner, according to criteria to be decided on by the parties at their first meeting;
>
> (f) Prevent the import of hazardous wastes and other wastes if it has reason to believe that the wastes in question will not be managed in an environmentally sound manner."

15. Hazardous wastes and other wastes should, as far as is compatible with environmentally sound and efficient management, be disposed of in the country where they were generated (preambular paragraph 8). Transboundary movements of such wastes from the State of their generation to any other State should be permitted only when conducted under conditions which do not endanger human health and the environment (preambular paragraph 9). In addition, transboundary movements of such wastes are permitted only if:

(a) Such wastes, if exported, are managed in an environmentally sound manner in the country of import or elsewhere (Article 4, paragraph 8);

(b) One of the following conditions is met (Article 4, paragraph 9):

(i) If the country of export does not have the technical capacity and the necessary facilities to dispose of the wastes in question in an environmentally sound and efficient manner; or

(ii) If the wastes in question are required as a raw material for recycling or recovery industries in the country of import; or,

(iii) If the transboundary movement in question is in accordance with other criteria decided by the parties.

B. Control procedure for transboundary movements of waste

16. Any transboundary movements of hazardous and other wastes are subject to prior written notification from the exporting country and prior written consent from the importing and, if appropriate, transit countries (Article 6, paragraphs 1 to 4). Parties shall prohibit the export of hazardous wastes and other wastes if the country of import prohibits the import of such wastes (Article 4, paragraph 1 (b)). Some countries have implemented national prohibitions, inter alia following Decision III/1 including an amendment to the Convention banning the export of hazardous wastes from OECD/EU countries and Liechtenstein (proposed Annex VII) to non-Annex VII countries that has not entered into force. The Basel Convention also requires that information regarding any proposed transboundary movement is provided using the accepted notification form (Article 4, paragraph 2 (f)) and that the approved consignment is accompanied by a movement document from the point where the transboundary movement commences to the point of disposal (Article 4, paragraph 7 (c)).

17. Furthermore, hazardous wastes and other wastes subject to transboundary movements should be packaged, labelled and transported in conformity with international rules and standards (Article 4, paragraph 7 (b)).[3]

18. When transboundary movement of hazardous and other wastes to which consent of the countries concerned has been given cannot be completed, the country of export shall ensure that the wastes in question are taken back into the country of export if alternative arrangements cannot be made for their disposal in an environmentally sound manner (Article 8, first sentence). In the case of illegal traffic (as defined in Article 9, paragraph 1) as the result of the conduct on part of the exporter or generator, the country of export shall ensure that the wastes in question are

(a) Taken back by the exporter or the generator or, if necessary, by itself into the State of export; or if impracticable;

(b) Otherwise disposed of in accordance with the provisions of the Convention (Article 9, paragraph 2).

19. No transboundary movements of hazardous wastes and other wastes are permitted between a party and a non-party to the Convention (Article 4, paragraph 5) unless a bilateral, multilateral or regional arrangement exists, as required under Article 11 of the Convention.

C. Definitions of waste and hazardous waste

20. The Convention defines waste as “substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law” (Article 2, paragraph 1). It defines disposal in article 2, paragraph 4, as “any operation specified in Annex IV to this Convention”. It is important to note that national provisions concerning the definition of waste may differ and, therefore, the same material may be regarded as waste in one country but as non-waste in another country.

21. Hazardous waste is defined in the Convention as “wastes that belong to any category contained in Annex I, unless they do not possess any of the characteristics contained in Annex III; (definition in article 1, paragraph 1(a)) and wastes that are not covered under paragraph 1(a) but are defined as, or considered to be, hazardous wastes by the domestic legislation of the party of export, import or transit” (definition in article 1, paragraph 1(b)). The definition of hazardous waste therefore incorporates domestic law such that material regarded as a hazardous waste in one country but not in another country is defined as hazardous

[3] In this connection, the United Nations Recommendations on the Transport of Dangerous Goods (Model Regulations) (ECE, 2003a – see annex V, Bibliography)) or later versions should be used.

waste under the Convention. The Convention also requires that parties inform the other parties, through the Secretariat of the Convention, of their national definitions (article 3). Providing detailed and specific information on the national definitions of hazardous waste can promote compliance and avoid ambiguity concerning the applicability of national definitions.

22. To aid in distinguishing hazardous wastes from non-hazardous wastes for the purpose of Article 1, paragraph 1 (a), two annexes have been inserted into the Convention. Annex VIII includes wastes considered to be hazardous according to Article 1, paragraph 1 (a), of the Convention unless they do not possess any of the characteristics of Annex III. Annex IX includes wastes that are not covered by Article 1, paragraph 1 (a), unless they contain Annex I material to an extent causing them to exhibit an Annex III characteristic. Both Annex VIII and Annex IX include listings for various types of e-waste. More information on the distinction between hazardous and non hazardous e-waste is included in section IV. B of these guidelines.

[B1110 Electrical and electronic assemblies *** Electrical and electronic assemblies (including printed circuit boards, electronic components and wires) destined for direct reuse (*Footnote: Reuse can include repair, refurbishment or upgrading, but not major reassembly ;)* and not for final disposal (*Footnote: In Some countries these materials destined for direct reuse are not considered wastes).*

While subject to some interpretation by national governments, the B1110 listing in Annex IX of the Convention provide that exports of equipment for reuse, including reuse after repair, refurbishment, or upgrading, are generally outside the scope of the Convention because the equipment does not qualify as a waste or, alternatively, such equipment is generally viewed as non-hazardous.]

III. Guidance on the distinction between waste and non-waste

A. General considerations

23. To determine if used equipment is waste it may be necessary to examine all circumstances including the history of an item and its proposed fate on a case-by-case basis. However, there are characteristics of the used equipment that are likely to indicate whether it is waste or not.

24. Without prejudice to paragraph 26 below, where the holders of used equipment claim that this is intended to be or is a transboundary transport of used equipment intended for direct reuse or reuse after [failure analysis][root cause analysis], repair and refurbishment and not e-waste, the evidence as required in paragraph 26 should be provided or be in place to support this claim to an authority on its request (prior to the transport, either generally or on a case-by-case basis)

B. Situations where used equipment should normally be considered waste, or not be considered waste

25. Used equipment is waste in a country if it is defined or considered as waste under the provisions of its national legislation. Without prejudice of paragraph 26, used equipment should normally be considered waste if:

(a) The equipment is destined for disposal or recycling instead of being transported with the intent of reuse or its fate is uncertain;

(b) The equipment is not complete - essential parts are missing and the equipment cannot perform its essential [key] functions;

(c) It shows a defect that materially affects its functionality and fails relevant functionality tests;

(d) It shows physical damage that impairs its functionality or safety, as defined in relevant standards, [and cannot be repaired at reasonable cost];

(e) The protection against damage during transport, loading and unloading operations is inappropriate, e.g. the packaging or stacking of the load is insufficient;

(f) The appearance is particularly worn or damaged, thus reducing the marketability of the item(s);

(g) The item has among its constituent part(s) hazardous components that are required to be disposed of under national legislation or are prohibited to be exported or prohibited for use in such equipment under national legislation;[4]

(h) The equipment is destined for disposal or recycling instead of reuse or its fate is uncertain;

(i) There is no regular market for the equipment;

(j) It is destined for [disassembly and] cannibalization (to gain spare parts); or

(k) The price paid for the items is significantly lower [i.e. a value approaching $ 0] than would be expected from fully functional equipment intended for reuse;

(l) [The residual life of the equipment is no longer than 1/3 of the normal life-span of this kind of new equipment.]

26. Used equipment should normally not be considered waste:

(a) Where used equipment is not destined for any of the operations listed in Annex IV of the Convention (recovery or disposal operations) and is **directly reused for the purpose for which it was originally intended** or presented for sale, or transported across borders for the purpose of being put back to direct reuse or sold to end consumers for such reuse. The following should be provided or be in place prior and during the transport:

(i) A copy of the invoice and contract relating to the sale and/or transfer of ownership of the used equipment, and documentation accompanying the transport according to paragraph 30 [and Appendix III], including inter alia a signed declaration that indicates that the used equipment has been tested and is destined for direct reuse and fully functional and includes information on the further user or, where this is not possible, the retailer or distributer should be in place;

(ii) Evidence of evaluation or testing[5] in the form of a copy of the records (certificate of testing – proof of functionality) on every item within the consignment and a protocol containing all record information (see section III C below) should be available during the transport; [Providing this evidence of testing will enter into force x months after the adoption of the guidelines]

(iii) A declaration made by the holder who arranges the transport of the equipment that none of the equipment within the consignment is defined as or considered to be waste in any of the countries involved in the transport (countries of export and import, and, if applicable countries of transit) should be available during the transport;

(iv) [Each piece of equipment and their components is individually packaged to prevent hazards and loss of value, including protection against abrasion, static charges, ignition, loss of fluids or toxic contaminants, or breakage.] [Appropriate protection against damage during transportation, loading and unloading, in particular through sufficient packaging [6] and stacking of the load.]

[26(ab) Where used medical devices and their components[7] are sent by and to the manufacturer or a third party acting on behalf of the manufacturer, for any of the following purposes:

(i) root cause analysis, failure analysis, diagnostic testing,

(ii) refurbishment, or

(iii) repair,

[4] E.g. asbestos, PCBs, CFCs. The use of these substances is phased out or prohibited in the context of multilateral environmental agreements or in national legislation of certain countries for certain applications.

[5] Testing of used equipment should be performed before shipment in the country of export.

[6] With regard to computing equipment, see the packaging guidelines developed under PACE.

[7] As per definition in GHTF in SG1(PD)/N71R04.

under a valid agreement[8]; and hazardous wastes resulting from these operations are shipped for environmentally sound management [to Annex VII Countries] [or to non-Annex VII countries as long as systems are in place to achieve the equivalent level of environmental protection].]

[26 (ac) Used parts for service and maintenance of equipment which may contain electrical or electronic components, handled in a closed circular economy for remanufacturing[9]].

[When a holder arranges a transboundary transport of used equipment that is destined for [**failure analysis[10]] [root cause analysis], or for repair and refurbishment[11] with the intention of reuse** and all of the following conditions are met:

(v) [[Equipment are not exported to countries that have notified the Secretariat of the Basel Convention via Article 13(2) that they consider such used equipment to be waste and have prohibited their import][Equipment are exported to countries that have notified the Secretariat of the Basel Convention that they do not consider such used equipment to be waste subject to the conditions included in this paragraph 26b to be waste] when destined for :

- any facility in their country that performs such operations;
- facilities that are specifically identified, but not to any other facilities.

[In case a country has not communicated any such information exports to that country are only allowed if the holder has obtained written confirmation from the authorities in the country of destination that the equipment is not considered to be waste.]

Further restrictions made on a national basis shall be respected and can be so noted (e.g. import bans for all or certain types of used equipment).

(i bis) [Equipment and their components should only be exported to Parties and non-Parties who have notified the Secretariat that their country has capacity for [failure analysis] [root cause analysis], repair and/or refurbishment of electrical and electronic equipment. Such notifications can be found [on the Basel Convention website.] Where notices exist, shipments should follow all specifications of the notice.] **[**Such information will be publicly available on the SBC website and be kept up to date. This condition will enter into effect 6 months after the adoption of these guidelines in order to allow continuation of the current operations while the database is being established;]]

(vi) [Used equipment transported across borders is compliant with applicable national legislation and relevant international rules, standards and guidelines on restrictions of the use of hazardous substances [, do not contain cathode ray tubes (CRTs)] [and that the residual life of the equipment is more than 1/3 of the normal life span of this kind of equipment]];

[8] 'Valid agreement': a long term contract between the manufacturer and the third party shipping or performing the refurbishment, repair or [failure analysis] [root cause analysis] identifying responsibilities and procedures for the correct handling of used EEE.

[9] Remanufacturing is a standardized industrial process that restores used parts to fulfil a function which is at least equivalent compared to the original part.

[10] Failure analysis is a test performed by the original manufacturer or a party on his behalf, of collecting and analyzing data to determine the cause of a failure. Root cause analysis (RCA) is a particular failure analysis that is aimed at identifying the root causes of faults or problems. A root cause is a cause that once removed from the problem fault sequence, prevents the final undesirable event from recurring. Field test is a test performed before failure analysis under different conditions in terms of climate and other factors critical in developing equipment.

[11] Repair and Refurbishment are operations which make equipment ready for direct reuse. These operations can include initial evaluation, diagnostic testing and final functionality testing as long as it is in connection with the repair and refurbishment

(vii) [[All equipment that after [failure analysis] [root cause analysis], repair and refurbishment is still unusable will be taken back to the country of export]. All residual waste generated from the [failure analysis] [root cause analysis], repair and refurbishment operation which is hazardous according to the Basel Convention definitions (Article 1, 1(a) and 1(b)) or its hazardous characteristics are unknown, shall be disposed of [in an environmentally sound manner (ESM) in accordance with the Basel Convention][in an Annex VII country][in [the export country or] an Annex VII country unless accompanied by a conclusive proof that the residual hazardous waste can be treated at a facility in the importing country is ESM]. Any transboundary movements necessary shall be accomplished in accordance with the Basel Convention;]

(viii) Documentation according to paragraph 26ter accompanies the transport;

(ix) A valid contract exists[12] between the holder who arranges the transport and the facility where the equipment is to be repaired or refurbished with the intention of reuse, or is intended to undergo [failure analysis] [root cause analysis]. The contract should contain a minimum set of provisions, including the following:

- [the intention of the transboundary transport ([failure analysis] [root cause analysis], repair refurbishment);]
- [a provision that the holder who arranges the transport and the facility ensure compliance with other applicable national legislation and relevant international rules, standards and guidelines;
- a provision engaging the facility to provide the holder who arranges the transport a feedback report on the repair or refurbishment activities that were applied to the equipment and on the management of any residual hazardous waste that may have been generated from these activities;
- a provision that the facility ensures compliance with applicable national legislation and relevant international rules, standards and guidelines on restrictions of the use of hazardous substances as regards the repaired or refurbished equipment and with the principles of ESM for the treatment of any residual hazardous waste that may be generated from the repair or refurbishment activities;]
- [arrangements assuring the exporter's responsibility (with or without third parties involved in implementation) for ensuring the environmentally sound management of the used equipment, their components, and any residual waste, materials, and products throughout the export, transit, import, testing, repair, and refurbishment processes, until they are either tested, fully functional equipment or components and are made available for direct reuse, or as resulting scrap/waste disposed of ;
- performance of regular on-going due diligence to ensure importing facility(s) and any other third parties involved are consistently meeting the requirements of national laws, including ensuring the environmentally sound management of any disposed equipment or components;]
- [transfer of responsibility when the ownership of the equipment is transferred];

(x) [Each piece of equipment and their components is individually packaged to prevent hazards and loss of value, including protection against abrasion, static charges, ignition, loss of fluids or toxic contaminants, or breakage.] [Appropriate protection against damage during transportation, loading and unloading, in particular through sufficient packaging[13] and stacking of the load]]

[12] Or equivalent document in cases where there is no change of ownership of the equipment.

[13] With regard to computing equipment, see the packaging guidelines developed under PACE.

Alt 26(b) [For cases of transboundary transports of used equipment other than the case referred to in paragraph 26, Parties and non-Parties may define their own conditions, such as on

- accountability of the exporter,
- compliance with legislation on hazardous substances in products ,
- packaging,
- import restrictions, and
- management of residues arising from the repair, refurbishment or testing operations in line with the provisions of the Convention

upon which such equipment may not be waste. Parties and non-Parties should inform the Secretariat about any such conditions. It should be documented by conclusive proof that these conditions are met and the transport should be accompanied by appropriate documentation. In the absence of such documentation, the transboundary transport of such equipment should be considered as a transboundary movement of [non] waste.]

[26bis. Further conditions in addition to paragraph 26(b) could be considered at the national level, taking into account existing conditions in some countries e.g. the following:

(a) …

(b) …]

26ter The documentation accompanying the transport of used equipment falling under paragraph 26 (a) should contain the information referred to in paragraphs 26(a) and 30. The documentation accompanying the transport of used equipment falling under paragraph 26(b) should contain the following information[14]:

(a) Name of the holder who arranges the transport, and the receiving facility;

(abis) Description of the equipment (e.g. name);

(b) Quantity of equipment;

(bbis) Purpose of the transboundary transport (e.g. repair, refurbishment, [failure analysis] [root cause analysis])

(c) [Date of the movement;]

(d) Countries concerned;

(e) Signed declaration by the holder who arranges the transport of the equipment on the existence of a contract according to paragraph 26(b)(v) [, that the used equipment complies with applicable national legislation and relevant international rules, standards and guidelines on restrictions of use of certain hazardous substances], [that the holder is accountable for the whole process] and that this holder will provide additional information to authorities on request, and including the declaration according to paragraph 26(a) (iii).

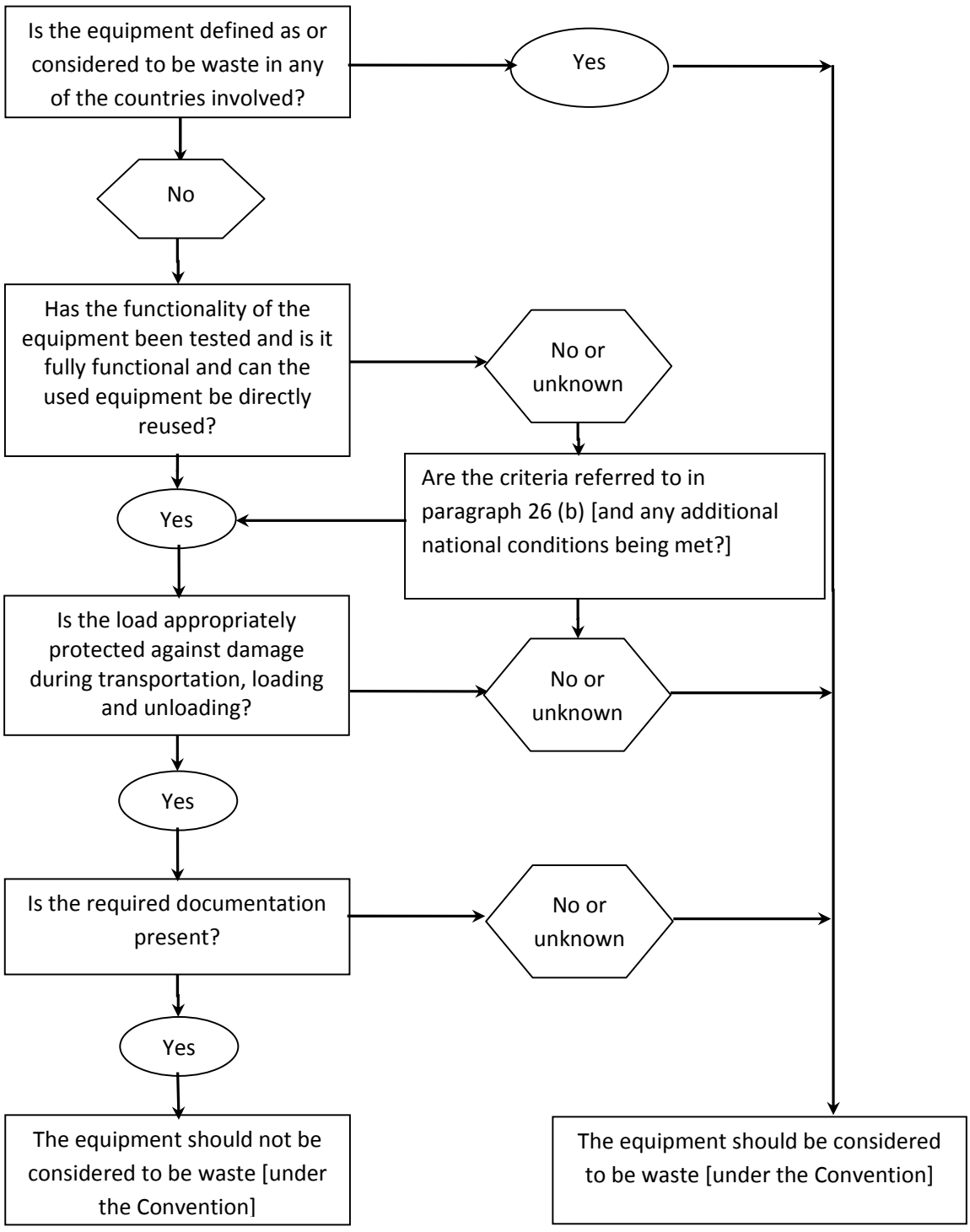
[Upon receipt of the movement, the receiving facility should provide a signed declaration of receipt]. A recommended form for the documentation according to paragraph 26 (b) is contained in appendix II.

Holders should retain the documentation referred to in this paragraph for a period of one year following the date a transboundary transport commences.

26quat. Figure 1 summarizes the decision steps as described in Section II.A and this section.

[14] Insofar the information (except for subparagraph (b)) is identical for all equipment in the same transport, the information may be provided covering all equipment in a transport.

Figure 1 Decision steps according to paragraphs 24 and 26



C. Evaluation and testing of used equipment destined for direct reuse

27. Holders who prepare an export of used equipment destined for direct reuse covered by paragraph 26 (a) rather than e-waste should take the following steps:

Step 1: evaluation and testing

28. The tests to be conducted depend on the kind of equipment. Functionality should be tested and the presence of hazardous substances or components should be evaluated. The completion of a visual inspection without testing functionality is unlikely to be sufficient. For most of the equipment, a functionality test of the essential [key] functions is sufficient. Section IV. B of these guidelines provides guidance on the evaluation for the presence of hazardous substances and components. A list of references to examples of functionality tests for certain categories of used equipment is provided in appendix IV to the present document.

Step 2: recording

29. Results of evaluation and testing should be recorded. The record should contain the following information:

(a) Name of the item;

(b) Name of the producer (if available)

(c) Identification number of the item (type no.), where applicable;

(d) Year of production (if available);

(e) Name and address of the company responsible for evidence of functionality;

(f) Result of tests as described in step 1 (e. g. Naming defective parts and defect or indication of full functionality) including date of the functionality test;

(g) Kind of tests performed;

(h) Signed declaration [by the company responsible for evidence of functionality].

30. The record should accompany the transport and should be fixed securely but not permanently on either the used equipment itself (if not packed) or on the packaging so it can be read without unpacking the equipment. A recommended form for the record on the results of evaluation and testing, including the declaration according to paragraph 26(a)(i), is contained in appendix III.

IV. Guidance on transboundary movements of e-waste

A. General considerations

31. When e-waste is considered to be hazardous waste according to Article 1, paragraph1 (a) of the Convention or by national legislation (Article 1, paragraph1 (b)), national import or export prohibitions must be respected. Where no such national prohibitions apply, the control procedure as mentioned in section II. B of these guidelines applies. For e-waste that is not considered to be hazardous, the Basel Convention does not contain a specific procedure. However, certain parties have implemented procedures in those cases, such as those applicable for transboundary movements of "green-listed" waste under European Union legislation,[15] or the procedure for pre-movement inspection of recycling materials as applicable for China.[16]

[15] Regulation (EC) No. 1013/2006 on shipments of waste and Regulation (EC) No. 1418/2007 concerning the export for recovery of certain waste listed in annex III or IIIA to Regulation (EC) No. 1013/2006 to certain countries to which the OECD decision on the control of transboundary movements of wastes does not apply (see: http://ec.europa.eu/environment/waste/shipments/legis.htm).

[16] Pre-movement inspections for recycling materials are established by the General Administration of Quality Supervision, Inspection and Quarantine of China (AQSIQ). Information on the procedure can be found on the web-site of the China Certification & Inspection Group (CCIC), which is authorized to handle this procedure in various countries worldwide, e.g in Europe at http://www.ccic-europe.com.

32. In a case where a competent authority involved in transboundary movements of e-waste considers a specific item to be hazardous waste according to its national law, while other authorities would not, the control procedure [in Article 6(5)] for hazardous waste would apply. The same mechanism is suggested for differences of opinion between competent authorities on the assessment as to whether the equipment constitutes a waste or not. In those cases, the applicable procedures for transboundary movements of waste would be applied. If this approach is taken and the applicable procedures are not followed, the movement would be regarded as illegal.

33. [Certain parties may consider used equipment destined for repair, refurbishment or upgrading [without proper assurances] to be waste, while others may not. In accordance with the principles of the Convention, if one of the countries concerned considers this used equipment to be waste the procedures on transboundary movement of e-waste as indicated in section IV A of this guidance should be followed. Note that in some cases, the decision to classify used equipment destined for repair or refurbishment as a hazardous waste could result in the imposition of a ban on the export or import of such equipment under national legislation or pursuant to the Convention's prohibition on trade with non-parties].

34. (deleted)

B. Distinction of hazardous waste and non-hazardous waste

35. E-waste is included in Annex VIII to the Convention with the following entry for hazardous wastes:

> "A1180 Waste electrical and electronic assemblies or scrap [17] containing components such as accumulators and other batteries included on list A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB capacitors, or contaminated with Annex I constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they possess any of the characteristics contained in Annex III (note the related entry on list B, B1110)."[18]

36. E-waste is also included in Annex IX to the Convention with the following entry for non-hazardous wastes:

> "B1110 Electrical and electronic assemblies:
>
> - Electronic assemblies consisting only of metals or alloys;
> - Waste electrical and electronic assemblies or scrap[19] (including printed circuit boards) not containing components such as accumulators and other batteries included on list A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or not contaminated with Annex I constituents (e.g., cadmium, mercury, lead, polychlorinated biphenyl) or from which these have been removed, to an extent that they do not possess any of the characteristics contained in Annex III (note the related entry on list A A1180);
> - Electrical and electronic assemblies (including printed circuit boards, electronic components and wires) destined for direct reuse,[20] and not for recycling or final disposal."[21]

36bis. Equipment will often contain hazardous components [or substances], examples of which are indicated in entry A1180 of Annex VIII. [E-waste containing such components or substances may qualify as hazardous wastes if the waste exhibits hazardous characteristics contained in Annex III. However, the presence of such a component or substance in equipment should not necessarily cause the equipment as a whole to be deemed hazardous waste under the Convention.] E-waste [should therefore be presumed to be hazardous waste unless it can be shown that it does not contain such components and in particular]: [containing such components should therefore be presumed to be hazardous waste unless it can be shown

[17] This entry does not include scrap assemblies from electric power generation.

[18] PCBs are at a concentration level of 50 mg/kg or more.

[19] This entry does not include scrap from electrical power generation.

[20] Reuse can include repair, refurbishment or upgrading, but not major reassembly.

[21] In some countries these materials destined for direct reuse are not considered wastes.

either [that it does not contain such components or]that it does not exhibit hazardous characteristics [or that it does not contain such components or substances and in particular:].[22]

(a) Lead-containing glass from cathode ray tubes (CRTs) and imaging lenses, which are assigned to Annex VIII entries A1180 or A2010 “glass from cathode ray tubes and other activated glass”. This waste also belongs to category Y31 in Annex I, “Lead; lead compounds” and is likely to possess hazard characteristics H6.1, H11, H12 and H13 included in Annex III;

(b) Nickel-cadmium batteries and batteries containing mercury, which are assigned to Annex VIII entry A1170 “unsorted waste batteries…”. This waste also belongs to category Y26 in Annex I, “Cadmium; cadmium compounds” or Y29 “Mercury, mercury compounds” and is likely to possess hazard characteristics H6.1, H11, H12 and H13;

(c) Selenium drums, which are assigned to Annex VIII entry A1020 “selenium; selenium compounds”. This waste also belongs to category Y25 in Annex I, “Selenium; selenium compounds” and is likely to possess hazard characteristics H6.1, H11, H12 and H13;

(d) Printed circuit boards, which are assigned to Annex VIII entry A1180 “waste electronic and electrical assemblies……”, and entry A1020 “antimony; antimony compounds” and “beryllium; beryllium compounds”. These assemblies contain brominated compounds and antimony oxides as flame retardants, lead in solder and beryllium in copper alloy connectors. They also belong in Annex I, to categories Y31, “Lead; lead compounds”, Y20, “Beryllium, beryllium compounds” and Y27 “Antimony, antimony compounds” and Y45, organohalogen compounds other than substances referred to elsewhere in Annex I. They are likely to possess hazard characteristics H6.1, H11, H12 and H13;

(e) Fluorescent tubes and backlight lamps from liquid crystal displays (LCD), which contain mercury and are assigned to Annex VIII entry A1030 “Mercury; mercury compounds”. This waste also belongs to category Y29 in Annex 1, “Mercury; mercury compounds” and is likely to possess hazard characteristics H6.1, H11, H12 and H13;

(f) Plastic components containing Brominated Flame Retardants (BFRs) [, in particular BFRs that are persistent organic pollutants according to the Stockholm Convention, may - where appropriate - be assigned to Annex VIII entry A3180 "Wastes, substances and articles containing, consisting of or contaminated with polychlorinated biphenyl (PCB), polychlorinated terphenyl (PCT), polychlorinated naphthalene (PCN) or polybrominated biphenyl (PBB), or any other polybrominated analogues of these compounds, at a concentration of 50 mg/kg or more". In general, waste containing brominated flame retardants also] belong[s] to category Y45 in Annex I, organohalogen compounds other than substances referred to elsewhere in Annex I . If antimony compounds are used as synergist for these brominated flame retardants, in addition category Y27 “Antimony, antimony compounds” can be assigned. Depending on the concentration and the chemical properties of the brominated flame retardants and their synergists such waste [is likely to] [may] possess hazard characteristics H6.1, H11, H12 and H13.

(g) Other components containing or contaminated with mercury, such as mercury switches, contacts and thermometers, which are assigned to Annex VIII entry A 1010, A1030 or A1180. This waste also belongs to category Y29 in Annex I,” Mercury; mercury compounds” and is likely to possess hazard characteristics H6.1, H11, H12 and H13;

(h) Oils/liquids, which are assigned to annex VIII entry A 4060 “Waste oil/water, hydrocarbons/water mixtures, emulsions”. The waste belongs to category Y8 in Annex I, “Waste mineral oils unfit for their originally intended use” or Y9 in Annex I, “Waste oil/water, hydrocarbons/water mixtures, emulsions”, and is likely to possess hazardous characteristics H3, H11, H12and H13;

(i) Components containing asbestos, such as in wires, cooking stoves and heaters, which are assigned to annex VIII entry A 2050.

(j) This waste also belongs to category Y 36 in Annex I, “Asbestos (dust and fibres)” and is likely to possess hazardous characteristic H 11.

[22] The following list of components or constituents are non-exhaustive examples.

36ter. Further guidance and examples of hazardous and non-hazardous equipment and on hazardous components that can be found in electrical and electronic equipment is contained in appendix IV to the present document.

V. [Guidance on control of transboundary movements of e-waste and used equipment and regarding facilities]

37. Inspections should be undertaken by competent bodies of State authorities (e.g. police, customs and (environmental) inspectors) at facilities and during the movement.

A. Guidance on control of transboundary movements of e-waste and used equipment

37bis. Holders of used equipment who arrange the transport should ensure that it is accompanied by appropriate documentation according to paragraphs [26, 26ter, 29, 30 and 38] of those guidelines and that it is appropriately protected against damage during transportation, loading and unloading, in particular through sufficient packaging or appropriate stacking of the load in order to demonstrate that the items concerned are not e-waste. Posters or other media containing sample photographs of illegal shipments and examples of documentation could be developed to help educate officers at borders, ports, or other inspection points to identify illegal shipments. [Examples of such photographs are included in Annex ..][23].

38. For practical reasons of control, every load of used equipment should also be accompanied by a declaration of the liable person on its responsibility and by a relevant transport document, e.g. by a waybill or a CMR document where applicable.[24] This document contains a description of the goods transported using the Harmonized Commodity Description and Coding System (normally referred to as the "Harmonized System") developed by the World Customs Organization (WCO).

39. In the absence of proof that an item is used equipment and not e-waste through appropriate documentation according to paragraphs [26, 26ter, 29, 30 and 38] and appropriate protection against damage during transportation, loading and unloading, in particular through sufficient packaging and appropriate stacking of the load which should be the obligations of the holder who arranges the transport, the relevant State authorities (e. g. customs, police or environmental agencies) should consider an item to be (potentially hazardous) e-waste and, in the absence of consents in accordance with the requirements of the Basel Convention, should presume that the export comprises a [possible] case of illegal traffic as specified in Article 9 of the Convention. In these circumstances the relevant competent authorities are obliged to abide with the provisions of Article 9. [Illegal traffic is to be considered a criminal offence in accordance with Article 4.3 of the Convention.][Parties are obliged to criminalize illegal traffic.]

40. When e-waste is exported as hazardous waste, the documentation required under the control procedure of the Convention should accompany the consignment.

40bis. The Secretariat of the Basel Convention has cooperated with the WCO to establish a table providing an overview of which codes of the Harmonized System contain materials that can be found in Annexes VII and IX to the Basel Convention.[25] This table can facilitate comparison of the CMR documents with the documents that should accompany the transport of used equipment or e-waste according to the procedures in these guidelines. While this tool may be useful for such comparisions, transboudnary transports should be evaluated on a case-by-case basis and a hazardous waste determination should be based on all of the information that is available.

[23] It was suggested that the use of photo materials might assist enforcement activities. Parties that have such illustrations are requested to provie the Secretariat with this material in view of their inclusion in a new annex to the guidelines.

[24] Document containing the information as required under the Convention on the Contract for the International Carriage of Goods by Road (CMR Convention). Although the form in which the information should be presented is not mandatory, it is recommended that the standard CMRforms be used to facilitate communication in case of a control.

[25] The latest version of the table can be found on the web-site of the WCO under http://www.wcoomd.org/en/topics/nomenclature/instrument-and-tools/interconnection-table.aspx. The table contains a correlation with goods covered by a number of international conventions, including the Basel Convention.

41. Health and safety issues and potential risks for enforcement agents (such as customs officers) are important for any inspection of transports of e-waste or used equipment. Enforcement officers should have specific training before doing such inspections. Particular care should be applied when opening containers. In particular, if the transport consists of waste, the items may not have been stacked in a stable way and items may fall out of the container when it is opened it for inspection. The load may also contain hazardous substances that could be released when inspecting the load. Further information regarding health and safety aspects for inspections is contained in appendix IV to the present document.

B. [Guidance on facilities for [failure analysis] [root cause analysis], repair and refurbishment

41bis. At facilities receiving used equipment that is not waste and is intended for [failure analysis] [root cause analysis], repair and refurbishment, inspections should be undertaken to verify if the relevant national provisions for environmental protection, including waste-related provisions, and any environmental permits or licenses are complied with. PACE developed the G*uidelines on Environmentally Sound Testing, Refurbishment & Repair of Use Computing Equipment* that can be used by cohtries to help ensur any such operation is environmentally sound. In addition, the compliance with the criteria in paragraph 26(b) should be checked.

41ter. It is recommended to facilities receiving used equipment that is not waste and is intended for [failure analysis] [root cause analysis], repair and refurbishment to, as appropriate, include provisions in the contract with the holders arranging transports that used equipment that was destined for [failure analysis][root cause analysis], repair or refurbishment, but for which no [failure analysis] [root cause analysis], repair or refurbishment has been conducted, is [taken back by the holders arranging the transport and that the waste generated during [failure analysis] [root cause analysis], repair or refurbishment is taken back by the holders arranging the transport.]or [contains provisions that prove that the waste generated shall be disposed of in and environmentally sound manner].

Some developing countries[26] where such activities take place have implemented policies that require these facilities to assure that none of the used equipment that is transported to these facilities may remain in the country after [failure analysis] [root cause analysis], repair or refurbishment and that all the waste generated by these activities has to be exported as well to facilities that meet ESM standards. These requirements are part of the operations environmental permit of these facilities. This assures that the activities will not result in unwanted imports of equipment into their country that would need to be managed as e-waste when they come to the end of their useful life. It also assures that the waste generated by these activities do not take up capacity of the national waste management infrastructure and will be managed according to ESM standards.]

[26] For the following example, proper references should be given; the current example is based on the practices in Malaysia.

Appendix I: Glossary of terms

Note: Some of these terms were developed for the purpose of the present guidelines and should not be considered as having been agreed to internationally. Their purpose is to assist readers to better understand these guidelines. Insofar as appropriate, the use of these terms has been aligned with terms used in other guidelines and guidance documents developed under the Basel Convention.

Note: The outcome of the SIWG meeting on legal clarity in Konstanz has been taken into account; for terms not reflected in this outcome (Component, Essential function, Fully functional, Upgrading), the wording in document UNEP/CHW/OEWG.9/INF/20 has been taken into account. In finliazing this glossary the final outcome of the work on legal clarity will be taken into account as appropriate.

Terminology	Description
Basel Convention	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, adopted on March 22, 1989 and entered into force in 1992.
Component	Element with electrical or electronic functionality [designed to be] connected together with other components, including by soldering to a printed circuit board, to create an electric or electronic circuit with a particular function (for example an amplifier, radio receiver, monitor, hard-drive, motherboard, battery).
Direct reuse	The using again, by a person other than its previous owner, of equipment that is not waste for the same purpose for which it was conceived without the necessity of [pre-processing[27]][repair or refurbishment]
Disposal	Any operation specified in Annex IV of the Basel Convention (Article 2, paragraph 4, of the Convention).
Environmentally sound management	Taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes (Article 2, paragraph 8, of the Convention).
Equipment	Electrical and electronic equipment that is dependent on electric currents or electromagnetic fields in order to work properly, including components that can be removed from equipment and can be tested for functionality and either be subsequently directly reused or reused after repair or refurbishment.
Essential [key] function	[An originally intended function of a unit of equipment that will satisfactorily enable the equipment to be used.]
[Failure analysis	Failure analysis is a test performed by the original manufacturer or a party on his behalf, of collecting and analyzing data to determine the cause of a failure.]
Fully functional	[Equipment is fully functional if it was tested and demonstrated to be capable of performing the essential [key] functions that it was designed to perform.]
[Major reassembly	The remanufacture of a single unit with multiple parts taken from multiple other units]

[27] Pre-processing may include e.g. [checking], [testing] cleaning, repair, refurbishment [or upgrading].

Other waste	Wastes included in Annex II of the Convention.
Non-waste	A substance or object that does not meet the definition of "waste".
Recycling	[Any recovery operation that involves the reprocessing or transformation of waste into new products, or materials or substances that enter the [economic**]**[production**]** cycle. Recycling does not include energy recovery and the reprocessing into materials that are to be used as fuels. Some recycling operations are identified in section B of Annex IV to the Convention.] [Relevant operations specified in Annex IV B to the Basel Convention.]
Recovery	[Relevant operations specified in Annex IV B of the Basel Convention][Commonly used to refer to disposal operations specified in Annex IV B to the Basel Convention.]
Refurbishment	[Modification of [used] equipment [that is waste or a product] to increase its performance and/or functionality or to meet applicable technical standards or regulatory requirements, with the result of making the waste or product a fully functional product to be used for a purpose that is at least the one that was originally intended, including through such activities as cleaning, data sanitization and upgrading.]
Repair	Fixing a specified fault in [used] equipment that is a waste or a product and/or replacing defective components of equipment a fully functional product to be used for its originally intended purpose.
Reuse	[The using again, by a person other than its previous owner, of equipment [that is not waste] [for the same purpose for which it was conceived], [possibly after pre-processing][possibly after repair, refurbishment]].
Root cause analysis	A step-by-step method that leads to the identification of the root cause of an equipment failure [that actually occurd or that may potentially occur in the future].
Upgrading	Modification of fully functional equipment by the addition of new software or hardware to increase its performance and/or functionality.
Wastes	Substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law (Article 2, paragraph 1, of the Basel Convention).
Waste electrical and electronic equipment	Electrical or electronic equipment that is waste, including all components, sub-assemblies and consumables which are part of the equipment at the time the equipment becomes waste.

Appendix II: Information accompanying transboundary transports of used equipment falling under paragraph 26 (b)

1. Holder who arranges the transport	**2. Receiving facility**	**3. Description of the equipment (e.g. name):**
Name: Address: Contact person: Tel.: Fax: E-mail:	Name: Address: Contact person: Tel.: Fax: E-mail:	

4. Purpose of the transport:[28]

☐ [Failure analysis including] Root cause analysis
☐ Repair
☐ Refurbishment

[In case the fall-back option is needed, add: ☐ Other, please specify:]

5. Actual quantity:

6. Countries/States concerned:

Export/dispatch	Transit	Import/destination

7. Declaration of the holder who arranges the transport of the equipment:

I declare that I am entitled to represent my company legally and that

[For the preferred option of paragraph 26b:

a) the equipment in this transport is equipment that is not defined as or considered to be waste in any of the countries involved in the transport and meets the criteria set in paragraph 26b :

☐ [the receiving facility is covered by a notification by the authorities of the country of import indicating it may receive equipment as non waste as published by the Secretariat of the Basel Convention];
☐ the equipment complies with national legislation and relevant international rules, standards and guidelines on restrictions of the use of hazardous substances [and age of the equipment as meant in paragraph 26 (b) ii];
☐ the existence of a contract according to paragraph 26(b)(v)
☐ [I will keep ownership or control over the activities until the equipment has been analysed, repaired or refurbished and the residual hazardous wastes have been managed in an environmentally sound manner][In case of change of ownership the control over the activities will be transferred as well];
☐ Upon request from the authorities I will make available underlying documentation(e.g. contracts or equivalent documents) that can be used to verify these statements;]

[In case the fall-back option is needed:

a) the equipment in this transport is equipment that is not defined as or considered to be waste in any of the countries involved in the transport and meets any conditions the Parties involved in the transport have defined and communicated to the Secretariat of the Basel Convention.]

abis) I will provide additional information to authorities on request;

b) the above information is complete and correct to the best of my knowledge.

[28] If multiple options apply to the equipment, please indicate them all.

Name:	Function:	Date:	Signature:
[TO BE COMPLETED BY THE RECEIVING FACILITY			
8. Movement received at the receiving facility: □		**Quantity/volume received:**	
Name:	Date:	Signature:]	

Appendix III: Information accompanying transboundary transports of used equipment falling under paragraph 26 (a), including on recording the results of evaluation and testing of used equipment

1. Holderwho arranges the transport (responsible for testing): Name: Address: Contact person: Tel: E-mail**:**	**2. Company responsible for evidence of functionality (if different than holder):** Name: Address: Contact person: Tel: E-mail:	**[3. Carrier** Name: Address: Phone No: E-mail:]
[4. Importer Name: Address: Phone No: E-mail:]	**5. User, retailer [or distributor], [(if different from importer):]** Name: Address: Contact person: Tel: E-mail:	**6. [Country of export[/dispatch]:** **Country of import[/destination]:]**

7. Declaration:

[I, the person that conducted the evaluation and testing declare that the results of evaluation and testing are complete and correct to the best of my knowledge.

Name: Date: Signature:]

I, the holder who arranges the transport of the equipment listed below, hereby declare that prior to export the used equipment listed below was tested and is fully functional.[29] I confirm that this equipment is not defined as or considered to be waste in any of the countries involved in the transport and is destined for direct reuse[30] and not for recovery or disposal operations.

Name: Date: Signature:

[29] Equipment is "fully functional" when it has been tested and demonstrated to be capable of performing at least the essential [key] functions they were designed to perform.

An essential [key] function is an originally intended function of a unit of equipment that will satisfactorily enable the equipment to be used.

[30] The using again, by a person other than its previous owner, of equipment that is not waste for the same purpose for which it was conceived without the necessity of [pre-processing] [repair or refurbishment].

8. Name of the item of equipment[31]	9. Name of the producer (if available)	10. Identification number (type no.) (if applicable)	11. Year of production (if available)	12. Date of functionality testing	13. Kind of tests performed and results of test (e.g. indication of full functionality or indication of defective parts and defect)[32]

[31] List the equipment for which the information in the boxes 1 to 3 is the same and that is intended to be moved together and identify the names of the equipment such as: PC, refrigerator, printer, TV, etc.

[32] Attach details if necessary.

Appendix IV: Reference material

This appendix contains references to information on functionality testing for certain categories of used equipment (paragraph 28), hazardous and non-hazardous equipment and hazardous components that can be found in such equipment (paragraph 36ter) and information regarding health and safety aspects for inspections (paragraph 41).

1. Functionality testing or evaluation

This section contains references to tests and procedures for functionality tests of electrical and electronic equipment. The examples are not meant to be exhaustive but illustrate procedures as they are applied by some parties or recommended in other guidance documents under the Basel Convention. Testing procedures and protocols for other categories of used equipment are not yet available.

References from parties

Australia

Criteria for the export and import of used electronic equipment (DEH, 2005). Available on http://pandora.nla.gov.au/pan/51666/20050902-0000/www.deh.gov.au/settlements/publications/chemicals/hazardous-waste/electronic-paper.html

Annex B of the document contains parameters that may be used when testing functionality of certain types of equipment.

European Union

Revised Correspondents' Guidelines No. 1 on shipments of waste electrical and electronic equipment (WEEE) (2007). Available on http://ec.europa.eu/environment/waste/shipments/guidance.htm

Appendix 1 to these guidelines contains parameters that may be used when testing functionality of certain types of equipment.

Malaysia

Guidelines for the classification of used electrical and electronic equipment in Malaysia. (DOE, 2008). Available on http://www.doe.gov.my/portal/wp-content/uploads/2010/07/ECTRICAL_AND_ELECTRONIC_EQUIPMENTIN_MALAYSIA.pdf

Paragraph 7 of these guidelines contains parameters that may be used when testing functionality of certain types of equipment.

Norway

A guide for exporters of used goods (Klif, 2009) by the Norwegian Climate and Pollution Agency. Available on http://www.klif.no/publikasjoner/2516/ta2516.pdf

Example images of criteria on pages 4-8 can be used when evaluating functionality of used goods.

References from the guidance documents under the Basel Convention

MPPI - Mobile phones

The guidance document on the environmentally sound management of used and end-of-life mobile phones that was adopted at the tenth session of the Conference of the Parties (UNEP/CHW.10/INF/27/Rev.1 contains a number of proposed tests on functionality for mobile phones in its section 5.2.1.4

PACE - Computing equipment

The guidance document on environmentally sound management of used and end-of-life computing equipment that was adopted at the eleventh session of the Conference of the Parties (UNEP/CHW.11/6/Add.1/Rev.1) contains in appendix 5 to the annex a set of functionality tests for used computing equipment.

PACE - Laptop batteries

The guidance document on environmentally sound management of used and end-of-life computing equipment that was adopted at the eleventh session of the Conference of the Parties (UNEP/CHW.11/15) contains in appendix 6 to the annex a set of functionality tests for laptop batteries.

Basel Convention regional centre for South-East Asia (BCRC-SEA)

Technical Guidelines for 3 R (Reduce, Reuse, Recycle) of End-of-Life Electrical and Electronic Products contains a number of functionality tests for different types of equipment in its annexes. These provide for specific tests for refrigeration systems, twin-tub washing machines, automatic washing machines, TVs and audio systems and PCs. The guidelines can be found at http://www.bcrc-sea.org/?content=publication&cat=2

2. Hazardous and non-hazardous equipment and hazardous components that can be found in such equipment

Section IV B of the guidelines contains information about the distinction between hazardous and non-hazardous e-waste. Additional guidance and examples of hazardous and non-hazardous equipment and on hazardous components that can be found in equipment can be found in the following reference material.

Switzerland

The e-waste guide developed as part of the "Global Knowledge Partnerships in e-Waste Recycling" programme, initiated by the Swiss State Secretariat for Economic Affairs (SECO) and implemented by the Swiss Federal Laboratories for Materials Science and Technology (EMPA) contains a section on hazardous substances in e-waste: http://ewasteguide.info/node/219

Sweden

"Recycling and disposal of electronic waste – health hazards and environmental impacts", report no. 6417, March 2011, Swedish Environmental Protection Agency: http://www.naturvardsverket.se/Documents/publikationer6400/978-91-620-6417-4.pdf

3. Health and safety aspects for inspections

Section V of the guidelines provides information for control of transboundary movements of used equipment and e-waste. One of the aspects to be taken into account when carrying out controls is the health and safety of the enforcement agents. Additional information on how to take into account these aspects can be found in the following reference material.

Standardization bodies

OHSAS 18001 Standards for Occupational Health and Safety Management Systems is usually available from national standards institutions, e.g. the British Standards Institution: www.bsigroup.com

International Labour Organization (ILO)

The ILO guidelines on occupational safety and health management systems (ILO-OSH 2001) is available on: http://www.ilo.org/safework/info/standards-and-instruments/WCMS_107727/lang--en/index.htm

ILO has also developed an electronic tool kit on occupational health and safety which includes standards and advice but has to be purchased at a cost of $395 via:

http://www.ohsas-18001-occupational-health-and-safety.com/ohsas-18001-kit.htm

Basel Convention regional centre for South-East Asia (BCRC-SEA)

A guidance on occupational safety and health aspects specifically developed as guidance for hazardous materials/waste inspection "Panduan Singkat Pengelolaan Limbah B3 Dalam Rangka Pelaksanaan Konvensi Basel - Segi Keselamatan Dalam Inspeksi Bahan Berbahaya" ("Brief guidance for hazardous waste management under the Basel Convention implementation – safety aspects in hazardous materials inspection") written by D. Wardhana Hasanuddin Sutradiningrat, former Senior Technical Advisor to the BCRC-SEA, in 2008. Since it was initially prepared for the Customs & Excise Authority in Indonesia, it

was written in Bahasa Indonesia (Malay language)[33] and may need translation. Contact: baseljakarta@bcrc-sea.org.

Ireland

Ireland's Health and Safety Authority has on-line advice on developing an occupational health and safety (OHS) management system for a number of different occupations/industries. While waste management is not yet included in its directory, the site contains some useful general videos covering the elements of an OHS system (as per Irish legislation) and risk assessment – see these links:

http://vimeo.com/19383449 - about the online system

http://vimeo.com/19971075 - risk assessment

http://vimeo.com/19970831 - safety statement

The guidance on risk assessment and the development of safety policy and a safety statement could be adapted for use by enforcement agents

United Kingdom of Great Britain and Northern Ireland

The United Kingdom Health and Safety Executive has online guidance on occupational health and safety relating to the waste industry and specifically to waste electrical and electronic equipment. See these links:

http://www.hse.gov.uk/waste/index.htm

http://www.hse.gov.uk/waste/waste-electrical.htm.

[33] EU questions if a document that is not available in an official UN language is useful as reference.

Appendix V: References

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Basel Convention Mobile Phone Partnership Initiative (MPPI), 2009e. Guidelines on material recovery and recycling of end-of-life mobile phones. Revised and approved text 25 March 2009

Basel Convention Partnership on Action for Computing Equipment (PACE) environmentally sound management criteria recommendations

Basel Convention Partnership on Action for Computing Equipment (PACE) guidelines on environmentally sound testing, refurbishment, and repair of used computing equipment

Basel Convention Partnership on Action for Computing Equipment (PACE) Guidelines on Environmentally Sound Material Recovery and Recycling of End-of-Life Computing Equipment

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附錄 2-4

關於對由汞或汞化合物構成、含有此類物質或受其污染的廢物實行無害環境管理的增訂技術準則

UNITED NATIONS

UNEP

BC

UNEP/CHW.12/5/Add.8

Distr.: General
4 December 2014

Original: English

BASEL CONVENTION

Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal
Twelfth meeting
Geneva, 4–15 May 2015
Item 4 (b) (i) of the provisional agenda*

Matters related to the implementation of the Convention: scientific and technical matters: technical guidelines

Technical guidelines

Updated technical guidelines for the environmentally sound management of wastes consisting of, containing, or contaminated with mercury or mercury compounds

Note by the Secretariat

1. As referred to in document UNEP/CHW.12/5, the Conference of the Parties, in paragraph 5 of decision BC-11/5, requested the lead country or, if there was no lead country, the Secretariat, in consultation with the small intersessional working group on the development of technical guidelines on the environmentally sound management of mercury wastes, to prepare draft updated technical guidelines for the environmentally sound management (ESM) of wastes consisting of elemental mercury and wastes containing or contaminated with mercury.

2. In July 2013, Japan informed the Secretariat of its willingness to lead the work on the updating of the technical guidelines referred to above.

3. Subsequently, Japan submitted draft updated technical guidelines for the ESM of wastes consisting of, containing, or contaminated with mercury or mercury compounds which are set out in the annex to the present note. The changes made to the technical guidelines adopted by the Conference of the Parties at its tenth meeting[1] have been tracked so that the revisions can be easily identified.

4. Pursuant to paragraph 4 of decision OEWG-9/4, parties and others were invited to provide comments by 15 February 2015 on the draft technical guidelines of 20 November 2014 that were made available on the Basel Convention website,[2] and which are set out in the annex to the present note. A final draft is presented to the Conference of the Parties as information document UNEP/CHW.12/INF/8 taking into account comments received.

* UNEP/CHW.12/1.

[1] UNEP/CHW.10/6/Add.2/Rev.1.

[2] http://www.basel.int/Implementation/MercuryWastes/TechnicalGuidelines/tabid/2380/Default.aspx.

Annex

Draft updated technical guidelines for the environmentally sound management of wastes consisting of ~~elemental mercury and wastes~~, containing, or contaminated with mercury or mercury compounds

~~Revised final version (31 October 2011)~~~~Contents~~

(Draft of 20 November 2014 - Rev.5)

Contents

Abbreviations and acronyms

ASGM	Artisanal and small-scale gold mining
ASTM	American Society for Testing and Materials
AOX	Absorbable organic halides
BAT	Best available techniques
CCME	Canadian Council of Ministers for the Environment
CEN	European Committee for Standardization
CETEM	Centre for Mineral Technology
CFLs	Compact fluorescent lamps
CH_3Hg^+ or $MeHg^+$	Monomethylmercury, commonly called methylmercury
Cl	Chlorine
EMS	Environmental management system
EN	European standard
EPA	Environmental Protection Agency
EPR	Extended producer responsibility
ESM	Environmentally sound management
FAO	Food and Agriculture Organization of the United Nations
GMP	Global Mercury Project
HCl	Hydrochloric acid
HF	Hydrofluoric acid
Hg	Mercury
$HgCl_2$	Mercury dichloride
HgO	Mercury (II) oxide
HgS	Mercury sulphide or cinnabar
$HgSO_4$	Mercury sulphate
HNO_3	Nitric acid
IAEA	International Atomic Energy Agency
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ILO	International Labour Organization
IMERC	Interstate Mercury Education and Reduction Clearinghouse
IMO	International Maritime Organization
ISO	International Organization for Standardization
J-Moss	Marking of presence of the specific chemical substances for electrical and electronic equipment
JIS	Japanese Industrial Standards
JLT	Japanese standardized leaching test
LCD	Liquid crystal displays
LED	Light emitting diode
MMSD	Mining, Minerals and Sustainable Development
MSW	Municipal solid waste
NEWMOA	Northeast Waste Management Officials' Association
NGO	Non-governmental organization
NIP	National implementation plan
NIMD	National Institute for Minamata Disease
NOx	Nitrogen oxide
OEWG	Open-ended working group
OECD	Organisation for Economic Co-operation and Development
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
QA/QC	Quality assurance/quality control
PAC	Powdered activated carbon
PACE	Partnership for Action on Computing Equipment
PBB	Polybrominated biphenyls
PBDE	Polybrominated diphenyl ethers
PCB	Polychlorinated biphenyl
PM	Particulate matter
POPs	Persistent organic pollutants
PVC	Polyvinyl chloride
RoHS	Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment
SAICM	Strategic Approach to International Chemicals Management

SBC	Secretariat of the Basel Convention
SETAC	Society of Environmental Toxicology and Chemistry
SO_2	Sulphur dioxide
SOP	Standard operational procedure
SPC	Sulphur polymer cement
S/S	Solidification/stabilization
TCLP	Toxicity Characteristic Leaching Procedure
TOC	Total organic carbon
TS	Technical specification
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
VCM	Vinyl chloride monomer
WEEE	Waste electrical and electronic equipment
WHO	World Health Organization

I. Introduction

A. Scope

1. The present guidelines provide guidance for the environmentally sound management (ESM) of wastes consisting of ~~elemental mercury and wastes~~, containing, or contaminated with mercury or mercury compounds, hereinafter referred to as "mercury wastes", pursuant to decisions VIII/33, IX/15 ~~and~~, BC-10/7, BC-11/5 and BC-12/… of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and Their Disposal and ~~decision~~decisions VII/7 and OEWG-9/4 of the Open-ended Working Group of the Basel Convention. This document supersedes the Basel Convention's technical guidelines for the ESM of wastes consisting of elemental mercury and wastes containing or contaminated with mercury adopted by the Conference of the Parties at its tenth meeting.

2. In paragraph 1 of Article 2 ("Definitions"), the Basel Convention defines wastes as "substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law". The following mercury wastes are covered by the guidelines (see table 2 for more examples):

A: Wastes consisting of ~~elemental~~ mercury or mercury compounds (e.g. ~~elemental~~excess mercury from the decommissioning of chlor-alkali facilities, mercury recovered from ~~waste~~wastes containing mercury ~~and waste~~or mercury compounds or wastes contaminated with mercury ~~and~~or mercury compounds or surplus stock of ~~elemental~~ mercury or mercury compounds designated as waste);

B: Wastes containing mercury or mercury compounds (e.g. ~~waste of~~ mercury-added products~~):~~);

B1: Wastes of mercury-added products that easily release mercury into the environment when they are broken (e.g. ~~waste~~ mercury thermometers, fluorescent lamps);

B2: Wastes of mercury-added products other than B1 (e.g. batteries);

B3: Stabilized or solidified wastes containing mercury that result from the stabilization or solidification of wastes consisting of ~~elemental~~ mercury or mercury compounds;

C: Wastes contaminated with mercury or mercury compounds (e.g. residues generated from mining processes, industrial processes, or waste treatment processes).

3. The present guidelines focus on ~~wastes consisting of elemental~~ mercury ~~and~~ wastes ~~containing or contaminated with mercury~~ categorized as hazardous ~~waste~~wastes.

B. About mercury[1]

4. Mercury is or has been widely used in products such as ~~medical~~measuring devices (barometers, hygrometers, manometers, thermometers, ~~blood pressure gauges~~sphygmomanometers), switches and relays, ~~barometers,~~ fluorescent ~~light bulbs~~lamps, batteries, cosmetics pesticides, biocides, topical antiseptics and dental ~~fillings~~amalgam, and in ~~industrial~~ manufacturing processes, such as the production ~~such as~~of chlor-alkali ~~plants,~~, acetaldehyde, vinyl chloride monomer (VCM~~) production, acetaldehyde production and~~), sodium or potassium methylate or ethylate, and polyurethane, and mercury-added product manufacturing. Mercury may also be a by-product of raw materials refining or production processes such as non-ferrous ~~mining~~metal production and oil and gas ~~operations~~refining. Mercury is recognized as a global hazardous pollutant[2]. Mercury emissions and releases can be ~~human~~ caused by human activity (anthropogenic) ~~and~~but may also come from natural sources~~.~~ such as volcanic eruptions and forest fires. Once mercury is emitted or released into the environment, it persists in the atmosphere (e.g. mercury vapour), soil (e.g. ionic mercury) and aquatic phase (e.g. methylmercury ($MeHg^{+}$, or CH_3Hg^{+})). Some mercury in the environment ends up in the food chain ~~because of bioaccumulation and~~mainly due to biomagnification ~~and~~of mercury that is ~~eventually ingested by humans.~~bioavailable.

5. Improper handling, collection, transportation or disposal of ~~wastes consisting of elemental~~ mercury ~~and~~ wastes ~~containing or contaminated with mercury~~ can lead to emissions or releases of mercury, as can some disposal technologies.

6. The case of Minamata, Japan, where wastewater containing mercury was discharged into Minamata Bay (Ministry of the Environment, Japan 2002), the illegal dumping of mercury ~~-~~contaminated waste in Cambodia in 1998 (Honda *et al*. 2006; NIMD 1999), and the Thor Chemicals case in South Africa (Lambrecht 1989) are but a few examples of cases in which wastes containing or contaminated with mercury or mercury compounds were not managed in an environmentally sound manner.

7. ~~Although~~ The provisions of the ~~future global legally binding instrument~~Minamata Convention on Mercury (hereinafter referred to as "Minamata Convention") are intended to reduce mercury supply and demand~~,~~. The growing global trend towards phasing out mercury-added products and processes using mercury will soon result in the generation of an excess of mercury if mercury supplies remain at the current level. In addition, the coming years are expected to see increased use of some mercury-added products such as fluorescent lamps, which are being used to replace incandescent lamps as part of a low-carbon-society strategy, and in those used to back-light for liquid crystal displays (LCD). Ensuring ESM, particularly of ~~wastes consisting of elemental~~ mercury ~~and~~ wastes ~~containing mercury,~~ will be a critical issue for most countries.

[1] Further information on mercury and its chemical properties, sources, behaviour in the environment, human health risks and pollution is available from several sources (see b~~B~~ibliography below)

- For chemical properties: Japan Public Health Association, 2001; Steffen, 2007; WHO, 2003; Spiegel, 2006; ILO 2000 and 2001; Oliveira 1998; and Tajima 1970.
- For sources of anthropogenic emissions: UNEP, 2008a; and the Zero Mercury Working Group, 2009;
- For behaviour in the environment: Japan Public Health Association, 2001; and Wood, 1974;
- For human health risks: Ozonoff, 2006; Sanbom, 2006; Sakamoto, 2005; WHO, 1990; Kanai, 2003; Kerper, 1992; Mottet, 1985; Sakamoto, 2004; Oikawa, 1983; Richardson, 2003; Richardson and Allan, 1996; Gay, 1979; Boom, 2003; Hylander, 2005; Bull, 2006; WHO, 1972, 1990, 1991, 2003 and 2008;~~,~~ Japan Public Health Association, 2001; Canadian Centre for Occupational Health and Safety, 1998; Asano, 2000; and UNEP ~~and WHO~~ 2008.
- For mercury pollution: Ministry of the Environment, Japan 1997 and~~,~~ 2002; Amin-Zaki, 1978; Bakir, 1973; Damluji, 1972; UNEP, 2002; Lambrecht, 1989; Department of Environmental Affairs and Tourism 1997 and~~,~~ 2007; GroundWork, 2005; The School of Natural Resources and Environment, University of Michigan, 2000; and~~,~~ Butler, 1997.

[2] The preamble of the Minamata Convention on Mercury recognizes that mercury is a chemical of global concern owing to its long-range atmospheric transport, its persistence in the environment once anthropogenically introduced, its ability to bioaccumulate in ecosystems and its significant negative effects on human health and the environment.

II. Relevant provisions of the Basel Convention and international linkages

A. Basel Convention

1. General provisions

8. The Basel Convention aims to protect human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous and other wastes.

9. In paragraph 4 of Article 2, the Convention defines disposal as "any operation specified in Annex IV" to the Convention~~, which includes~~. Annex IV contains two categories of operations: those leading to the possibility of resource recovery, recycling, reclamation, direct reuse or alternative uses (R operations) and those not leading to this possibility (D operations).

10. Paragraph 1 of Article 4 ("General obligations") establishes the procedure by which parties exercising their right to prohibit the import of hazardous wastes or other wastes for disposal are to inform the other parties of their decision. Paragraph 1 (a) states: "Parties exercising their right to prohibit the import of hazardous or other wastes for disposal shall inform the other Parties of their decision pursuant to Article 13." Paragraph 1 (b) states: "Parties shall prohibit or shall not permit the export of hazardous or other wastes to the Parties which have prohibited the import of such waste when notified pursuant to subparagraph (a)."

11. Paragraphs 2 (a)–(e) and 2 (g) of Article 4 set out key provisions pertaining to ESM, waste minimization, reduction of transboundary movement, and waste disposal practices that mitigate adverse effects on human health and the environment:

> "Each Party shall take appropriate measures to:
>
> (a) Ensure that the generation of hazardous wastes and other wastes within it is reduced to a minimum, taking into account social, technological and economic aspects;
>
> (b) Ensure the availability of adequate disposal facilities, for ESM of hazardous wastes and other wastes, that shall be located, to the extent possible, within it, whatever the place of their disposal;
>
> (c) Ensure that persons involved in the management of hazardous wastes or other wastes within it take such steps as are necessary to prevent pollution due to hazardous wastes and other wastes arising from such management and, if such pollution occurs, to minimize the consequences thereof for human health and the environment;
>
> (d) Ensure that the transboundary movement of hazardous wastes and other wastes is reduced to the minimum consistent with the environmentally sound and efficient management of such wastes, and is conducted in a manner which will protect human health and the environment against the adverse effects which may result from such movement;
>
> (e) Not allow the export of hazardous wastes or other wastes to a State or group of States belonging to an economic and/or political integration organization that are Parties, particularly developing countries, which have prohibited by their legislation all imports, or if it has reason to believe that the wastes in question will not be managed in an environmentally sound manner, according to criteria to be decided on by the Parties at their first meeting;
>
> (g) Prevent the import of hazardous wastes and other wastes if it has reason to believe that the wastes in question will not be managed in an environmentally sound manner."

2. Mercury-related provisions

12. Article 1 ("Scope of the Convention") defines the waste types covered by the Convention. Subparagraph (a) sets out a two-step process for determining whether a "waste" is a "hazardous waste" covered by the Convention: first, the waste must belong to one of the categories listed in Annex I to the Convention ("Categories of wastes to be controlled"); and, second, it must possess at least one of the characteristics listed in Annex III to the Convention ("List of hazardous characteristics").

13. Annex I wastes are presumed to exhibit one or more of the hazardous characteristics listed in Annex III. These may include H6.1 "Poisonous (acute)", H11 "Toxic (delayed or chronic)" and H12 "Ecotoxic", unless, through national tests they can be shown not to exhibit such characteristics.

National tests may be useful for identifying a particular hazardous characteristic listed in Annex III until such time as the hazardous characteristic is fully defined. Guidance papers for some Annex III hazardous characteristics have been drafted under the Convention.

14. List A of Annex VIII to the Convention describes wastes that are "characterized as hazardous under Article 1 paragraph 1 (a) of this Convention" although "designation of a waste on Annex VIII does not preclude the use of Annex III (hazardous characteristics) to demonstrate that a waste is not hazardous" (Annex I, paragraph (b)). List B of Annex IX lists wastes that "will not be wastes covered by Article 1, paragraph 1 (a), of this Convention unless they contain Annex I material to an extent causing them to exhibit an Annex III characteristic".

15. As stated in paragraph 1 (b) of Article 1, "wastes that are not covered under paragraph (a) but are defined as, or are considered to be, hazardous wastes by the domestic legislation of the Party of export, import or transit" are also subject to the Convention.

16. ~~Wastes consisting of elemental mercury and wastes containing or contaminated with mercury~~Mercury wastes listed in Annexes I and VIII to the Basel Convention are shown in Table -1.

Table -1 ~~Wastes consisting of elemental mercury and wastes containing or contaminated with mercury~~Mercury wastes listed in Annexes I and VIII to the Basel Convention

Entries with direct reference to mercury	
Y29	Wastes having as constituents: ***Mercury***; ***mercury compounds***
A1010	Metal wastes and waste consisting of alloys of any of the following: … - ***Mercury*** … but excluding such wastes specifically listed on list B.
A1030	Wastes having as constituents or contaminants any of the following: … - ***Mercury; mercury compounds*** …
A1180	Waste electrical and electronic assemblies or scrap[3] containing components such as accumulators and other batteries included on list A, ***mercury-switches***, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or contaminated with Annex I constituents (e.g. cadmium, ***mercury***, lead, polychlorinated biphenyl) to an extent that they possess any of the characteristics contained in Annex III (note the related entry on list B B1110)[4]
Other entries related to wastes which may contain or be contaminated with mercury	
A1170	Unsorted waste batteries excluding mixtures of only list B batteries. Waste batteries not specified on list B containing Annex I constituents to an extent to render them hazardous
A2030	Waste catalysts but excluding such wastes specified on list B
A2060	Coal-fired power plant fly-ash containing Annex I substances in concentrations sufficient to exhibit Annex III characteristics (note the related entry on list B B2050)
A3170	Wastes arising from the production of aliphatic halogenated hydrocarbons (such as chloromethane, dichloro-ethane, vinyl chloride, vinylidene chloride, allyl chloride and epichlorhydrin)
A4010	Wastes from the production, preparation and use of pharmaceutical products but excluding such wastes specified on list B
A4020	Clinical and related wastes; that is wastes arising from medical, nursing, dental, veterinary, or similar practices, and wastes generated in hospitals or other facilities during the investigation or treatment of patients, or research projects
A4030	Wastes from the production, formulation and use of biocides and phytopharmaceuticals, including waste pesticides and herbicides which are off-specification, outdated, or unfit for their originally intended use
A4080	Wastes of an explosive nature (but excluding such wastes specified on list B)
A4100	Wastes from industrial pollution control devices for cleaning of industrial off-gases but excluding such wastes specified on list B

[3] This entry does not include scrap assemblies from electric power generation.

[4] PCBs are at a concentration level of 50 mg/kg or more.

A4140	Waste consisting of or containing off specification or outdated[5] chemicals corresponding to Annex I categories and exhibiting Annex III hazard characteristics
A4160	Spent activated carbon not included on list B (note the related entry on list B B2060)

B. International linkages

1. ~~United Nations Environment Programme Governing Council~~

~~In its decision 25/5 III, the United Nations Environment Programme (UNEP) Governing Council set up an international negotiating committee to prepare a global legally binding instrument~~**Minamata Convention on Mercury**~~. The committee's work began in June 2010 and is to be completed by early 2013. The instrument's mandate is, among other things:~~

17. The objective of the Minamata Convention, which was adopted in October 2013, is to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. The Minamata Convention covers various areas to achieve its objective, including:

(a) To reduce the supply of mercury and ~~enhance the capacity for its environmentally sound storage~~control the international trade in mercury;

(b) To reduce the demand for mercury in products ~~and~~, manufacturing processes, and artisanal and small-scale gold mining;

(c) To reduce ~~international trade in~~emissions and releases of mercury to air, land, and water;

(d) To ~~reduce atmospheric emissions~~ensure environmentally sound interim storage of mercury;

(e) To address mercury ~~containing waste~~ wastes and remediation of contaminated sites; and

(f) To specify arrangements for capacity-building ~~and~~, technical assistance, and technology transfer.

18. ~~In~~ Article 11 of the ~~same~~Minamata Convention sets forth waste-related provisions as follows:

1. The relevant definitions of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal shall apply to wastes covered under this Convention for Parties to the Basel Convention. Parties to this Convention that are not Parties to the Basel Convention shall use those definitions as guidance as applied to wastes covered under this Convention.

2. For the purposes of this Convention, mercury wastes means substances or objects:

(a) Consisting of mercury or mercury compounds;

(b) Containing mercury or mercury compounds; or

(c) Contaminated with mercury or mercury compounds,

in a quantity above the relevant thresholds defined by the Conference of the Parties, in collaboration with the relevant bodies of the Basel Convention in a harmonized manner, that are disposed of, or are intended to be disposed of, or are required to be disposed of by the provisions of national law or this Convention. This definition excludes overburden, waste rock and tailings from mining, except from primary mercury mining, unless they contain mercury or mercury compounds above thresholds defined by the Conference of the Parties.

3. Each party shall take appropriate measures so that mercury waste is:

(a) Managed in an environmentally sound manner, taking into account the guidelines developed under the Basel Convention and in accordance with requirements that the Conference of the Parties shall adopt in an additional annex in accordance with Article 27. In developing requirements, the Conference of the Parties shall take into account parties' waste management regulations and programmes;

(b) Only recovered, recycled, reclaimed or directly re-used for a use allowed to a party under this Convention or for environmentally sound disposal pursuant to paragraph 3 (a);

[5] "Outdated" means unused within the period recommended by the manufacturer.

(c) For Parties to the Basel Convention, not transported across international boundaries except for the purpose of environmentally sound disposal in conformity with this Article and with that Convention. In circumstances where the Basel Convention does not apply to transport across international boundaries, a party shall allow such transport only after taking into account relevant international rules, standards, and guidelines.

4. The Conference of the Parties shall seek to cooperate closely with the relevant bodies of the Basel Convention in the review and update, as appropriate, of the guidelines referred to in paragraph 3 (a).

5. Parties are encouraged to cooperate with each other and with relevant intergovernmental organizations and other entities, as appropriate, to develop and maintain global, regional and national capacity for the management of mercury wastes in an environmentally sound manner.

19. The following paragraphs address other provisions of the Minamata Convention that are relevant to mercury wastes.

20. Paragraph 5 (b) of Article 3 of the Minamata Convention provides that "each Party shall take measures to ensure that, where the Party determines that excess mercury from the decommissioning of chlor-alkali facilities is available, such mercury is disposed of in accordance with the guidelines for environmentally sound management referred to in paragraph 3 (a) of Article 11, using operations that do not lead to recovery, recycling, reclamation, direct re-use or alternative uses".

21. Paragraph 1 of Article 4 of the Minamata Convention requires that "each Party shall not allow, by taking appropriate measures, the manufacture, import or export of mercury-added products listed in Part I of Annex A after the phase-out date specified for those products, except where an exclusion is specified in Annex A or the Party has a registered exemption pursuant to Article 6". The phase--out date is set as 2020 in Part I of Annex A, and the mercury-added products listed in Part I of Annex A are as follows:

Batteries, except for button zinc silver oxide batteries with a mercury content < 2 per cent and button zinc air batteries with a mercury content < 2 per cent.
Switches and relays, except very high accuracy capacitance and loss measurement bridges and high frequency radio frequency switches and relays in monitoring and control instruments with a maximum mercury content of 20 mg per bridge, switch or relay.
Compact fluorescent lamps (CFLs) for general lighting purposes that are ≤ 30 watts with a mercury content exceeding 5 mg per lamp burner.
Linear fluorescent lamps (LFLs) for general lighting purposes: (a) Triband phosphor < 60 watts with a mercury content exceeding 5 mg per lamp; (b) Halophosphate phosphor ≤ 40 watts with a mercury content exceeding 10 mg per lamp.
High--pressure mercury vapour lamps (HPMV) for general lighting purposes.
Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays: (a) short length (≤ 500 mm) with mercury content exceeding 3.5 mg per lamp; (b) medium length (> 500 mm and ≤ 1 500 mm) with mercury content exceeding 5 mg per lamp; (c) long length (> 1 500 mm) with mercury content exceeding 13 mg per lamp.
Cosmetics (with mercury content above 1ppm), including skin lightening soaps and creams, and not including eye area cosmetics where mercury is used as a preservative and no effective and safe substitute preservatives are available.[1/]
Pesticides, biocides and topical antiseptics.
The following non-electronic measuring devices, except non-electronic measuring devices installed in large-scale equipment or those used for high precision measurement, where no suitable mercury-free alternative is available: (a) barometers; (b) hygrometers; (c) manometers; (d) thermometers; (e) sphygmomanometers.

[1/] The intention is not to cover cosmetics, soaps or creams with trace contaminants of mercury.

The following products are excluded from Annex A:

(a) Products essential for civil protection and military uses;

(b) Products for research, calibration of instrumentation, for use as reference standard;

(c) Where no feasible mercury-free alternative for replacement is available, switches and relays, cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays, and measuring devices;

(d) Products used in traditional or religious practices; and

(e) Vaccines containing thiomersal as preservatives.

22. Paragraph 3 of Article 4 of the Minamata Convention provides that "each Party shall take measures for the mercury-added products listed in Part II of Annex A in accordance with the provisions set out therein". Part II of Annex A provides that "measures to be taken by a Party to phase down the use of dental amalgam shall take into account the Party's domestic circumstances and relevant international guidance and shall include two or more of the measures from a list.

23. Paragraph 2 of Article 5 of the Minamata Convention requires that "each Party shall not allow the use of mercury or mercury compounds in the manufacturing processes listed in Part I of Annex B" where chlor-alkali and acetaldehyde production are listed. In addition, Paragraph 3 of Article 5 provides that "each Party shall take measures to restrict the use of mercury or mercury compounds in the processes listed in Part II of Annex B" where vinyl chloride monomer production, sodium or potassium methylate or ethylate, and production of polyurethane using mercury containing catalysts are listed. Conversion of these processes using mercury or mercury compounds to mercury-free processes and mercury emission/release control from these processes will generate mercury wastes.

24. Paragraph 3 of Article 8 of the Minamata Convention requires that "A Party with relevant sources shall take measures to control emissions". The relevant sources in Annex D of the Convention include waste incineration facilities, coal-fired power plants, coal-fired industrial boilers, smelting and roasting processes used in the production of non-ferrous metals, and cement clinker production facilities. Paragraph 4 of Article 8 provides that "for its new sources, each Party shall require the use of best available techniques and best environmental practices to control and, where feasible, reduce emissions, as soon as practicable but no later than five years after the date of entry into force of the Convention for that Party". Paragraph 5 of Article 8 provides that "for its existing sources, each Party shall include in any national plan, and shall implement, one or more of the following measures, taking into account its national circumstances, and the economic and technical feasibility and affordability of the measures, as soon as practicable but no more than ten years after the date of entry into force of the Convention for it:

(a) A quantified goal for controlling and, where feasible, reducing emissions from relevant sources;

(b) Emission limit values for controlling and, where feasible, reducing emissions from relevant sources;

(c) The use of best available techniques and best environmental practices to control emissions from relevant sources;

(d) A multi-pollutant control strategy that would deliver co-benefits for control of mercury emissions; and

(e) Alternative measures to reduce emissions from relevant sources."

These mercury emission control requirements and practices are likely to generate solid wastes contaminated with mercury or mercury compounds.

25. Article 12 of the Minamata Convention provides that "each Party shall endeavour to develop appropriate strategies for identifying and assessing sites contaminated by mercury or mercury compounds" and that "the Conference of the Parties shall adopt guidance on managing contaminated sites". Site remediation activities are likely to generate mercury wastes.

2. UNEP Global Mercury Partnership

~~17.~~26. In its decision~~,~~ 25/5 III, the UNEP Governing Council requested the Executive Director of UNEP ~~was requested, coordinating~~to coordinate, as appropriate, with governments, intergovernmental organizations, stakeholders and the Global Mercury Partnership, to continue and enhance existing work in several areas. ~~The Chemicals Branch of the UNEP Division of Technology, Industry and Economics provides the secretariat services for the mercury negotiations and~~ The Global Mercury

Partnership ~~has~~ currently has eight identified ~~seven~~ priority actions (or partnership areas).[6] ~~.~~ The UNEP Mercury Waste Management Partnership Area was initiated in 2008 with the Ministry of the Environment of Japan as lead. Among others, the mercury waste management partnership area has identified and grouped country level projects by waste streams, and provided a resource person list of experts on mercury waste.

~~2~~3. Rotterdam Convention

~~18.~~27. Annex III to the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade lists "mercury compounds, including inorganic mercury compounds, alkyl mercury compounds and alkyloxyalkyl and aryl mercury compounds". Annex III sets out a list of chemicals subject to the prior informed consent procedure, along with the associated decision guidance documents and any additional information. Annex III includes chemicals that have been banned or severely restricted for health or environmental reasons.

~~3~~4. Heavy Metals Protocol

~~19.~~28. The objective of the Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution on Heavy Metals, which was amended in 2012, is to control anthropogenic emissions of heavy metals, including mercury, that are subject to long-range transboundary atmospheric transport and are likely to have significant adverse human health or environmental effects. Parties are required to reduce emissions of target heavy metals below their 1990 levels (or an alternative year between 1985 and 1995) by applying best available techniques for ~~new~~ stationary sources, and imposing emissions limit values for certain ~~new~~ stationary sources~~, and applying best available techniques and limit values for certain existing sources~~. Parties are also required to develop and maintain emission inventories for covered heavy metals. Annex VII to the Protocol specifically lists mercury-containing electrical components ~~and mercury-containing~~, measuring devices, fluorescent lamps, dental amalgam, pesticides, paint, and batteries for recommended product management measures, which include substitution, minimization, labelling, economic incentives, voluntary agreements and programmes for collection, recycling ~~programmes~~or disposal.

~~4~~5. SAICM

~~20.~~29. The Strategic Approach to International Chemicals Management (SAICM) comprises three core texts: the Dubai Declaration; an overarching policy strategy; and a global plan of action. Mercury is specifically addressed in the Global Plan of Action under work area 14: "Mercury and other chemicals of global concern; chemicals produced or used in high volumes; chemicals subject to wide dispersive uses; and other chemicals of concern at the national level", with specific activities addressing the reduction of risks, the need for further action and the review of scientific information. A quick start programme for the implementation of SAICM objectives was established to support initial enabling capacity-building and implementation activities in developing countries, least developed countries, small island developing states and countries with economies in transition (UNEP, 2006a). As of February 2014 seven projects have been implemented under the quick start programme; this includes mercury components such as the campaign on minimization of mercury use and inventory development of mercury products, mercury releases and mining sites (SAICM, 2014).

III. Guidance on environmentally sound management (ESM)

A. General ~~concept~~considerations

~~21.~~30. ESM is a broad policy concept~~.~~ that is understood and implemented in various ways by countries, stakeholders and organizations. Provisions and guidance documents pertaining to ESM of hazardous wastes as ~~it applies~~applied to ~~wastes consisting of elemental~~ mercury ~~and~~ wastes ~~containing or contaminated with mercury (and, more broadly, to hazardous wastes)~~ covered by the Basel Convention and the Organisation for Economic Co-operation and Development (OECD) core performance elements provide international guidance that support ~~ESM efforts under way in various countries and in some industrial sectors. It should be noted that international efforts under the auspices of, among others, the UNEP Global Mercury Partnership and the intergovernmental negotiating committee process are continuing. In the meantime, it is important to use these guidelines to promote and implement ESM for these~~and implement the ESM of hazardous wastes.

[6] For further information, http://www.unep.org/~~hazardoussubstances~~chemicalsandwaste/Mercury/GlobalMercuryPartnership/tabid/1253/language/en-US/Default.aspx.

1. Basel Convention

~~22.~~31. In paragraph 8 of its Article 2, the Basel Convention defines ESM of hazardous wastes or other wastes as taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner that will protect human health and the environment against the adverse effects which may result from such wastes.

~~23.~~32. In paragraph 2 (b) of Article 4, the Convention requires each party to take the appropriate measures to "ensure the availability of adequate disposal facilities for the environmentally sound management of hazardous or other wastes, that shall be located, to the extent possible, within it, whatever the place of their disposal", while in paragraph 2 (c) it requires each party to "ensure that persons involved in the management of hazardous wastes or other wastes within it take such steps as are necessary to prevent pollution due to hazardous wastes and other wastes arising from such management and, if such pollution occurs, to minimize the consequences thereof for human health and the environment".

~~24.~~33. In paragraph 8 of Article 4, the Convention requires that "hazardous wastes or other wastes, to be exported, are managed in an environmentally sound manner in the State of import or elsewhere. Technical guidelines for the environmentally sound management of wastes subject to this Convention shall be decided by the Parties at their first meeting". The present guidelines are intended to provide a more precise definition of ESM in the context of ~~wastes consisting of elemental mercury and wastes containing or contaminated with mercury~~mercury wastes, including appropriate treatment and disposal methods for these waste streams.

~~1. Several key principles for ESM of waste were articulated in the 1994 guidance document on the preparation of technical guidelines~~The 2013 framework for the environmentally sound management of ~~wastes subject~~ hazardous wastes and other wastes was adopted by the Conference of the Parties to the Basel Convention at its eleventh meeting~~. It recommends~~. The framework establishes a ~~number of legal, institutional and technical conditions (ESM criteria) such as:~~

~~25. A regulatory~~common understanding of what ESM encompasses and identifies tools~~enforcement infrastructure to ensure compliance with applicable regulations;~~

~~26. Sites or facilities are authorized~~ and ~~are of an adequate standard of technology~~strategies to support and ~~pollution control to deal with hazardous wastes in the way proposed, in particular taking into account the level of technology~~promote the implementation of ESM. It is intended as a practical guide for governments and ~~pollution control~~other stakeholders participating in the ~~exporting country;~~

~~27. Operators of sites or facilities at which hazardous wastes are managed are required, as appropriate, to monitor the effects of those activities;~~

~~28. Appropriate action is taken in cases where monitoring gives indications that the~~ management of hazardous wastes ~~has resulted in unacceptable releases;~~ and

~~29.~~34. ~~People involved in the management of hazardous wastes are capable~~ other wastes and ~~adequately trained in their capacity~~constitutes the most comprehensive ESM guidance to complement the Basel technical guidelines.

35. Under the Basel Convention, ESM is ~~also~~ the subject of multiple provisions (refer to section II A.1 above) and the following declarations namely:

~~1.~~ (a) The 1999 ~~Basel~~ Declaration on Environmentally Sound Management, which ~~states that numerous activities should be carried out in this context, such as:~~

was adopted by the Conference of the Parties to the Basel Convention at its fifth meeting calls on parties to enhance and strengthen their efforts and cooperation to achieve ESM, including through prevention, minimization, recycling, recovery and disposal of hazardous and other wastes subject to the Basel Convention, taking into account social, technological and economic concerns; and through further reduction of transboundary movements of hazardous and other wastes subject to the Basel Convention.

~~a. Active promotion~~(b) The 2011 Cartagena Declaration on the Prevention, Minimization and ~~use~~Recovery of ~~cleaner technologies with the aim~~Hazardous Wastes and

Other Wastes was adopted by the Conference of the Parties to the Basel Convention at its tenth meeting. It reaffirms that the Basel Convention is the primary global legal instrument for guiding the ESM of hazardous wastes and other wastes ~~subject to the Basel Convention;~~

~~b. Further reduction of the transboundary movements of hazardous~~ and ~~other wastes subject to the Basel Convention, taking into account the need for efficient management, the principles of self-sufficiency and proximity and the priority requirements for recovery and recycling;~~

~~c. Prevention and monitoring of illegal traffic;~~

~~d. Improvement and promotion of institutional and technical capacity-building, and development, and of the transfer of environmentally sound technologies, especially for developing countries and countries with economies in transition;~~

~~e. Further development of regional and subregional centres for training and technology transfer;~~

~~f. Enhancement of information exchange, education and awareness-raising in all sectors of society~~

~~g. Cooperation and partnership at all levels between countries, public authorities, international organizations, the industry sector, non-governmental organizations and academic institutions; and~~

~~Development of mechanisms for compliance with and for the monitoring and effective implementation of the Convention and its amendments~~their disposal.

~~30.~~36. ESM criteria recommendations for computing equipment have been developed under the Basel Convention Partnership for Action on Computing Equipment (PACE).

2. Organisation for Economic Co-operation and Development

~~31.~~37. OECD has adopted a recommendation on ESM of waste that covers such items as the core performance elements of ESM guidelines applying to waste recovery facilities, including: elements of performance that precede collection, transport, treatment and storage; and elements subsequent to

storage, transport, treatment and disposal of pertinent residues (OECD 2004). ~~The core performance elements are:~~

~~32. That the facility should have an applicable environmental management system (EMS) in place;~~

~~33. That the facility should take sufficient measures to safeguard occupational and environmental health and safety;~~

~~34. That the facility should have an adequate monitoring, recording and reporting programme;~~

~~35. That the facility should have an appropriate and adequate training programme for its personnel;~~

~~36. That the facility should have an adequate emergency plan; and~~

~~37. That the facility should have an adequate plan for closure and after-care.~~

38. Further information may be found in the guidance manual for the implementation of the OECD recommendation on ESM of waste (OECD 2007).

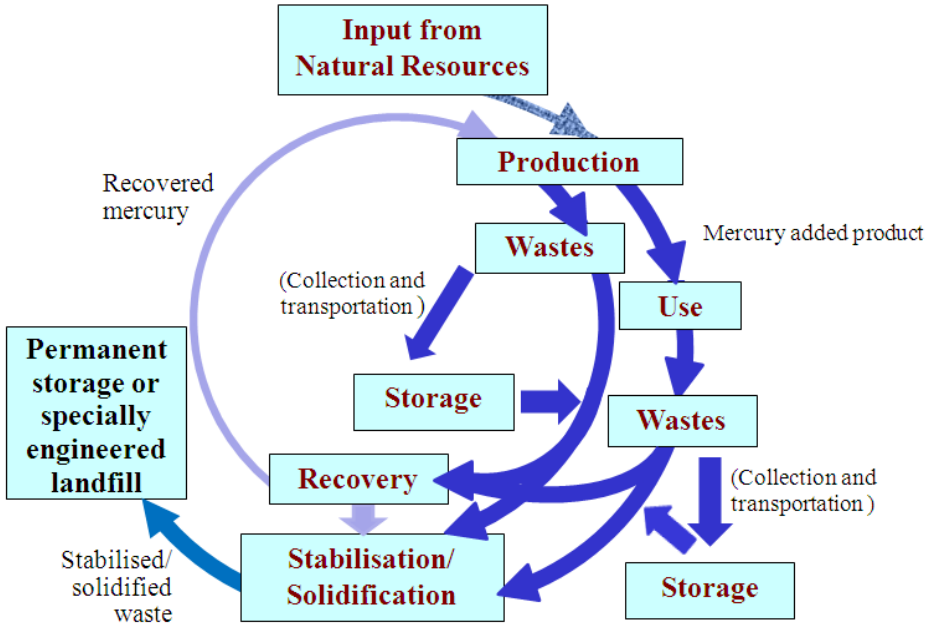
3. Life-cycle management of mercury

39. The concept of life-cycle management provides an important perspective for ESM of ~~wastes consisting of elemental mercury and wastes containing or contaminated with mercury.~~mercury wastes. Life-cycle management provides a framework for analysing and managing the performance of goods and services in terms of their sustainability. Global businesses are using it to reduce, for instance, their products' carbon, material and water footprints, and to improve the social and economic performance of their offerings so as to ensure a more sustainable value chain (UNEP and SETAC, 2009). When life-cycle management is applied to mercury, performance should be analysed at the following stages: production of mercury-added products or production of other products using mercury; use of the products; collection and transportation of wastes; and disposal of wastes.

40. In life-cycle management of mercury, it is important to prioritize the reduction of mercury used in products and processes to reduce the mercury content in the wastes to be disposed of and in wastes generated ~~in~~from industrial processes. When using mercury-added products, special care should be taken not to emit or release mercury into the environment. ~~Wastes consisting of elemental mercury or~~ Mercury wastes ~~containing or contaminated with mercury~~ should be treated to recover the mercury or to immobilize it in an environmentally sound manner. The recovered mercury should be disposed of, after stabilization/solidification (S/S) at a permanent storage site or a specially engineered landfill site; alternatively, it may be used as an input for products for which mercury-free alternatives do not exist or are unavailable, or where it would take a long time to replace mercury-added products; this could help to reduce the ~~amount~~production of new mercury ~~released~~ from ~~the earth. Wastes consisting of elemental mercury or~~ primary mining. Mercury wastes ~~containing or contaminated with mercury~~ may be stored, ~~for example for~~pending further treatment or disposal, or until ~~facilities are available or for~~ export to other countries for disposal is possible (see figure 1).

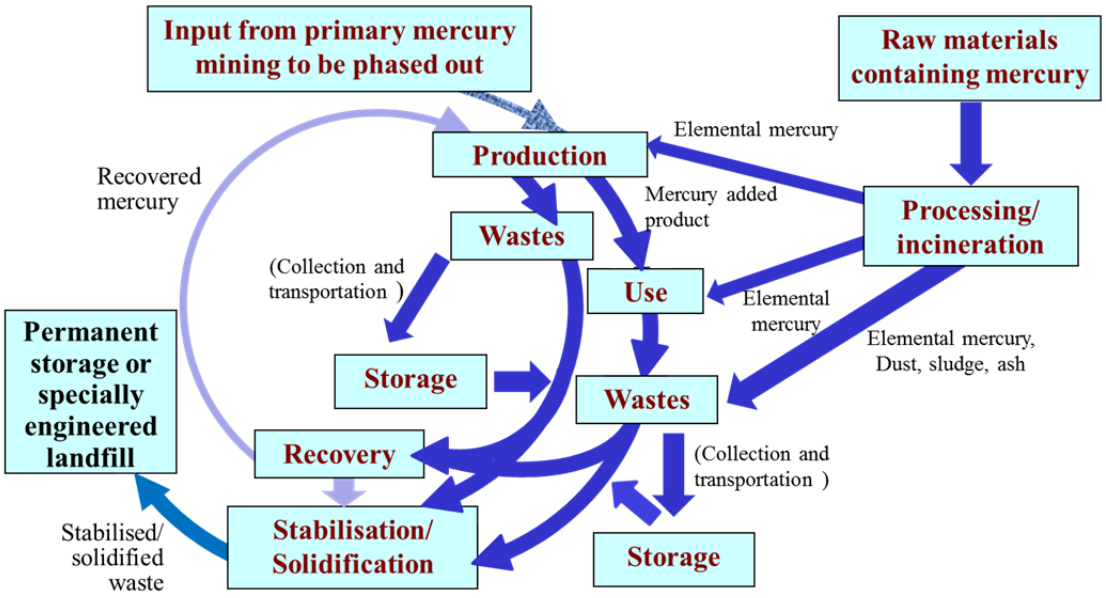
Figure 1: Basic concept of mercury management

"Minimize mercury release to the environment at each stage"



*This figure does not cover the flow of waste contaminated with mercury.

"Prevent and minimize mercury release to the environment at each stage"



~~40.~~41. Waste management covers source separation, collection, transportation, storage and disposal (e.g. recovery, solidification, stabilization ~~and,~~ permanent storage~~).~~ or disposal in a specially engineered landfill). When a Government plans to collect ~~wastes consisting of elemental~~ mercury ~~or wastes containing or contaminated with mercury~~wastes, it also needs to plan the subsequent waste management step, such as storage and disposal.

B. Legislative and regulatory framework

~~41.~~42. Parties to the Basel Convention should examine their national controls, standards and procedures to ensure that they fully implement their Convention obligations, including those pertaining to the transboundary movement and ESM of ~~wastes consisting of elemental mercury and wastes containing or contaminated with mercury~~mercury wastes.

42.43. Implementing legislation should give Governments the power to enact specific rules and regulations, inspect and enforce and establish penalties for violations. Such legislation on hazardous wastes should also define hazardous wastes. Wastes consisting of elemental mercury and wastes containing or contaminated with mercury in accordance with the Basel Convention. Mercury wastes should be included in the definition. The legislation could define ESM and require adherence to ESM principles, thus ensuring that countries comply with the provisions on ESM of wastes consisting of elemental mercury and wastes containing or contaminated with mercury.mercury wastes. The specific components and features of a regulatory framework that would meet the requirements of the Basel Convention and other international agreements are discussed below.[7].

1. Registration of waste generators

43.44. One approach required to provide full control over wastes consisting of elemental mercury and wastes containing or contaminated with mercurywastes involves establishing a regulatory framework to register generators of this type of waste. The register should include large-scale generators such as power plants, industrial establishments (e.g. chlor-alkali plants using mercury cell technology, VCM production facilities using a mercury catalyst or smelting operations), hospitals, medical clinics, dentists and dental clinics, research institutes, collectors of mercury waste, etc. A register of these waste generators would make it possible to clarify the origins of the waste, and their type and volume (or quantity of used mercury-added products).

44.45. The information required of generators of this type of waste would bemercury wastes could include the name, address, responsible person, type of business, amount of waste generated, kind of waste, collection scheme and how such wastes are finally handed over to collectors or are disposed of. Waste generators should transmit and update this information to the public sector (central or local government) regularly. In addition, waste inventory programmes based on the amounts and kinds of waste reported should be developed.

45.46. Such waste generators should have a duty to avoid anyprevent mercury leakage intoemission and releases to the environment until the wastes are handed over to collectors or sent to a disposal facility. They should comply strictly with national or local legal frameworks for managing such wastes and be liable for remediating or compensating any environmental or health damage that might occur.

2. Reduction and phase-out of mercury in products and industrial processes

46.47. The reduction and phase-out of mercury use in products and industrial processes is one of the most effective ways to reduce emissions and releases of mercury to the environment.

47.48. Parties should develop and enforce a legislative or regulatory framework for a reduction and phase-out programme. An effective regulatory framework supports and measures according to the proper organizationprovisions of the Minamata Convention (see paragraphs 21 through 23extended producer responsibility (EPR) obligations (as discussed in chapter III, E, 3), which depend on shared responsibilities among stakeholders. above). One approach to securing a legislative or regulatory framework for a phase-out programme involves establishing a legislative or regulatory framework with a cut-off date for banning the usenot allowing the manufacture, export and import of mercury in products and processes (except for those for which there are no technically or practically viable alternatives or exemptions.)). After this date, mercury usemanufacturing, export and import should not be banned and EPR collection and treatment schemes on ESM, in cooperation with all stakeholders, should be established.allowed. This approach encourages large-scale users andwould require that producers, importers and exporters of mercury and mercury-containingadded products to comply with the requirement to embark on a mercury phase-out programme. In certain cases it may be useful to complement the phase-out programme with a ban on the export of wastes. (see paragraph 5961 below).

48.49. One example of a framework for phase-out production is Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, also known as the "RoHS Directive", which restricts the use of, among others, mercury in electrical and electronic equipment. Temporary exemptions for the use of these substances are allowed for several products for which there are currently no viable alternatives (e.g. some types of mercury-containingadded lamps). Most

[7] Further guidance on Basel Convention regulatory frameworks can be found in the following documents: Model National Legislation on the Management of Hazardous Wastes and Other Wastes as well as on the Control of Transboundary Movements of Hazardous Wastes and Other Wastes and their Disposal (UNEP 1995), Basel Convention: Manual for Implementation of the Basel Convention (SBC 1995a) and Basel Convention: Guide to the Control System (SBC 1998).

mercury-containing electrical and electronic equipment has thus been phased out in the European Union market since the Directive entered into force on 1 July 2006. The "RoHS Directive" has since been 'recast' and Directive 2011/65/EU of the European Parliament and of the Council of 8th June 2011, the "RoHS 2 Directive" had to be transposed by the EU Member States by 2nd January 2013.

~~49.~~50. Another example from the European Union is Directive 2006/66/EC of the European Parliament and of the Council ~~of 6 September 2006~~ on batteries and accumulators and waste batteries and accumulators ~~and repealing Directive 91/157/EEC~~, which prohibits the placing on the market of all batteries, whether or not incorporated into appliances that contain more than 0.0005 per cent of mercury by weight~~, subject to exemptions (~~. An exception from this ~~ban is not applicable to~~prohibition for button cells~~, which may still have~~ with a mercury content of no more than 2 per cent by weight~~).~~ applies until 1 October 2015~~.~~. Batteries and accumulators lawfully placed on the market prior to the respective bans can still be marketed until stocks run out.

~~50.~~51. Norway has imposed a general ban on the use of mercury in products to ensure that mercury is not used in products where alternatives exist.~~.~~[8] ~~:~~ It is prohibited to manufacture, import, export, sell or use substances or preparations that contain mercury or mercury compounds, and to manufacture, import, export or sell solid processed mercury-added products or mercury compounds. This will reduce the number of mercury-added products on the market, in addition to discharges from products that have inadvertently failed to be disposed of as hazardous waste.

3. Transboundary movement requirements

~~51.~~52. Under the Basel Convention, ~~wastes consisting of elemental~~ mercury ~~and~~ wastes ~~containing or contaminated with mercury~~ are considered hazardous wastes as they belong to a category contained in Annex I (Y29: wastes having mercury or mercury compound as constituents) unless they do not possess any of the characteristics contained in Annex III.

~~52.~~53. If a party to the Convention has national legislation banning the import of ~~wastes consisting of elemental mercury and wastes containing or contaminated with~~ mercury wastes, and has reported the information in accordance with paragraph 1 (a) of Article 4, other parties ~~cannot~~shall prohibit or shall not permit the export of such ~~waste~~wastes to that party. In addition, in the case where a State of import has not prohibited the import of mercury wastes, parties to the Convention shall prohibit or shall not permit the export of such wastes if the State of import does not consent in writing to the specific import.

54. The Minamata Convention also includes a provision on transboundary movements of mercury waste in paragraph 3(c) of Article 11 (see paragraph 18 above).

~~53.~~55. Transboundary movements of hazardous wastes and other wastes must be kept to a minimum consistent with their ~~ESM~~environmentally sound and efficient management and conducted in a manner that protects human health and the environment from any adverse effects that may result from such movements. Transboundary movements of these wastes are permitted only under the following conditions:

~~(a) If conducted under conditions that do not endanger human health and the environment;~~

~~(b) If exports are managed in an environmentally sound manner in the country of import or elsewhere;~~

~~(c)~~(a) If the country of export does not have the technical capacity and the necessary facilities, capacity or suitable disposal sites in order to dispose of the wastes in question in an environmentally sound and efficient manner;

~~(d)~~(b) If the wastes in question are required as a raw material for recycling or recovery industries in the country of import; or

~~(e)~~(c) If the transboundary movements in question are in accordance with other criteria decided by the parties.

[8] Special exemptions are however made:

- Limited use (concentration limits specified) in packaging, batteries, some components in vehicles and in some electrical and electronic equipment according to the European Union Regulations implemented in Norway.
- Substances/preparations and solid processed products where the content of mercury or mercury compounds is lower than 0.001 per cent by weight.
- Thimerosal as a preservative in vaccines.

The Regulations do not apply to the use of products for analysis and research purposes. However, the prohibition applies to mercury thermometers to be used for analysis and research purposes.

~~54.~~56. Any transboundary movements of hazardous and other wastes are to be notified in writing to the competent authorities of all countries concerned by the movement (country of export, country of import and, if applicable, country of transit). This notification is to contain the declarations and information requested in the Convention and shall be written in a language acceptable by the State of import. Prior written consent from the importing and the exporting country and, if appropriate, from transit countries, in addition to a confirmation of the existence of a contract specifying ESM of the wastes between the exporter and the owner of the disposal facility are required before any transboundary movements of hazardous and other wastes can take place. Parties are to prohibit the export of hazardous wastes and other wastes if the country of import prohibits the import of such wastes. The Convention also requires that information regarding any consignment be accompanied by a movement document from the point where the transboundary movement commences to the point of disposal. ~~The Basel Ban Amendment (~~Some countries have implemented national prohibitions following Decision III/1, ~~of the Conference of the Parties~~including an amendment to the Convention~~) would, if it enters into force, prohibit~~ banning the export of hazardous wastes ~~either for disposal or recycling~~ from ~~Annex VII countries (~~OECD ~~member~~/EU countries~~, the European Union,~~ and Liechtenstein~~),~~ (Annex VII countries) to non-Annex VII countries ~~(i.e., developing countries). Some countries have similar domestic prohibitions.~~that has not entered into force.

~~55.~~57. Hazardous wastes and other wastes subject to transboundary movements should be packaged, labelled and transported in conformity with international rules and standards.~~.~~[9]~~.~~

~~56.~~58. When required by the State of import or any State of transit that is a party, transboundary movement of hazardous or other wastes is to be covered by insurance, a bond or other guarantee.

~~57.~~59. Where it is not possible to complete a transboundary movement of hazardous or other wastes for which the consent of the countries concerned has been given, the country of export is to ensure that the wastes in question are returned to the country of export for disposal if alternative arrangements cannot be made for their disposal in an ESM manner. This is to be done within 90 days of the importing State's notification to the exporting States or within another period of time on which the States involved agree. In the case of illegal traffic (as defined in paragraph 1 of Article 9), the country of export shall ensure that the wastes in question are returned to the country of export for disposal or are disposed of in accordance with the provisions of the Convention.

~~58.~~60. No transboundary movements of hazardous wastes and other wastes are permitted between a party and a non-party to the Convention unless a bilateral, multilateral or regional arrangement exists, as required under Article 11 of the Convention. Existing bilateral and multilateral agreements that have been reported to the Secretariat are listed on the Basel Convention webpage.[10]~~.~~

~~59.~~61. It is worth noting that the export of metallic mercury and certain mercury compounds and mixtures from the European Union has been banned by the Regulation (EC) No 1102/2008 since 15 March 2011 (European Commission, ~~2010~~2010a). Similarly, the Mercury Export Ban Act of 2008 ~~will ban United States~~severely restricts exports of elemental mercury from the United States of America as of 1 January 2013~~ and require long-term storage of mercury~~.

4. Authorization and inspection of disposal facilities

~~60.~~62. ~~Wastes consisting of elemental mercury and wastes containing or contaminated with mercury~~ Mercury wastes should be disposed of in facilities that practise ESM.

~~61.~~63. Most countries have legislation or sector-specific regulation that requires waste disposal facilities to obtain some form of approval or operating permit to commence operations. Approvals or operating permits may include specific conditions (facility design and operating conditions) which must be maintained in order for the approval or permit to remain valid. It may be necessary to add requirements specific to ~~wastes consisting of elemental mercury and to wastes containing or contaminated with mercury~~mercury waste to meet the requirements of ESM, to comply with specific requirements of the Basel Convention and to take into account recommendations and guidelines on best available techniques (BAT) such as Guidelines on best available techniques and provisional guidance on best environmental practices of the Stockholm Convention and the reference documents on BAT by the European Union (BREFs) and guidelines for the chlor-alkali sector from the World

[9] See e.g. United Nations (2013): UN Recommendations on the Transport of Dangerous Goods (Model Regulations) Eighteenth revised edition, http://www.unece.org/trans/danger/publi/unrec/rev18/18files_e.html

[10] For bilateral agreements see http://www.basel.int/Countries/Agreements/BilateralAgreements/tabid/1517/Default.aspx
For multilateral agreements see http://www.basel.int/Countries/Agreements/MultilateralAgreements/tabid/1518/Default.aspx

Chlorine Council and Eurochlor.[11] Approvals or operating permits should be reviewed periodically and if necessary updated in order to improve occupational and environmental safety by applying improved or new technologies.

~~62.~~64. Disposal facilities should be periodically inspected by an independent authority or technical inspection association in order to verify compliance with the requirements set out in the facility's permit. Legislation should also allow for extraordinary inspections if there is evidence for non-compliance.

C. Identification and inventory

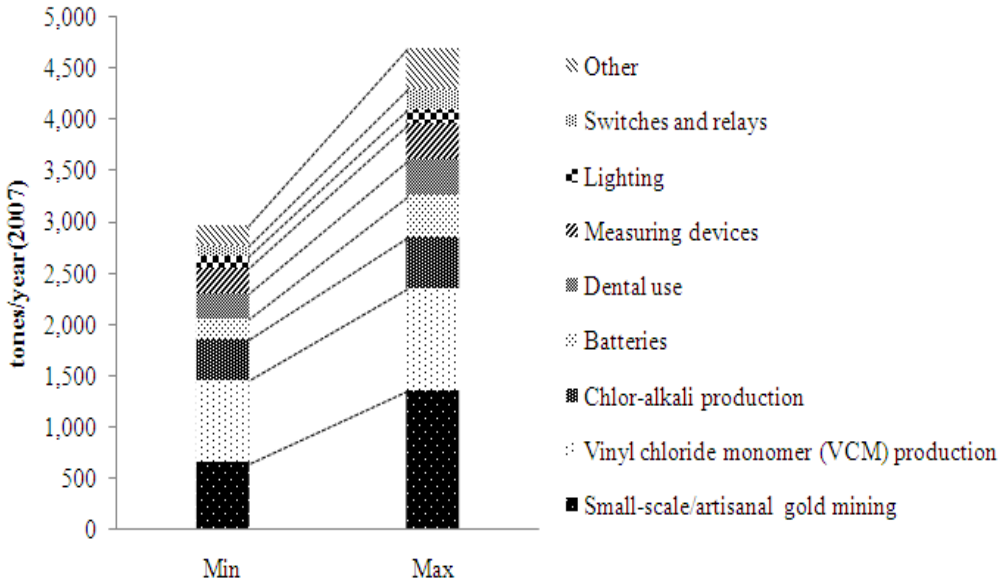
~~63.~~65. It is important to identify sources that generate ~~wastes consisting of elemental mercury and wastes containing or contaminated with mercury~~mercury wastes and to quantify the amount of wastes and mercury concentrations in inventories in order to be able to take effective action to prevent, minimize and manage such waste.

1. Identification of sources of mercury wastes

66. Major sources of mercury waste include industrial processes using mercury or mercury compounds, and mercury devices which become waste. The other major source is mercury released by use or processing of natural resources (e.g., non-ferrous metals ore processing, coal combustion, etc.). Figure 2 shows global mercury use by application in 2007. The largest use sector is artisanal and small-scale gold mining, followed by vinyl chloride monomer VCM/polyvinyl chloride (PVC) production and chlor-alkali production. Mercury is also used for ~~consumer~~ products such as batteries, dental amalgam, measuring devices, lamps, and electrical and electronic devices, although the amount of mercury in these use categories varies by nation. The ~~range~~total amount of mercury ~~uses~~used globally in 2007 was between 3,000 tonnes - 4,700 tonnes (Maxson, 2010).

[11] See compilation at http://www.unep.org/~~hazardoussubstances~~chemicalsandwaste/Mercury/PrioritiesforAction/ChloralkaliSector/Reports/tabid/4495/language/en-US/Default.aspx.

Figure 2: Estimated global mercury use in 2007 (Maxson, 2010)



~~**Figure 2** Estimated global mercury use in 2007 (Maxson 2010)~~

~~64.~~67. The sources, categories and examples of ~~wastes consisting of elemental~~ mercury ~~and wastes containing or contaminated with mercury~~wastes are summarized in table ~~-~~2.

~~65.~~68. It should be noted that in some countries some of the industrial sources presented in table ~~-~~2 (Sources 1, 2, 3, 4 and 7, except for the production processes using mercury) neither use mercury, nor generate ~~wastes consisting of elemental~~ mercury ~~and~~ wastes ~~containing or contaminated with mercury~~ at all. Industrial processes depend on a country's technological and social conditions, and these will determine whether mercury-free processes ~~can be introduced~~are used.

Table ~~-~~2: Sources, categories, examples of mercury wastes (UNEP 2002; 2005; 2006b; 2006c). *

A: ~~Wastes~~Waste consisting of ~~elemental~~ mercury or mercury compounds; B: Wastes containing mercury or mercury compounds; C: Wastes contaminated with mercury or mercury compounds.

Source	Categories*	Examples of waste types	Remarks
1. Extraction and use of fuels/energy sources			
1.1. Coal combustion in power plants	C	Flue gas cleaning residues (fly ash, particulate matters, wastewater / sludge, etc.)	• Accumulation in bottom ashes and flue gas cleaning residues.
1.2. Other coal combustion	C		
1.3. Extraction, refining and use of mineral oil	C		
1.4. Extraction, refining and use of natural gas	C		
1.5. Extraction and use of other fossil fuels	C		
1.6. Biomass fired power and heat generation	C		
2. Primary (virgin) metal production			
2.1. Primary extraction and processing of mercury	C	Smelting residue	• Pyrometallurgy of mercury ore
2.2. Metal (aluminium, copper, gold, lead, manganese,	C	Tailings, extraction process residues, flue gas cleaning residues, wastewater treatment	• Industrial processing; • Thermal treatment of ore; and

Source		Cate-gories*	Examples of waste types	Remarks
	mercury, zinc, primary ferrous metal, other non-ferrous metals) extraction and initial processing		residues	• Amalgamation.
3. Production processes with mercury impurities				
3.1.	Cement production	C	Process residues, flue gas cleaning residues, sludge	• Pyroprocessing of raw materials and fuels with naturally occurring mercury impurities
3.2.	Pulp and paper production			• Combustion of raw materials with naturally occurring mercury impurities
3.3.	Lime production and lightweight aggregate kilns			• Calcination of raw materials and fuels with naturally occurring mercury impurities
4. Intentional use of mercury in industrial production				
4.1.	Chlor-alkali production with mercury-technology	A/C	Solid waste contaminated with mercury, elemental mercury, process residues, soil	• Mercury cell; • Mercury recovery units (retort).
4.2.	Production of alcoholates~~,~~ (e.g. sodium or potassium methylate or ethylate), dithionite and ultrapure potassium hydroxide solution	A/C	Solid waste contaminated with mercury, elemental mercury, process residues, soil	• Mercury cell; • Mercury recovery units (retort).
4.3.	VCM production with mercuric chloride $HgCl_2$ catalyst	A/B/C	Process residues	• Mercury catalyst process
4.4.	Acetaldehyde production with mercury-sulphate ($HgSO_4$) catalyst	C	Wastewater	• Mercury-sulphate process
4.5.	Other production of chemicals and pharmaceuticals with mercury compounds and/or catalysts	C	Process residues, wastewater	• Mercury catalyst process
4.6.	Production of products referred to in 5. below	C	Process residues, wastewater	
5. Products and applications with intentional use of mercury				
5.1.	Thermometers and other measuring devices with mercury	B	Used, obsolete or broken products	• Elemental mercury
5.2.	Electrical and electronic switches, contacts and relays with mercury			
5.3.	Light sources with mercury	B		• Vapour-phase elemental mercury;

Source	Cate-gories*	Examples of waste types	Remarks
			• Divalent mercury adsorbed on phosphor powder.
5.4. Batteries containing mercury	B		• Elemental mercury, mercury oxide
5.5. Biocides and pesticides	B	Stockpiles (obsolete pesticides), soil and solid waste contaminated with mercury	• Mercury compounds (mainly ethylmercury chloride)
5.6. Paints	B	Stockpiles (obsolete paints), solid waste contaminated with mercury, wastewater treatment residues	• Phenylmercuric acetate and similar mercury compounds
5.7. Pharmaceuticals for human and veterinary uses	B	Stockpiles (obsolete pharmaceuticals), medical waste	• Thimerosal; • Mercuric chloride; • Phenyl mercuric nitrate; • Mercurochrome, etc.
5.8. Cosmetics and related products	B	Stockpiles	• Mercury iodide; • Ammoniated mercury, etc.
5.9. Dental amalgam fillings	B/C	Stockpiles, wastewater treatment residues	• Alloys of mercury, silver, copper and tin
5.10. Manometers and gauges	B	Used, obsolete or broken products	• Elemental mercury
5.11. Laboratory chemicals and equipment	A/B/C	Stockpiles, wastewater treatment residues, laboratory wastes	• Elemental mercury; • Mercury chloride, etc.
5.12. Polyurethane elastomers	B/C	Defective and excess product waste, used or end-of-life product	• Elastomer waste containing mercury compounds
5.13. Sponge gold/gold production from ASGM sources	C	Flue gas residues, wastewater treatment residues	• Thermal treatment of gold; • Industrial processing.
5.14. Mercury metal use in religious rituals and folklore medicine	C	Solid waste, wastewater treatment residues	• Elemental mercury
5.15. Miscellaneous product uses, mercury metal uses and other sources	B/C	Stockpiles, wastewater treatment residues, solid wastes	• Infra-red detection semiconductors with mercury; • Bougie and Cantor tubes; • Educational uses, etc.
6. Secondary metal production			
6.1. Recovery of mercury	A/C	Spillage during recycling process, extraction process residues, flue gas cleaning residues, wastewater treatment residues	• Dismantling of chlor-alkali facilities; • Recovery from mercury meters used in natural gas pipelines; • Recovery from manometers, thermometers, and other equipment.
6.2. Recovery of ferrous metals	C		• Shredding; • Smelting of materials containing mercury.
6.3. Recovery of gold from e-waste (printed circuit board)	A/C		• Elemental mercury; • Thermal process.
6.4. Recovery of other metals, such as copper and aluminium	C		• Other mercury-~~containing~~added materials or products /components

Source	Categories*	Examples of waste types	Remarks
7. Waste incineration			
7.1. Incineration of municipal solid waste	C	Flue gas cleaning residues, wastewater treatment residues	• Mercury-added products and process waste; • Natural mercury impurities in high volume materials (plastics, paper, etc.) and minerals.
7.2. Incineration of hazardous waste			
7.3. Incineration of medical waste			
7.4. Sewage sludge incineration			
8. Waste deposition/landfilling and wastewater treatment			
8.1. Controlled landfills/deposits	C	Wastewater, wastewater treatment residues, solid waste contaminated with mercury	• Mercury-added products and process waste; Natural mercury impurities in bulk materials (plastics, tin cans, etc.) and minerals.
8.2. Diffuse deposition under some control			
8.3. Uncontrolled local disposal of industrial production waste			
8.4. Uncontrolled dumping of general waste			
8.5. Wastewater system/treatment		Wastewater treatment residues, slurry	• Intentionally used mercury in spent products and process waste; • Mercury as an anthropogenic trace pollutant in bulk materials.
9. Crematoria and cemeteries			
9.1. Crematoria	C	Flue gas cleaning residues, wastewater treatment residues	• Dental amalgam fillings
9.2. Cemeteries		Soil contaminated with mercury	

~~66.~~69. More detailed information about mercury-added products (specific name and manufacturer of products) is available from the following sources:

(a) UNEP. 2008c.: Report on the major mercury-containing products and processes, their substitutes and experience in switching to mercury-free products and processes~~,~~. Available at: http://www.chem.unep.ch/mercury/OEWG2/documents/g7)/English/OEWG_2_7.doc;

(b) European Commission. 2008. Options for reducing mercury use in products and applications, and the fate of mercury already circulating in society, http://ec.europa.eu/environment/chemicals/mercury/pdf/study_report2008.pdf;

(c) UNEP Global Mercury Partnership – Mercury-Containing Products Partnership Area~~,~~. Available at: http://www.~~chem.unep.ch/mercury/Sector-Specific-Information~~unep.org/chemicalsandwaste/Mercury~~-in-products.htm~~/InterimActivities/Partnerships/Products/tabid/3565/language/en-US/Default.aspx;

(d) Lowell Center for Sustainable Production. 2003. An Investigation of Alternatives to Mercury-Containing Products. Available at:~~,~~ http://www.chem.unep.ch/mercury/Sector-~~-~~Specific-~~-~~Information/Docs/lcspfinal.pdf;

(e) The Interstate Mercury Education and Reduction Clearinghouse (IMERC) Mercury-Added Products Database~~,~~. Available at: http://www.newmoa.org/prevention/mercury/imerc/notification.

2. Inventories

~~67.~~70. Inventories are an important tool for identifying, quantifying and characterizing wastes. National inventories may be used:

(a) To establish a baseline for quantities of mercury-added products produced, circulated/traded or in use, ~~and~~ commodity mercury ~~and wastes consisting of elemental~~, mercury ~~and wastes~~ containing ~~or contaminated with~~ by-products produced and mercury wastes ;

(b) To establish an information registry to assist with safety and regulatory inspections;

(c) To obtain the accurate information needed to draw up plans for lifecycle management of mercury;

(d) To assist with the preparation of emergency response plans; and

(e) To track progress towards reducing and phasing out mercury.

~~68.~~71. After identifying the sources and types of ~~wastes consisting of elemental mercury and wastes containing or contaminated with mercury~~mercury wastes, process-specific information and quantities should be used to estimate the amounts of waste from the identified sources for different types of waste in a given country (or area, community, etc.) (UNEP, 2005).

~~69.~~72. It is in some cases very difficult to collect the necessary data to estimate these amounts, particularly in developing countries and countries with economies in transition due to a lack of (or no) data, particularly where small-scale facilities are concerned. In cases where actual measurements are not feasible, data collection could be carried out using questionnaire-based surveys.

~~70.~~73. The Methodological Guide for the Undertaking of National Inventories of Hazardous Wastes within the Framework of the Basel Convention (SBC, 2000) should be used to compile inventories of ~~wastes consisting of elemental mercury and wastes containing or contaminated with mercury.~~mercury wastes. The Methodological Guide has also been tried out in conjunction with the Pilot Project on National Inventories of Hazardous Waste, produced by the BCRC-SEA, whose report can be used as a practical reference.~~-~~[12]~~-~~

~~71.~~74. The Toolkit for Identification and Quantification of Mercury Releases (UNEP, ~~2010a~~2013) can also be usefully applied. There are two levels of inventory development~~:~~: Level 1 provides a simplified version and Level 2 is the comprehensive version. The toolkit helps countries to build their knowledge base by compiling a mercury inventory that identifies sources of mercury releases in their country and estimates or quantifies the releases. The toolkit is a ~~simple and~~ standardized methodology for ~~producing~~developing consistent national and regional mercury inventories ~~.~~(UNEP, 2005). The toolkit has been applied in a number of countries (UNEP, 2008c~~).~~) and is used further in a number of GEF-funded projects.

~~72.~~75. In keeping with a lifecycle approach, channels or pathways through which the mercury in the waste ~~is~~may be released into the environment should also be identified. In view of the potential risks of mercury release into the environment, waste types should be ranked according to priority for action. Information about possible measures should then be collected, especially with regard to sources and types of mercury waste with a large amount of mercury and involving higher risks of mercury release into the environment. Measures must then be analysed or evaluated in terms of the potential amount of environmental mercury release to be prevented, administrative and social costs, availability of techniques and facilities and ease of reaching the social agreement associated with the implementation of these measures, etc.

~~73.~~76. In some countries, a Pollutant Release and Transfer Registry (PRTR) is used to collect data about specific mercury content in wastes and its transfer by each facility (Kuncova et al., 2007). PRTR data are also publicly available.~~-~~[13]~~-~~

D. Sampling, analysis and monitoring

~~74.~~77. Sampling, analysis and monitoring are critical components in the management of ~~wastes consisting of elemental mercury and wastes containing or contaminated with mercury.~~mercury wastes. Waste sampling, analysis and monitoring should be conducted by trained professionals in accordance with a well-designed plan and using internationally accepted or nationally approved methods, carried out using the same method each time over the time span of the programme. They should also be subjected to rigorous quality assurance and quality control measures. Mistakes in sampling, analysis or monitoring or deviation from standard operational procedures can result in meaningless data or

[12] Available at: http://www.bcrc-sea.org/?content=publication&cat=2

[13] For example, the Czech Republic PRTR, known as the Integrated Pollution Register (available at http://www.irz.cz), collects chemically specific data about mercury and mercury compounds transfered in the wastes, which gives a clear picture of the total amount of mercury transfered in wastes as well as data on how the waste is handled.

even programme-damaging data. Each party, as appropriate, should therefore ensure that training, protocols and laboratory capability are in place for sampling, monitoring and analytical methods and that these standards are enforced.

~~75.~~78. Because there are numerous reasons for sampling, analysing and monitoring and because there are so many different physical forms of waste, many different sampling, analysis and monitoring methods are available. Although it is beyond the scope of this document to discuss them specifically, the next three sections will consider the key points involved in sampling, analysis and monitoring.

~~76.~~79. For information on good laboratory practice, the OECD series (OECD, various years) may be usefully consulted; on general methodological considerations, the ~~WHO/~~UNEP/WHO document Guidance for Identifying Populations at Risk from Mercury Exposure contains helpful information~~.~~[14][15]. Further orientation on mercury is being developed through a UNEP-GEF project; this project also attempts to establish an on-line databank of operational mercury laboratories.[16]

1. Sampling

~~77.~~80. The overall objective of any sampling activity is to obtain a sample which can be used for the targeted purpose, e.g. site characterization, compliance with regulatory standards or suitability for proposed treatment or disposal. This objective should be identified before sampling is started. It is indispensable for quality requirements in terms of equipment, transportation and traceability to be met.

~~78.~~81. Standard sampling procedures should be established and agreed upon before the start of the sampling campaign (both matrix- and mercury-specific). Elements of these procedures include the following:

(a) The number of samples to be taken, the sampling frequency, the duration of the sampling project and a description of the sampling method (including quality assurance procedures put in place, e.g. appropriate sampling containers,[17] field blanks and chain-of-custody);

(b) Selection of location ~~or~~, sites or points at which mercury wastes are generated, and time of sample-taking (including description and geographic localization);

(c) Identity of person who took the sample and conditions during sampling;

(d) Full description of sample characteristics – labelling;

(e) Preservation of the integrity of samples during transport and storage (before analysis);

(f) Close cooperation between the sampler and the analytical laboratory; and

(g) Appropriately trained sampling personnel.

~~79.~~82. Sampling should comply with specific national legislation, where it exists, or with international regulations. In countries where regulations do not exist, qualified staff should be appointed. Sampling procedures include the following:

(a) Development of a standard operational procedure (SOP) for sampling each of the matrices for subsequent mercury analysis;

(b) Application of well-established sampling procedures such as those developed by the International Organization for Standardization (ISO), the European Committee for Standardization (CEN), the United States Environmental Protection Agency (United States EPA), the Global Environment Monitoring System (GEMS) or the American Society for Testing and Materials (ASTM); and

(c) Establishment of quality assurance and quality control (QA/QC) procedures.

~~80.~~83. All these steps should be followed if a sampling programme is to be successful. Similarly, documentation should be thorough and rigorous.

~~81.~~84. Types of matrices typically sampled for mercury include solids, liquids and gases:

(a) Liquids:

~~[14] http://www.unep.org/hazardoussubstances/LinkClick.aspx?fileticket=DUJZp8XnXq8%3d&tabid=3593&language=en-US~~

[15] Available at: http://www.chem.unep.ch/mercury/IdentifyingPopnatRiskExposuretoMercuryFinalAugust08.pdf

[16] Development of a Plan for Global Monitoring of Human Exposure to and Environmental Concentrations of Mercury (~~–~~GEF ID 5409).

[17] Polyethylene bottles are permeable to mercury and should not be used. Please refer to Parker et al. (2005) for details.

(i) Leachate from dumpsites and landfills;

(ii) Liquid collected from spills;

(iii) Water (surface water, drinking water and industrial effluents);

(iv) Biological materials (blood, urine, hair; especially in the case of workers' health monitoring);

(b) Solids:

(i) Stockpiles, products and formulations consisting of, containing or contaminated with mercury;

(ii) Solids from industrial sources and treatment or disposal processes (fly ash, bottom ash, sludge, still bottoms, other residues, clothing, etc.);

(iii) Containers, equipment or other packaging materials (rinse or wipe samples), including the tissues or fabric used in the collection of wipe samples;

(iv) Soil, sediment, rubble, sewage sludge and compost;

(c) Gases:

(i) Air (indoor~~).~~) of facilities handling mercury wastes.

(ii) Mercury releases to the air from treated mercury wastes

(iii) Flue gas from waste incinerators.

~~82.~~85. In environmental and human monitoring programmes, both biotic and abiotic matrices may be included:

(a) Plant materials and food;

(b) Human hair, urine, nails, breast milk or blood;

(c) Air (ambient, wet or dry deposition or, possibly, snow~~).~~)

2. Analysis

~~83.~~86. Analysis refers to the extraction, purification, separation, identification, quantification and reporting of mercury concentrations in the matrix of interest. In order to obtain meaningful and acceptable results, the analytical laboratory should have the necessary infrastructure (housing) and proven experience with the matrix and the mercury species (e.g. successful participation in inter-laboratory comparison studies in external proficiency testing schemes).

~~84.~~87. Accreditation of the laboratory according to ISO 17025 or other standards by an independent body is also important. Essential criteria for obtaining high-quality results include:

(a) Specification of the analytical technique;

(b) Maintenance of analytical equipment;

(c) Validation of all methods used (including in-house methods); and

(d) Training of laboratory staff.

~~85.~~88. Mercury analysis is typically performed in a dedicated laboratory. For ~~specific situations~~screening purposes, test kits are available ~~that~~; these can be used in the field ~~for screening purposes~~as well.

~~86.~~89. For the analysis of mercury, there is no single analytical method available. Methods of analysing the various matrices for mercury, either for total mercury content or speciation of mercury, have been developed by the International Organization for Standardization (ISO), the European Committee for Standardization (CEN), or national methods such as those of the United States (United States EPA) or Japan. Table ~~-~~3 lists some examples for analysing mercury in wastes, flue gas and wastewater. Most in-house methods are variations of these. As with all chemical analysis, only validated methods should be used by the laboratory.

~~87.~~90. In addition, procedures and acceptance criteria for handling and preparation of the sample in the laboratory, e.g. homogenization, should be established.

~~88.~~91. The individual steps in the analytical determination include:

(a) Extraction;

(b) Purification;

(c) Identification by suitable detectors such as ICP, AFS, AAS; compact instruments;

(d) Quantification and reporting as required; and

(e) Reporting in accordance with regulation(s).

3. Monitoring

~~89.~~92. In paragraph 2 (b) of its Article 10 (“International Cooperation”), the Basel Convention requires parties to “cooperate in monitoring the effects of the management of hazardous wastes on human health and the environment”. Monitoring programmes should provide an indication of whether a hazardous waste management operation is functioning in accordance with its design, and should detect changes in environmental quality caused by the operation.

~~90.~~93. The information from the monitoring programme should be used to ensure that ~~the proper types of~~ hazardous wastes are ~~being~~ properly managed ~~by the~~according to waste ~~management operation, to discover and repair any damage~~types, to identify potential issues relating to possible mercury release or exposure and to determine whether ~~an alternative~~amendments to the management approach might be appropriate. By implementing a monitoring programme, facility managers can identify problems and take appropriate measures to remedy them.

~~91.~~94. It should be noted that a number of continuous mercury measurement systems are commercially available. Such monitoring may be required under national or local legislation.

Table ~~3~~: Chemical analysis of mercury in waste, flue gas and wastewater

Target		Method
Waste	To determine the mobility of mercury in waste	EN 12457-1 to 4: Characterization of waste - Leaching - Compliance test for leaching of granular waste materials and sludges (European Committee for Standardization, 2002a)
		EN 12920: Characterization of waste - Methodology for the determination of the leaching behaviour of waste under specified conditions (European Committee for Standardization, 2006)
		EN 13656: Characterization of waste - Microwave assisted digestion with hydrofluoric (HF), nitric (HNO_3) and hydrochloric (HCl) acid mixture for subsequent determination of elements in waste (European Committee for Standardization, 2002b)
		EN 13657: Characterization of waste - Digestion for subsequent determination of aqua regia soluble portion of elements in waste (European Committee for Standardization, 2002c)
		TS 14405: Characterization of waste - Leaching behaviour test - Up-flow percolation test (European Committee for Standardization, 2004)
		United States EPA Method 1311: TCLP, Toxicity Characteristic Leaching Procedure (United States EPA, 1992)
	To determine concentrations of mercury in waste	EN 13370: Characterization of waste - Analysis of eluates - Determination of Ammonium, AOX, conductivity, Hg, phenol index, TOC, easy liberatable CN-, F- (European Committee for Standardization, 2003)
		EN 15309: Characterization of waste and soil - Determination of elemental composition by X-ray fluorescence (European Committee for Standardization, 2007)
		United States EPA Method 7471B: Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique) (United States EPA, 2007d)
		United States EPA Method 7473: Mercury in Solids and Solutions by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry (United States EPA, 2007e)
		United States EPA Method 7470A: Mercury in Liquid Waste (Manual Cold-Vapor Technique) (United States EPA, 1994)
Flue Gas		EN 13211: Air quality - Stationary source emissions - Manual method of determination of the concentration of total mercury (European Committee for Standardization, 2001) *This method determines the total mercury content (i.e., ~~,~~ metallic/elemental Hg + ionic Hg).

Target		Method
		EN 14884: Air quality - Stationary source emissions - Determination of total mercury: Automated measuring systems (European Committee for Standardization, 2005)
		JIS K 0222: Analysis Method for Mercury in Flue Gas (Japan Standards Association, 1997)
		United States EPA Method 0060: Determination of Metals in Stack Emissions (United States EPA, 1996)
	For the speciation of mercury	ASTM D6784 - 02(2008) Standard Test Method for Elemental, Oxidized, Particle-Bound and Total Mercury in Flue Gas Generated from Coal-Fired Stationary Sources (Ontario Hydro Method) (ASTM international 2008)
Wastewater		ISO 5666: 1999: Water quality – Determination of mercury (ISO, 1999)
		ISO 16590: 2000: Water quality – Determination of mercury –- Methods involving enrichment by amalgamation (ISO, 2000)
		1SO 17852: 2006: Water quality – Determination of mercury - Method using atomic fluorescence spectrometry (ISO, 2006)

E. Waste prevention and minimization

92.95. The prevention and minimization of ~~wastes consisting of elemental~~ mercury ~~and~~ wastes ~~containing or contaminated with mercury~~ are the first ~~and most important steps~~preferred options in the ~~overall~~ ESM of such wastes. In its Article 4, paragraph 2, the Basel Convention calls on parties to "ensure that the generation of hazardous wastes and other wastes … is reduced to a minimum". In that way, the need for waste management is correspondingly reduced, enabling ESM resources to be more efficiently devised and directed. This section provides information for important sources of wastes.

96. Article 5 of the Minamata Convention requires phase out of mercury use in chlor-alkali and acetaldehyde production processes and restriction of mercury use in vinyl chloride monomer production, sodium or potassium methylate or ethylate, and production of polyurethane using mercury containing catalysts (see paragraph 23).

1. Waste prevention and minimization for industrial processes

93.97. There are several industrial processes using mercury; however, because of the quantity of mercury used in these processes this section discusses waste prevention and minimization measures only for artisanal and small-scale gold mining, vinyl-chloride monomer production and chlorine and caustic soda (chlor-alkali) production.

(a) Artisanal and small-scale gold mining

94.98. Mercury-free techniques ~~are available:~~such as gravimetric methods~~; Centre for Mineral Technology (CETEM);~~ and combining non-mercury methods are available. In cases where organized alternatives are unavailable, interim solutions that lead towards mercury-free techniques should be used. These can include mercury capture and recycling technologies such as retorts and fume hoods, and mercury re-activation and the avoidance of mercury intensive processing such as whole-ore amalgamation. The details can be found in the following references:

(a) GMP. 2006. Manual for Training Artisanal and Small-Scale Gold Miners, UNIDO, Vienna, Austria. Available at: ~~www.cetem.gov.br/gmp/Documentos/total_training_manual.pdf~~http://communitymining.org/attachments/221_training%20manual%20for%20miners%20GMP%20Marcelo%20Veiga.pdf?phpMyAdmin=cde87b62947d46938306c1d6ab7a0420;

(b) MMSD Project. 2002. Artisanal and Small-Scale Mining, Documents on Mining and Sustainable Development from United Nations and Other Organizations;

(c) UNEP. 2010a. Global ASGM Forum report~~,~~. Available at: http://www.unep.org/~~hazardoussubstances~~chemicalsandwaste/GlobalForumonASGM/tabid/6005/Default.aspx;

(d) UNEP. 2011. Global Mercury Partnership Reports and Publications~~,~~. Available at: http://www.unep.org/~~hazardoussubstances~~chemicalsandwaste/Mercury/PrioritiesforAction/ArtisanalandSmallScaleGoldMining/Reports/tabid/4489/language/en-US/Default.aspx;

(e) United States EPA. 2008. Manual for the Construction of a Mercury Collection System for Use in Gold Shops. Available at: ~~,~~http://www.epa.gov/oia//toxics/asgm.html.

~~95.~~99. Artisanal miners, their families, and the surrounding communities should be educated about: exposure risks to mercury and related health dangers; and environmental impacts of mercury use in artisanal and small-scale gold mining (ASGM).

~~96.~~100. Once awareness of these issues has increased, training in techniques and systems to prevent waste generation should be provided.

(b) Vinyl chloride monomer (VCM) production

~~97.~~101. VCM production using the acetylene process employs mercuric chloride as a component of the catalyst. Waste prevention and minimization opportunities exist and fall into two primary categories: (a) alternative, mercury-free manufacturing methods; and (b) better management of mercury during the process and environmental control to capture releases.

~~98.~~102. Mercury-free VCM manufacturing: VCM is manufactured using a variety of mercury-free methods, most commonly based on the oxychlorination of ethylene (The Office of Technology Assessment, 1983). While mercury-free methods are common worldwide, in several countries the acetylene process continues to be used because it is significantly less expensive in locations where coal is cheaper than ethylene (Maxson, 2011). Serious efforts to develop a mercury-free catalyst for the acetylene process are under way. A commercial-scale demonstration test of a mercury-free catalyst is scheduled for early 2012. If the commercial-scale test proves successful, the company developing the catalyst intends to produce the mercury-free catalyst, and a transition to mercury-free VCM production can be foreseen in the coming few years (Jacobs and Johnson Matthey, 2011).

~~99.~~103. Suggested measures to reduce generation of wastes contaminated with mercury include: better management of mercury and environmental control to capture releases; development and application of low-mercury catalyst; technological reform to prevent the mercuric chloride evaporation; prevention of catalyst poisoning; and delaying carbon deposition to reduce the use of mercury. Environmental control measures to capture mercury releases include: adsorption by activated carbon in mercury remover and de-acidification through foaming and washing towers; recycling and reuse of mercury-containing effluent; collection of mercury-containing sludge; and recovery of mercury from evaporated substances containing mercury; improved emission controls at catalyst recyclers and producers. For further information, the "Project Report on the Reduction of Mercury Use and Emission in Carbide PVC Production" (Ministry of Environmental Protection, China, 2010) should be consulted.

(c) Chlor-alkali production

~~100.~~104. As mercury cell factories are replaced by mercury-free processes, mercury emissions and wastes are eliminated. Mercury-free chlor-alkali production employs either diaphragm or membrane processes. Membrane technology is the more cost effective of the two because of the lower total electricity input required (Maxson, 2011). Although the mercury cell process is being phased out, as of ~~2010~~2012 there were still ~~about 100~~75 plants using the mercury cell process in ~~44~~40 countries. Solid waste from these chlor-alkali plants amounted to 163,465 tonnes in 2012 (UNEP Global Mercury Partnership – Mercury Reduction in Chlor-alkali Sector ~~2010~~2012). In 2010, mercury cell chlor-alkali installations represented about 10 per cent of global chlor-alkali production capacity. In Japan, the mercury cell process was no longer in use by 1986. At the beginning of ~~2010, 31~~2013, 28 per cent of European chlorine production capacity was based on mercury cell technology. European chlorine manufacturers have voluntarily committed to replace or close down all chlor-alkali mercury cell plants by 2020 (Euro Chlor ~~2010~~). In the United States, use of the mercury cell process declined from 14 facilities in 1996 to ~~five~~two facilities in ~~2007~~2013 (Chlorine Institute ~~2009). According to information from the World Chlorine Council, solid waste from chlor-alkali plants in Europe amounted to 43,293 tonnes in 2009. If North America, India, Russia, Brazil, Argentina and Uruguay are included, the reported total waste generation from this sector was 69,954 tonnes in 2009.[18] The quantity of waste generated by other plants around the world has not been reported.~~[2013]).

~~101.~~105. Waste contaminated with mercury generated from chlor-alkali plants may include semi-solid sludges from water, brine and caustic treatment, graphite and activated carbon from gas treatment, residues from retorting and mercury in tanks/sumps. In addition to monitoring of possible leakages and good housekeeping, reduction of mercury evaporation and better control of mercury emissions and recovery of mercury from wastewater and graphite and carbon from flue gas treatment and caustic treatment could reduce waste generation. For further information, the following documents or website should be consulted:

~~[18] http://www.unep.org/hazardoussubstances/Portals/9/Mercury/Documents/chloralkali/WCC_Hg_reporting2009.pdf.~~

(a) European Commission. (2001): Integrated Pollution Prevention2013b. Commission implementing decision of 9 December 2013 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and Control Reference Documentof the Council on Best Available Techniques in Chlor-Alkali Manufacturing Industry [currently being updated].industrial emissions, for the production of chlor-alkali (2013/732/EU).

(b) Global Mercury Partnership ChloralkaliChlor-alkali sector. Available at: : http://www.unep.org/hazardoussubstanceschemicalsandwaste/Mercury/InterimActivities/Partnerships/ChloralkaliSector/tabid/3560/language/en-US/Default.aspx (this website contains more than 20 guidelines for this industry).

2. Waste prevention and minimization for mercury-added products

106. Introducing mercury-free alternatives and banning mercury-added products are important ways to prevent generation of wastes containing mercury. Under the Minamata Convention, manufacture, export and import of specific mercury-added products are not allowed starting in the year 2020 (see paragraph 21 above).

102.107. As a transitional measure, setting maximum limits of mercury content in products for products where mercury-free alternatives are not available in the foreseeable future, would also help to reduce the generation of mercury wastes containing mercury if mercury-free alternatives are not available or phase-out takes a long timefrom this sector. Replacement of mercury-added products with mercury-free or reduced-mercury alternatives can be facilitated through green purchasing.

103.108. Where mercury-added products are still in use, the establishment of a safe closed system for utilization of mercury is desirable. Mercury contamination of the waste streams should be prevented by:

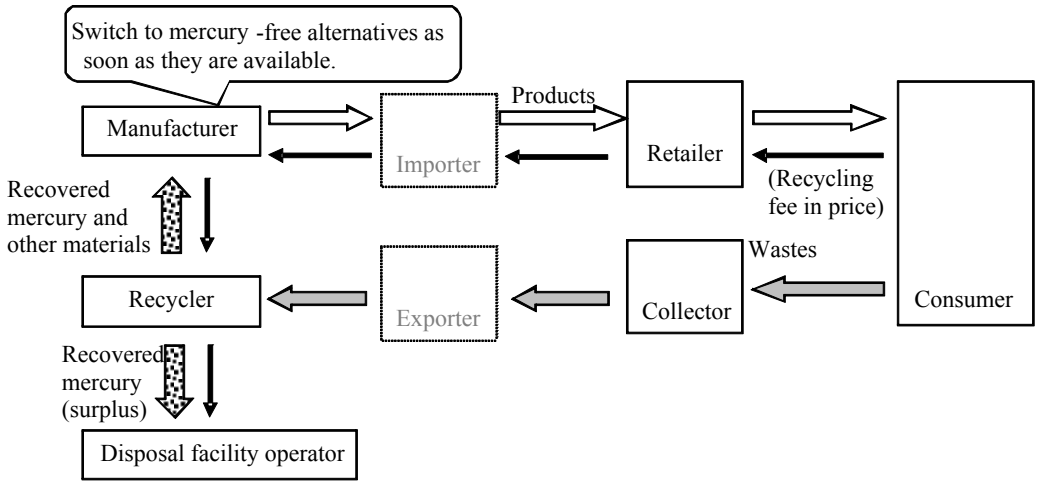
(a) Use of mercury-free products;

(b) Setting maximum limits of mercury contents in products; and

(c) Procurement.Setting procurement standards to purchase mercury-free and products containing mercury lower than specific contents.

Waste containing mercury should be separated from other wastes and collected, and when feasible, mercury should then be recovered from the waste and used for production (instead of using primary mercury)), or disposed of in an environmentally sound manner (see figure -3). Extended producer responsibility (EPR) shouldcan be used as an effective instrument to encourage the production of mercury-free products or less mercury-containing-added -products with a lower mercury content and collection of end products after becoming wastes. Other approaches could include paying a rebate for collection of life products. spent lamps.

Figure -3: Closed System for Utilization of Mercury



~~**Figure -3 Closed System for Utilization of Mercury**~~

(a) Mercury-free products

104.109. The substitution of mercury in products depends on factors such as product costefficacy or performance of substitute, substitute and product costs, impact on the environment and human health, technology, government policies and economies of scale. Many kinds of mercury-free

alternatives are now available. Detailed information about mercury-free alternatives is available in the following publications:

(a) List of alternatives to mercury-added products (UNEP, 2014);

(b) Replacement of mercury thermometers and sphygmomanometers in health care Technical guidance (WHO, 2010);

~~(a)~~(c) Report on the major mercury-containing products and processes, their substitutes and experience in switching to mercury-free products and processes (UNEP, 2008b); and

~~(b)~~(d) Options for reducing mercury use in products and applications, and the fate of mercury already circulating in society (European Commission, 2008~~);~~).

~~h. An Investigation of Alternatives to Mercury Containing Products, Prepared for the Maine Department of Environmental Protection (Galligan et al., 2003) Lowell Center for Sustainable Production, University of Lowell, MA, 2003, http://www.maine.gov/dep/mercury/lespfinal.pdf.~~

(b) Setting maximum limits of mercury content in products

110. Mercury content limits should be established for mercury-added products until such time as they can be ~~banned or~~ phased out, because ~~they~~such limits can result in less mercury used per product in the production stage, which, in turn, ~~results~~could result in less mercury being emitted throughout the entire product lifecycle~~.~~, including from accidental release or breakage, and also reduce the total amount of mercury in wastes requiring mercury-specific management. The Minamata Convention sets maximum content limits allowed for certain products (see paragraph 20 above).

~~105.~~111. Setting maximum limits of mercury content in products can be achieved through legal requirements (see examples in section III, B, 2 below) or voluntary actions under a publicly announced environmental/mercury management plan by the industry sector. As stated previously, legal requirements for the maximum amount of mercury in each unit have been established for batteries and fluorescent lamps in the European Union for both products, and in several States of the United States of America for the former. In Japan, maximum limits of mercury in fluorescent lamps are set by the corresponding industry association, and such limits have been adopted as a criterion in selecting fluorescent lamps for green purchasing by the national government.

~~106.~~112. In order to reduce the use of mercury in fluorescent lamps, manufacturers have developed their own technologies for ensuring a fixed amount of mercury is included in each lamp, so that the minimum and necessary amount of mercury is present to suit the required performance of each type of lamp. Examples of methods for injecting precise amounts of mercury in lamps include using mercury amalgam, a mercury alloy pellet, a mercury alloy ring, and a mercury capsule instead of injecting elemental mercury (Ministry of the Environment, Japan 2010).

~~107.~~113. The use of mercury amalgam dosing may have environmental and performance advantages over the use of elemental mercury throughout the life ~~-~~cycle of compact fluorescent lamps (CFLs) and other types of mercury-added lamps. Its strength is to minimize worker and consumer exposure – as well as environmental releases – to mercury vapour during manufacturing, transportation, installation, storage and recycling and disposal, particularly when lamps break. In addition, this accurate dosing method enables manufacturers to produce CFLs that contain very low mercury levels (two milligrams or less) while meeting important performance requirements including high efficiency and long lamp life.

(c) Procurement

~~108.~~114. Procurement programmes for mercury-free products should be encouraged in order to pursue waste prevention and promote uses of mercury-free products and products containing less mercury. Purchasing practices should, where possible, aim “to purchase mercury-free products,”

except in the few cases where alternatives to mercury-added products are practically or technologically unavailable, or "to purchase products whose mercury content is minimized~~".~~."

~~109.~~115. Larger users of mercury-added products, such as government institutions and healthcare facilities, can play an important role in stimulating the demand for mercury-free products by implementing green procurement programmes. In some cases, financial incentives could be used to encourage green procurement programmes. Some states in the United States, for instance, have subsidized the purchase of mercury-free thermometers.

3. Extended producer responsibility

~~110.~~116. Extended producer responsibility (EPR) is defined as "an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle. "Producer"[19] is considered to be the brand owner or importer except in cases such as packaging, and in situations where the brand owner is not clearly identified, as in the case of electronics, in which the manufacturer (and importer) would be considered as the producer (OECD, 2001a). EPR programmes shift the responsibility for end-of-life management of products to the producer, who puts the product for the first time on the market and away from municipalities, and can provide incentives for producers to incorporate environmental considerations in the design of their products so that the environmental costs of treatment and disposal are incorporated into the cost of the product. EPR can be implemented through mandatory, negotiated or voluntary approaches. Take-back collection programmes may be part of EPR programmes (see section F, 3, (b), d).

~~111.~~117. EPR programmes, depending upon their design, can achieve a number of objectives: (1) relieve the local government of the financial and, in some cases, the operational burden of the disposal of the waste/products/material, (2) encourage companies to design products for reuse, recyclability, and materials reduction (in terms of quantity and hazardousness); (3) incorporate waste management costs into the product price; (4) promote innovation in recycling technology. This promotes a market that reflects the environmental impact of products (OECD 2001a). Detailed descriptions of EPR schemes are available in several OECD publications~~.~~[20].

~~112.~~118. Where EPR programmes are used, environmental authorities should develop regulatory frameworks setting out the responsibilities of relevant stakeholders, standards for mercury contents and management of products, and components of EPR programmes, and encourage participation by relevant parties and the public. They should also be responsible for monitoring the performance of EPR programmes (e.g. amount of wastes collected, amount of mercury recovered and costs accrued for collection, recycling and storage) and for recommending changes as necessary. In implementing EPR programmes, the responsibility ~~should be placed on~~is most appropriately shared by all producers of the products considered, and free riders (producers who do not share their responsibilities) should not be allowed, otherwise other producers are forced to bear costs that are disproportionate to their product market share).

~~113.~~119. In the European Union, for example, fluorescent lamps including CFLs are one of the products subject to the requirements of the Waste Electrical and Electronic Equipment (WEEE) Directive. The WEEE Directive requires producer responsibility for end-of-life management of electrical and electronic equipment that contain, inter alia, mercury. Other examples include the EPR programme for batteries in the European Union, fluorescent lamps and batteries in the Republic of Korea.~~.~~[21].

F. Handling, separation, collection, packaging, labelling, transportation and storage

~~114.~~120. The procedures for handling, separation, collection, packaging, labelling, transportation and storage pending disposal of ~~wastes consisting of elemental~~ mercury ~~and~~ wastes ~~containing or contaminated with mercury~~ are similar to those for other hazardous wastes. Mercury ~~has some~~'s physical and chemical properties ~~that~~make it very mobile in the environment, and require additional precautions and handling techniques ~~but, in its elemental form, it is widely recognizable. In addition, sophisticated, accurate field and laboratory measurement techniques and equipment can, where available, make detection and monitoring for spills relatively straightforward.~~.~~

[19] European Union Directive 2008/98/EC provides that any natural or legal person who professionally develops, manufactures, processes, treats, sells or imports products has extended producer responsibility.

[20] http://www.oecd.org/document/19/0,3746,en_2649_34281_35158227_1_1_1_1,00.html.

[21] Information is available at http://eng.me.go.kr/content.do?method=moveContent&menuCode=pol_rec_pol_rec_sys_responsibility.

~~115.~~121. Specific technical guidance on the most appropriate handling ~~wastes consisting~~ of ~~elemental~~ mercury ~~and wastes containing or contaminated with mercury are~~wastes is provided in this section, but it is imperative that generators consult and adhere to their specific national and local authority requirements. For transport and transboundary movement of hazardous wastes, the following documents should be consulted to determine specific requirements:

(a) Basel Convention. 1995a. Manual for the Implementation of the Basel Convention ~~(SBC 1995a)~~;

(b) International Maritime Organization. 2014. ~~(IMO):~~ International Maritime Dangerous Goods Code, 2014 Edition, ~~2014 Edition (IMO 2002~~2014~~)~~;

(c) International Civil Aviation Organization ~~(ICAO~~. 2013. ~~):~~ Technical Instructions for the Safe Transport of Dangerous Goods by Air, 2013-2014 Edition ~~(ICAO 2013)~~;

(d) International Air Transport Association. 2014. ~~(IATA):~~ Dangerous Goods Regulations Manual ~~(IATA 2007~~2014~~)~~; and

(e) UNECE. 2013. ~~:~~ United Nations Recommendations on the Transport of Dangerous Goods, Model Regulations ~~(UNECE 2007~~2013~~)~~.

122. Product-specific guidance materials for handling, separation, collection, packaging, labelling, transportation and storage of such wastes are available from the followings:

(a) UNDP. 2010. Medical devices: Guidance on the Clean-up, Temporary or Intermediate Storage, and Transport of Mercury Waste from Health Care Facilities;

(b) WHO. 2010. Dental amalgam waste: "Chapter 6. Best Management Practices (BMP) for amalgam waste" in Future Use of Materials for Dental Restoration; and

(c) Fluorescent lamps: Training Module (1-hour version) for Generators and Handlers of Fluorescent and Mercury-Containing Lamps (and Ballasts) (The Lamp Recycling Outreach Project).

1. Handling

~~116.~~123. Those who handle ~~wastes consisting of elemental~~ mercury waste should pay particular attention to the prevention of evaporation and spillage of elemental mercury into the environment. Such waste should be placed in a gas- and liquid-tight container that bears a distinctive mark indicating that it contains "toxic" elemental mercury. Specially designed steel containers are most appropriate for this, as mercury amalgamates with many metals (e.g., zinc, copper and silver). Some plastics are permeable to mercury vapours and should be avoided if possible.

~~117.~~124. End users should handle safely and prevent any breakage or damage to waste mercury-added products such as fluorescent lamps, thermometers, electrical and electronic devices, etc. Waste mercury-added products such as paints and pesticides should be handled safely and should not be discharged into sinks, toilets, storm sewers or other rainfall runoff collection systems. These wastes should not be mixed with any other wastes. If such ~~wastes~~waste devices are accidentally broken or spilled, the clean-up procedure should be followed (see section III, L below).

~~118.~~125. Those who handle wastes contaminated with mercury should not mix them with other wastes. Such waste should be placed in a sealed container to prevent its release into the environment.

~~**(a) Reduction of discharge from dental amalgam waste**~~

~~2. To reduce mercury discharge from dental waste, the United States EPA recommends Environmentally Responsible Practices.[22] Strategies for proper amalgam management include the following:~~

~~a. Discard excess amalgam wastes into a grey bag. Never dispose of dental amalgam wastes in medical red bags or in office trash containers;~~

~~b. Select a responsible dental amalgam recycler – who will manage your waste amalgam safely to limit the amount of mercury which can go back into the environment;~~

~~[22] http://www.epa.gov/hg/pdfs/dental-module.pdf.~~

c. Install an amalgam separator in the office to capture up to 95 per cent of the mercury leaving a dental office through drains;23 and

d. Educate and train staff about the proper management of dental amalgam in the office.

2. Separation

119.126. Separation and collection of wastes consisting of elemental mercury and wastes containing or contaminated with mercurywastes are key factors in ESM because if such waste is simply disposed of as municipal solid waste (MSW) without any separation, the mercury content in the waste may be released into the environment as a result of landfilling or incineration. Wastes containing or contaminated with mercury should be collected separately from other wastes with no physical breakage or contamination. It is recommended to collect such wastes from households and other waste generators such as companies, governments, schools and other organizations separately, because the amount of waste generated by the two sectors differs.

127. Industrial mercury wastes should be managed as hazardous wastes separate from other wastes generated at the facility, as required by national law. Separate management of these wastes allows for appropriate treatment to either extract the mercury from the waste, or to stabilize the waste for proper disposal, without diluting the mercury content. Dilution of the mercury in the waste by mixing it with other wastes could make treatment less effective, or could inappropriately reduce the mercury concentration to be below the threshold(s) to be established under paragraph 2 of Article 11 of the Minamata Convention, thereby avoiding proper management of the waste.

120.128. The following items should be considered when implementing collection programmes for wastes consisting of elemental mercury and wastes containing or contaminated with mercurymercury wastes, in particular for waste mercury-added products from households and commercial/institutional entities:

(a) Advertise the programme, depot locations and collection time periods to all potential holders of such waste;

(b) Allow enough time for the collection programmes to complete the collection of all such waste;

(c) Include in the programme, to the extent practical, the collection of all such waste;

(d) Make available acceptable containers and safe-transport materials to owners of any such waste that needs to be repackaged or made safe for transport;

(e) Establish simple, low-cost mechanisms for collection;

(f) Ensure the safety both of those delivering such waste to depots and of workers at the depots;

(g) Ensure that the operators of depots are using an accepted disposal method;

(h) Ensure that the programme and facilities meet all applicable legislative requirements; and

(i) Ensure separation of such waste from other waste streams.

121.129. Depending on national or local legislation, labelling products which contain mercury can help to secure the proper separation and consequently the environmentally sound disposal of mercury-added products at the end of their useful life. AAny labelling system should be implemented by the producer during the manufacturing stage to help collection/recycling programmes to identify products that contain mercury and need special handling.[24] Labelling may need to comply with national right-to-know disclosure regulations for the presence, identity and properties of a toxic

[23] This is also part of the German Ordinance on Requirements for the Discharge of Wastewaters into Waters of 17 June 2004 (AbwV), (see page 106 in http://www.bmu.de/files/pdfs/allgemein/application/pdf/wastewater_ordinance.pdf).

[24] By way of example, guidelines are available at: http://www.newmoa.org/prevention/mercury/imerc/labelinginfo.cfm.
and the labelling scheme can be found at: http://www.digitaleurope.org/Services/MecuryFreelogo.aspx

substance in products. The label may need to specify proper operating conditions and care during use. It may include ~~end-of-life~~waste management instructions that encourage recycling and prevent improper disposal.

~~122.~~130. A labelling system for a "mercury-added product" could achieve the following objectives:~~:~~[25]~~:~~

(a) Informing consumers at the point of purchase that the product contains mercury and may require special handling at end-of-life;

(b) Identifying the products at the point of disposal so that they can be kept out of the waste stream destined for landfill or incineration and thus be recycled;

(c) Informing consumers that a product contains mercury, so that they will have information that will lead them to seek safer alternatives; and

(d) Providing right-to-know disclosure for a toxic substance.

~~123.~~131. Manufacturers can indicate mercury-added products by printing the international chemical symbol for mercury, "Hg" on them. For example, mercury-added products sold in certain states of the United States are required to carry this symbol~~:~~ ~~:~~[26]~~:~~ (Hg) . In the European Union, for example, the chemical symbol "Hg" is required to be printed on mercury-~~containing~~added batteries by Directive 2006/66/EC. Use of a similar emblem on the packaging labels of lamps traded internationally could promote global recognition that the lamp contains mercury. Additional information in appropriate local languages could further explain the (Hg)-symbol.

132. In the United States, the National Electrical Manufacturers Association's (NEMA) Lamp ("light bulb") Section maintains that a harmonized national or international approach to labelling mercury-~~containing~~added lamps is an essential component of the efficient and economic distribution of energy efficient lighting~~.~~[27] . On ~~18 June~~19 July 2010, the United States Federal Trade Commission promulgated a rule[28] requiring that, starting in ~~January 2012~~19 July 2011, packaging for CFLs, light emitting diode (LED) lamps and traditional incandescent lamps must include new labels to help consumers choose the most efficient lamps for their lighting needs. For mercury-added lamps, both the ~~labels~~packaging and the lamps themselves will include this label disclosure as follows:~~:~~[29]

Figure 4: Example of Product Labelling (Fluorescent Lamp, left for packaging, right for product)

~~**Figure 4** Example of Product Labelling (Fluorescent Lamp, left for packaging, right for product)~~

~~124.~~133. When mercury-added products are exported to other countries where those products become waste, local consumers, users and other stakeholders may be unable to read foreign language labelling on those products. In this case, importers, exporters, manufacturers or national agencies in charge of product labelling should use appropriate and/or local language.

[25] By way of example, guidelines on the four points are available at: http://www.newmoa.org/prevention/mercury/imerc/ labelinginfo.cfm (NEWMOA, 2004).

Under the Law for Promotion of Effective Utilization of Resources in Japan, manufacturers and importers must include a label bearing the J-Moss symbol (http://~~210.254.215.73/~~home.jeita~~-~~.or.jp/eps/200512jmoss/orange.jpg) if any of the products (personal computers, air conditioners, television sets, refrigerators, washing machines, microwaves and home driers) contains lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and/or polybrominated diphenyl ethers (PBDE).

[26] Available at: http://www.newmoa.org/prevention/mercury/imerc/labelinginfo.cfm

[27] Available at: http://www.nema.org/Policy/Environmental-Stewardship/Lamps/Documents/Labeling%20White%20Paper%20Final%2010%2004.pdf and http://www.nef.org.uk/energysaving/lowenergylighting.htm.

[28] Appliance Labeling Rule, 75 Fed. Reg. 41696 (July 19, 2010).

[29] Available at: http://www.ftc.gov/os/2010/06/100618lightbulbs.pdf, last visited on 29 May 2011. For information about recycling etc., see: http://www.epa.gov/cfl/cflrecycling.html.

3. Collection

(a) Collection of ~~wastes~~waste consisting of ~~elemental~~ mercury or mercury compounds

~~125.~~134. Wastes consisting of ~~elemental~~ mercury or mercury compounds (e.g. from a closing chlor-alkali facility) are ~~typically~~ different from other mercury wastes in ~~volume and in~~terms of the hazards they may pose if mishandled. These may also be generated in high volumes, making their safe collection more difficult. Elemental mercury in bulk form must be carefully packaged in appropriate containers before shipping to designated storage or disposal facilities.[30]

(b) Collection of ~~wastes containing~~waste mercury-added products

~~126.~~135. Waste mercury-added products, after becoming wastes, should be collected separately from other wastes with as little physical breakage or contamination as possible. It is recommended to collect such wastes from households and other waste generators, such as companies, governments, schools and other organizations separately, because the amount of waste generated by the two sectors differs.

~~127.~~136. There are three options for collecting ~~wastes containing~~waste mercury-added products such as those referred to in paragraph 21 ~~fluorescent lamps, batteries, thermometers and electronic devices containing mercury~~ above from households (mercury batteries may be collected together with other types of batteries); these are discussed in the following three sections.

~~a.~~(i) Waste collection stations or drop-off depots

~~128.~~137. Only waste containing mercury should be discarded in a specially designed container at a waste collection station or depot in order to avoid mixing waste containing mercury with other wastes. Waste containing mercury should be collected exclusively by collectors authorised by local governments or appropriate authorities.

~~129.~~138. Boxes or containers for waste containing mercury should be made available for public use at existing waste collection stations. Coloured, marked waste containers should be used exclusively for waste containing mercury such as fluorescent lamps and mercury-~~containing~~added thermometers and batteries. Designated containers should all be the same colour and/or bear the same logo to facilitate public education and increased participation. Breakage of fluorescent lamps and thermometers should be avoided, *inter alia,* through appropriate box design and by providing written information on collection procedures. Different containers should be used for tube bulbs and CFLs. For CFLs, it is important to minimize the "free fall" of the lamp by installing soft, cascading baffles or flaps. Alternatively, a small open box could "invite" users to carefully place their spent bulbs inside without breaking them. Another option to minimize breakage involves the consumer handing the fluorescent lamps over to a competent staff member of a collection station to place in a box. In the event that lamp breakage does occur, the area should immediately be ventilated and staff should be informed in advance and follow clean up procedures.[31]

~~b.~~(ii) Collection at public places or shops

~~130.~~139. Waste containing mercury, particularly used fluorescent lamps, thermostats, mercury batteries and thermometers may be collected via specially designed collection vehicles or at public places or shops such as town halls, libraries, other public buildings, electronics stores, shopping malls and other retail outlets, provided that appropriate collection containers are available. Separate collection boxes or containers for these wastes should be designed to accommodate their characteristics and to minimize breakage. Only containers specifically designed for this purpose and shown to be capable of containing mercury vapour from broken lamps should be used in public collection locations.[32] Consumers should be able to take used fluorescent lamps, mercury batteries, thermostats, and mercury thermometers to those places free of charge. Authorized collectors, such as municipal collectors or private sector collectors (e.g. collectors trusted by producers of those products), should collect the wastes in the waste collection boxes or containers.

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[30] The United States Department of Energy provides detailed guidance on the safe handling and storage of elemental mercury ~~in~~ at the following website: http://mercurystorageeis.com/Elementalmercurystorage%20Interim%20Guidance%20(dated%202009-11-13).pdf and: http://mercurystorageeis.com/Volume%201-Final%20Mercury%20Storage%20EIS.pdf.

[31] Cleaning up a broken CFL, US EPA, see: http://www.epa.gov/cfl/cflcleanup.html; *Shedding Light on Mercury Risks from CFL Breakage*, Mercury Policy Project, February 2008, see: http://mpp.cclearn.org/wp-content/uploads/2008/08/final_shedding_light_all.pdf, German Environment Protection Agency, see: http.//umweltbundesamt.de/energie/licht/hgf.htm (in German).

[32] See: Glenz, T. G., Brosseau, L.M., Hoffbeck, R.W. (2009).

~~131.~~140. Boxes or containers for waste containing mercury should be monitored to avoid any other waste being deposited in them. The boxes or containers should also be labelled and placed inside buildings such as public buildings, schools and shops, where they can be monitored in a well-ventilated area, or, for example, outside the building in a covered and protected area.

~~c.~~(iii) Collection at households by collectors

~~132.~~141. Collection of waste mercury devices at households by authorized collectors may be applied for certain wastes such as e-waste. In order to ensure efficient collection of waste containing mercury by local collectors, an initiative or legal mechanism will often be required; for example, governments, producers of mercury-added products or other agencies will need to provide arrangements for the collection of waste containing mercury by local collectors.

~~d.~~(iv) Collection coordinated by business associations

142. Collection of waste mercury-added products from business/commercial entities could be implemented by business/commercial associations in an efficient manner. For example in Japan, the Tokyo Medical Association established an ad-hoc collection system for unnecessary mercury thermometers and sphygmomanometers and collected several thousands of these devices during one month of a collection period. During the collection period, each member medical institution was encouraged to bring these devices to designated local association branch offices and pay specific fees for transportation/disposal. The Tokyo Medical Association coordinated with local association branches and waste transporters/treaters for efficient collection and disposal. Each member medical institution benefited from lower fees for transportation because of economies of scale and from efficient transport arrangements.

(v) Take-back collection programme

~~133.~~143. Take-back programmes can refer to a variety of programmes established to divert spent or waste products from the waste stream for purposes of recycling, reusing, refurbishing or in some cases recovery. Take-back programmes are often voluntary initiatives delivered by the private sector (e.g. manufacturers and in some cases retailers) which provide the opportunity to consumers to return used products at the point of purchase or some other specified facility. Some take-back programmes offer financial incentives to consumers, others can be mandated or operated by governments (e.g. bottle deposits), and others can also partly finance disposal or recycling activities. Take-back collection programmes generally focus on consumer products that are widely used (Honda 2005), such as batteries, switches, thermostats, fluorescent lamps and other mercury-added products.

~~134.~~144. In Japan, producers collect and recycle used fluorescent lamps through leasing systems for business establishments under the Akari Anshin Service (Panasonic, 2009) and the Hitachi Lighting Service Pack (Hitachi, 2006).

(c) Collection of wastes contaminated with mercury or mercury compounds

~~135.~~145. Sewage treatment plants and waste incinerators are generally designed to include equipment for collecting sewage sludge, ash and residues which might contain trace amounts of mercury as well as other heavy metals. Mercury air pollution control devices in incinerators may increase mercury concentrations in the collected fly ash. If mercury concentrations in these wastes exceed the criteria for hazardous waste, the wastes should be collected separately.

4. Packaging and labelling

~~136.~~146. For transporting ~~wastes consisting of elemental~~ mercury ~~and wastes containing or contaminated with mercury~~wastes from generators' premises or public collection points to waste treatment facilities, the wastes should be properly packaged and labelled. Packaging and labelling for transport is often controlled by national hazardous waste or dangerous goods transportation legislation, which should be consulted first. If there is no or insufficient instruction, reference materials published by national governments, IATA, IMO and UNCE should be consulted. International standards have been developed for the proper labelling and identification of wastes. The following reference materials are helpful:

(a) UNECE. ~~(~~2003~~):~~ Globally Harmonized System of Classification and Labelling of Chemicals; and

(b) OECD. ~~(~~2001b~~):~~ Harmonized Integrated Classification System for Human Health and Environmental Hazards of Chemical Substances and Mixtures.

5. Transportation

~~137.~~147. ~~Wastes consisting of elemental mercury and wastes containing or contaminated with mercury~~Mercury wastes should be transported in an environmentally sound manner in order to avoid accidental spills and to track their transportation and ultimate destination appropriately. Prior to transportation, contingency plans should be prepared in order to minimize environmental impacts associated with spills, fires and other emergencies that might occur. During transportation, such wastes should be identified, packaged and transported in accordance with the "United Nations Recommendations on the Transport of Dangerous Goods: Model Regulations (Orange Book)". ~~Persons transporting such wastes should be qualified and certified as carriers of hazardous materials and wastes.~~

~~138.~~148. Companies transporting wastes within their own countries should be certified as carriers of hazardous materials and wastes, and their personnel should be qualified~~.~~ and certified as handling of hazardous materials and wastes as required by national or local legislation. Transporters should manage ~~wastes consisting of elemental~~ mercury ~~and~~ wastes ~~containing or contaminated with mercury~~ in a way that prevents breakage, release of their components into the environment and exposure to moisture.

~~139.~~149. Guidance on the safe transportation of hazardous materials can be obtained from IATA, IMO, UNECE and ICAO (see ~~-~~paragraph 121~~-~~).

6. Storage

(a) Storage of wastes containing mercury by waste generators pending collection

~~140.~~150. Storage by waste generators pending collection means that wastes containing mercury are stored temporarily at the waste generator's premises before the waste is collected for disposal. Wastes containing mercury should be stored safely and kept apart from other wastes until they are brought to waste collection stations or facilities or picked up by collection programmes or contractors. Bulk waste should be stored in such a manner as to minimize release to the environment, including, if feasible, storage in closed containers, on an impermeable concrete pad (with runoff controls), or covered with a waterproof tarp. Waste should be stored by generators for a limited time, as allowed by national standards or regulations, and in any case sent off-site for appropriate disposal as soon as is practical.

~~141.~~151. Household wastes containing mercury, mainly fluorescent lamps, other lamps, mercury-~~containing~~added batteries and ~~mercury-containing~~ thermometers, should be stored temporarily after appropriately packaging them, for example by using new product packaging or boxes that fit the shape of the wastes. Any mercury devices that are broken in the course of handling should be cleaned-up and all clean-up materials stored outdoors until collection for further management.[33] Liquid wastes containing mercury such as paints and pesticides should be kept in the original containers and their lids should be tightly closed. Containers and packages enclosing waste containing mercury should not be placed together with other wastes; they should be marked and stored in a dry and secure place such as a warehouse or other space that is not usually frequented by people.

~~142.~~152. In addition to the guidance contained in the two above paragraphs, large-scale users such as governments, businesses and schools will also need a plan to store large amounts of wastes containing mercury. Where original boxes or packages are not available, containers which are specially designed to store wastes containing mercury (e.g. fluorescent lamp containers) should be purchased. Containers or boxes for storing wastes containing mercury should be marked and dated and stored in a dry place. It is recommended to use ~~a separate~~an area or room separated from work areas or areas not open to the public for storing such wastes. These areas should also not share building ventilation systems with work or public areas, and have their own ventilation system or be vented directly to the outdoors. Guidance developed by the GEF for mercury wastes generated by health care facilities[34] provides detailed advice in this regard, which may be applicable to many commercial facilities that generate waste mercury devices.

[33] Materials should be stored outdoors because many commonly available containers such as plastic bags are permeable to mercury vapour. See, Maine DEP (2008).

[34] Guidance on the Clean Up, Temporary or Intermediate Storage, and Transport of Mercury Waste from Healthcare Facilities. http://www.gefmedwaste.org/downloads/Guidance%20on%20Cleanup%20Storage%20and%20Transport%20of%20Mercury%20from%20Health%20Care%20July%202010.pdf.

(b) Storage of ~~wastes consisting of elemental~~ mercury ~~and~~ wastes ~~containing or contaminated with mercury~~ pending disposal operations

~~143. This section covers storage of wastes consisting of elemental mercury and wastes containing or contaminated with mercury after collection before disposal as specified in paragraph . The technical requirements regarding storage of hazardous waste should be complied with, including national standards and regulations as well as international regulations. The risk of contamination to other materials should be avoided.~~

153. ~~a.~~Storage of mercury wastes at disposal facilities should also minimize the potential for release to the environment.

(i) Technical and operational considerations for storage facilities

~~144.~~154. In terms of siting and design, in principle, storage facilities should not be built in sensitive locations ~~such as~~whenever possible. These may include floodplains, wetlands, groundwater, earthquake zones, Karst terrain, unstable terrain or ~~those~~areas with unfavourable weather conditions and incompatible land use, in order to avoid any significant risks of mercury release and possible exposure to humans and the environment. However, such location limitation may not apply to the cases where technical (design) and legal conditions assure environmentally sound management of storage facilities. The storage area should be designed to ensure the security of the facility, and also ensure that there is no unnecessary chemical or physical reaction to mercury. The floors of storage facilities should be covered with mercury-resistant materials~~.~~ to prevent seepage or penetration of mercury from accidental leaks and spills. Storage facilities should have fire alarm systems and fire suppression systems and have negative pressure environments to avoid mercury emissions to the outside of the building. The temperature in storage areas should be maintained as low as feasibly possible, preferably at a constant temperature of 21 ~~°C.~~degrees Celsius. The storage area for ~~wastes consisting of elemental~~ mercury ~~and~~ wastes ~~containing or contaminated with mercury~~ should be clearly marked with warning signs (FAO, 1985; United States, EPA, 1997b; SBC, 2006; United States Department of Energy, 2009).

~~145.~~155. In terms of operation, storage facilities should be kept locked to avoid theft or unauthorized access. Access to ~~wastes consisting of elemental~~ mercury ~~and~~ wastes ~~containing or contaminated with mercury~~ should be restricted to those with adequate training ~~for the purpose~~ including in ~~recognition~~the identification of types of mercury wastes, mercury-specific hazards and handling~~.~~ of such wastes. It is recommended that storage buildings for all types of ~~wastes consisting of elemental~~ mercury ~~and~~ wastes ~~containing or contaminated with mercury~~ should not be used to store other liquid wastes and materials. A full inventory of the wastes kept in the storage site should be created and updated as waste is added or ~~disposed of~~removed. Regular inspection of storage areas should be undertaken, focusing particularly on damage, leaks, spills and deterioration. Clean-up and decontamination should be carried out speedily, but not without alerting the authorities concerned~~.~~, and in compliance with national laws and regulations. (FAO, 1985; United States EPA, 1997b).

~~146.~~156. In terms of safety for facilities, site-specific procedures should be developed to implement the safety requirements identified for storage of ~~wastes consisting of elemental mercury and wastes containing or contaminated with mercury.~~mercury wastes. A workable emergency plan, preferably with multiple procedures, should be in place and implemented immediately in case of accidental spillage and other emergencies. The protection of human life and the environment is paramount. In the event of an emergency, there should be a responsible person who can authorize modifications to the safety procedures when necessary in order to allow emergency response personnel to act. Adequate security siting and access to the area should be ensured (Environmental Management Bureau, Republic of the Philippines, 1997; SBC, 2006; U.S. Department of Energy, 2009).

~~b.~~(ii) Special considerations for storage of wastes consisting of ~~elemental~~ mercury or mercury compounds

~~147.~~157. ~~All containers~~A container should be ~~designed exclusively for~~structurally sound and capable of storing wastes consisting of ~~elemental mercury. The containers~~mercury or mercury compounds in an environmentally sound manner. A container should meet the following requirements: (1) no damage from any previously contained materials and those materials should not adversely react with mercury; (2) no damage to the structural integrity of the container; (3) no excessive corrosion; and (4) should have a protective coating (paint) to prevent against corrosion. Appropriate material for mercury containers is carbon or stainless steel which does not react with mercury at ambient temperatures. No protective coating is required for the inner surface of such containers as long as mercury meets purity requirements and no water is present inside the container. Protective coating

(e.g. epoxy paint and electroplating) should be applied to all exterior carbon steel surfaces in a manner that will not leave the steel exposed. The coating ~~must~~should be applied in a manner that minimizes blistering, peeling, or cracking of the paint. Labelling, including name of suppliers, origin, container number, gross weight, date when mercury was injected and a corrosives label, should be affixed to each container (United States Department of Energy, 2009). In addition, the container's compliance with specific technical requirements (tightness, pressure stability, shock resistance, behaviour when exposed to heat) should be shown on the label.

~~148.~~158. Containers for wastes consisting of ~~elemental~~ mercury or mercury compounds should be stored upright on pallets off the ground~~, with overpacking~~. The aisle in storage areas should be wide enough to allow for the passage of inspection teams, loading machinery, and emergency equipment. The floor should be coated with an epoxy coating and light coloured to allow detection of mercury droplets. The floor and coating should be inspected frequently to ensure that the floor has no cracks and the coating is intact. The floor of the warehouse should not be penetrated by any drains or plumbing, although sloped floors and open flow gutters with rounded-down edges could be used to avoid mercury trapping under gutter covers and to assist in the collection of spills. When choosing the materials from which to construct the walls, materials that do not readily absorb mercury vapour should be selected. It is important to include redundant systems to prevent releases in the event of an unexpected occurrence (U.S. Department of Energy, 2009; World Chlorine Council, 2004).

~~149.~~159. When storing wastes consisting of ~~elemental~~ mercury or mercury compounds, it should be as pure as possible in order to avoid any chemical reaction and degradation of containers. A mercury content greater than 99.9 weight per cent is recommended. For purification techniques, see section III, G, 1, f below.

~~c.~~(iii) Special considerations for storage of wastes contaminated with mercury or mercury compounds

~~150.~~160. Liquid wastes in containers should be placed in containment trays or a curved, leak-proof area. The liquid containment volume should be at least 125 per cent of the maximum liquid waste volume, taking into account the space taken up by stored items in the containment area.

~~151.~~161. Solid wastes should be stored in sealed containers such as barrels or pails, steel waste containers or in specially constructed containers that do not release mercury vapour.

G. Environmentally sound disposal

~~152.~~162. The following disposal operations, as provided for in Annexes IV A and IV B of the Basel Convention, should be permitted for the environmentally sound management of ~~wastes consisting of elemental mercury and wastes containing or contaminated with mercury:~~[35] mercury wastes[36]:

R4 Recycling/reclamation of metals and metal compounds;

R5 Recycling/reclamation of other inorganic materials;

R8 Recovery of components from catalysts;

R12 Exchange of wastes[37] for submission to operations R4, R5, R8 or R13;

R13 Accumulation of material intended for operations R4, R5, R8 or R12;

D5 Specially-engineered landfill;

D9 Physico-chemical treatment;

D12 Permanent storage;

D13 Blending or mixing[38] prior to submission to D5, D9, D12, D14 or D15;

D14 Repackaging prior to submission to D5, D9, D12, D13 or D15; and

D15 Storage pending any of the operations D5, D9, D12, D13 or D14.

~~153.~~163. In addition, a form of backfilling in underground facilities may also be permitted whereby waste is utilized in underground facilities for mining safety purposes taking advantage of the

~~[35] For information on storage pending disposal operations (operations R13 and D15), see section III, F, 6.~~

[36] For information on storage pending disposal operations (operations R13 and D15), see section III, F, 6.

[37] Exchange of wastes is interpreted to cover pre-treatment operations unless another R code is appropriate.

[38] Examples include pre-processing such as sorting, crushing, drying, shredding, conditioning or separating.

respective structural properties of the waste.[39] In Germany, for example, such a process is regulated by the Ordinance on Underground Waste Stowage (see http://www.bmu.de/fileadmin/bmu-import/files/pdfs/allgemein/application/pdf/underground_waste_stowage.pdf) that contains requirements that are equivalent to the European Landfill Directive and is subject to special licensing procedures and supervision.

164. In case a process as described in section III, G, 1 is carried out and the mercury is subsequently sent to a D5 or D12 operation, the operations described in section III, G, 1 would fall under operations D13 and D9. On the other hand, in case a process described under section III, G, 2 (e.g. stabilization) is carried out and the waste is subsequently sent to an R operation, such a process would also fall under an R operation. This may not be the case in all countries.

1. Recovery operations

165. Mercury recovery from solid waste generally comprises four processes: (1) pre-treatment; (2) thermal treatment; 3) thermal desorption and (3) purification, as shown in figure 5. In order to minimize mercury emissions from the mercury recovery process, a facility should employ a closed-system. The entire process should take place under reduced pressure in order to prevent leakage of mercury vapour into the processing area (Tanel, 1998). The small amount of exhausted air that is used in the process passes through a series of particulate filters and a carbon bed which absorbs the mercury prior to exhausting to the environment.

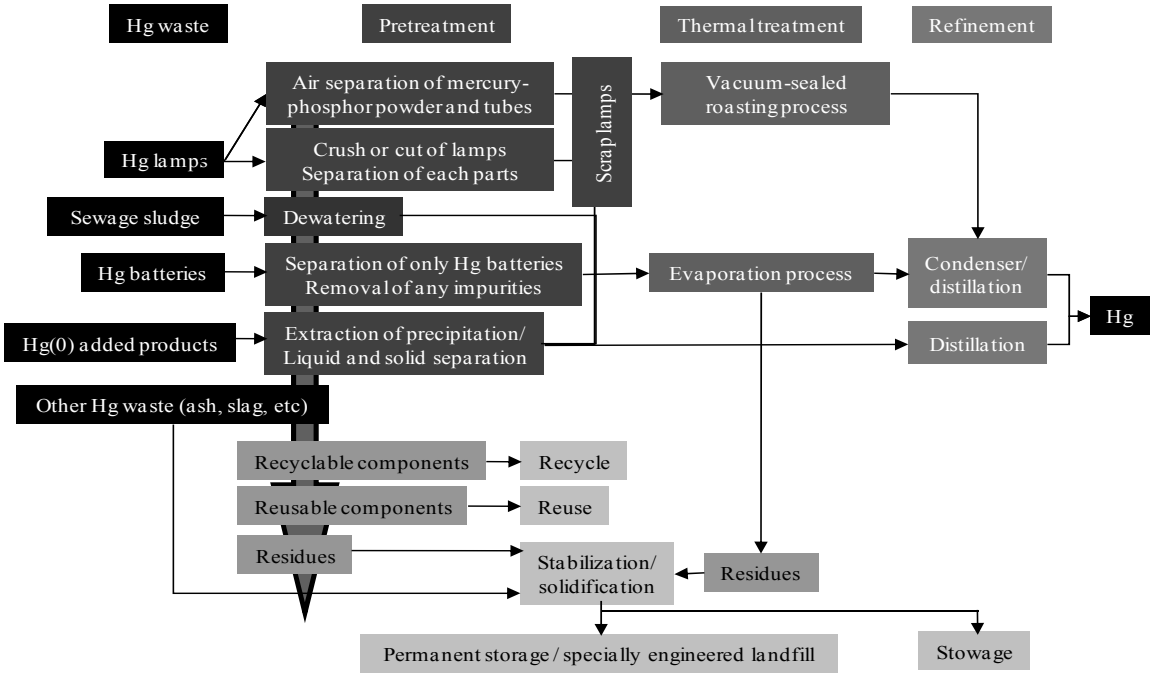
166. Examples for mercury recovery are: waste mercury-added equipment that easily releases mercury into the environment when broken; and wastes contaminated with a high concentration of mercury. The former include lamps containing mercury, measuring devices containing mercury (thermometers, sphygmomanometers, and manometers) and mercury switches and relays, and may include lamps containing mercury. The latter include wastewater treatment sludge from wet scrubbers of non-ferrous metal smelters. In the United States, a specific standard for wastes subject to mercury recovery has been set; thehazardous waste having a total mercury content greater than or equal to 260 mg/kg is subject to mercury recovery based on the Land Disposal Restrictions (see: U.S. Code of Federal Regulations: 40 CFR 268.40).

167. The Technical Guidelines on the Environmentally Sound Recycling/Reclamation of Metals and Metal Compounds (R4) of the Basel Convention focus mainly on the environmentally sound recycling and reclamation of metals and metal compounds including mercury that are listed in Annex I to the Basel Convention as categories of wastes to be controlled. It is possible to recycle mercury wastes, particularly wastes consisting of elemental mercury and wastes containing or contaminated with mercury, particularly elemental or mercury compounds, in special facilities which have advanced mercury-specific recycling technology. It should be noted that appropriate procedures should be employed in such recycling to prevent any releases of mercury into the environment. In addition, recycled mercury may be sold on the international commodities market, where it can be re-used. The recovery recycling of metal mercury-[40] will usually be determined by the degree of allowable use and a commercial evaluation as to whether it can be profitably recovered.

[39] Such backfilling of mercury sulphide resulting from the stabilization of wastewastes consisting of elemental mercury is currently possible only in Germany.

[40] See Article 11(3)(b) of the Minamata Convention. Furthermore, note that Article 3(5)(b) of that Convention prevents recycling of excess mercury (but not mercury wastes) from the decommissioning of chlor-alkali facilities.

Figure 5: Flow of mercury recovery from solid waste (Nomura Kohsan Co. Ltd., 2007)



~~**Figure 5 Flow of mercury recovery from solid waste (Nomura Kohsan Co. Ltd. 2007)**~~

~~157.~~168. Mercury recovery from wastewater is generally achieved by chemical oxidation, chemical precipitation, or adsorption and subsequent treatment processes. Mercury exists in wastewater due to accidental or intentional discharging of elemental mercury from thermometers, dental amalgams, or ~~other~~ industrial processes using mercury or mercury compounds. Mercury may be found in wastewater from wet-type air pollution control devices and leachate from landfills/dumping sites where wastes containing mercury such as mercury thermometers are disposed of or dumped. Mercury in wastewater should not be released into the aquatic environment where mercury is methylated into methylmercury which is bioaccumulated and biomagnified in the food chain.

~~158.~~169. Pre-treatment prior to operation R4 (recovery of mercury) falls under operation R12 and roasting, purification, chemical oxidation/precipitation and adsorption fall under operation R4.

(a) Pre-treatment (exchange of wastes for submission to operations R4 or R13)

~~159.~~170. Before undergoing thermal treatment, wastes containing mercury or contaminated with mercury are treated in order to increase the efficiency of the thermal treatment; the pre-treatment processes include, *inter alia*, removal of materials other than those containing mercury by crushing and air separation, dewatering of sludge and removal of impurities. Examples of waste-specific pre-treatment operations are summarized in table ~~-~~4.

Table ~~-~~4. Examples of pre-treatment operations by waste type

Waste Type	Pre-treatment
Fluorescent lamps	***Mechanical crushing*** Waste mercury-~~containing~~added lamps should be processed in a machine which crushes and separates the lamps into three categories: glass, end-caps and a mercury-phosphor powder mixture. This is accomplished by injecting the lamps into a sealed crushing and sieving chamber. Upon completion, the chamber automatically removes the end products to eliminate the possibility of cross-contamination. End-caps and glass should be removed and sent for reuse in manufacturing. However, the metal pins of the end caps should be removed and treated separately as their mercury content may be considerable. Mercury-phosphor powder may be disposed of or is further processed to separate the mercury from the phosphor (Nomura Kohsan Co. Ltd., 2007). Lamp glass from crushed mercury-~~containing~~added lamps can retain significant

Waste Type	Pre-treatment
	amounts of mercury, and should be treated thermally or in other ways to remove mercury before sending it for recovery (Jang, 2005) or disposal. If this glass is sent for re-melting as part of its recovery process, the melting unit should have air pollution controls specifically directed at capturing released mercury (such as activated carbon injection). A high-performance exhaust air system should prevent the emission of any mercury vapours or dust during the entire process. The fluorescent powder and any mercury should be removed from the chopped lamps in vibro wells by means of vibration and water. The washed-out fluorescent powder, including the mercury and fine particles of glass, sediment in two stages and the process water is returned to the washing process circulation (www.dela-recycling.com)
	Air separation Aluminium end caps of fluorescent lamps (straight, circular and compact tubes) are cut by hydrogen burners. Air blowing flows into the cut fluorescent lamps from the bottom to remove mercury-phosphor powder adsorbed on glass (Jang, 2005). Mercury-phosphor powder is collected at a precipitator and glass parts are crushed and washed with acid, through which mercury-phosphor powder adsorbed on glass is completely removed. In addition, end-caps are crushed and magnetically separated to aluminium, iron and plastics for recycling (Kobelco Eco-Solutions Co. Ltd., 2001; Ogaki, 2004).
Mercury-~~containing~~added Batteries	***Removal of Impurities*** In order to recycle mercury, mercury-~~containing~~added batteries should be collected separately and stored in suitable containers before treatment and recycling. If mercury-~~containing~~added batteries are collected together with other types of batteries or with waste electrical and electronic equipment, mercury-~~containing~~added batteries should be separated from other types of batteries. Before roasting treatment, impurities mixed with and adsorbed onto mercury-~~containing~~added batteries should be removed, preferably by mechanical process. In addition, mechanical screening of the size of mercury-~~containing~~added batteries is necessary for an effective roasting process. (Nomura Kohsan Co. Ltd., 2007).
Sewage Sludge	***Dewatering*** Sewage sludge has high water content (more than 95 per cent). Therefore sludge contaminated with mercury and destined for destruction needs to be dewatered to about 20 to 35 per cent solids before any thermal treatment. After dewatering, sewage sludge should be treated in a roasting process (Nomura Kohsan Co. Ltd., 2007; United States EPA, 1997a)
Elemental Mercury-~~containing~~added wastes	***Extraction*** Elemental mercury-~~containing~~added wastes such as thermometers and barometers should be collected without any breakage. After collection of elemental mercury-~~containing~~added wastes, elemental mercury in the products should be extracted, and the extracted elemental mercury is distilled for purification under reduced pressure.
Wastes containing mercury attached to devices	***Dismantling*** Wastes containing mercury, such as electric switches and relays, are usually attached to electric devices. Therefore, such wastes should be removed from the devices without breakage of the outer glass. Computer monitors and televisions that use flat screen liquid crystal display (LCD) technology contain one or more small lamps for illumination, usually located along the outside edge of the screen. While new technology sometimes uses light emitting diodes (LED) for these lamps, most LCD screens contain fluorescent mercury vapour lamps. These mercury lamps may often break during handling and mechanized processing and will then release their mercury vapour. They should therefore be carefully removed by hand and should not be treated by mechanized processing such as shredding, unless the shredding machine has the necessary pollution control equipment to manage such operations and is licensed and permitted to do so, such as at mercury treatment facilities. For further information see section 7.3 of the Basel Convention Partnership for Action on

Waste Type	Pre-treatment
	Computing Equipment: Guideline on environmentally sound material recovery and recycling of end-of-life computing equipment (document UNEP/CHW.10/INF/23). Further information on the presence of mercury in LCD backlights is available. (see Waste Resources Action Programme research report at: - http://www.wrap.org.uk/~~recycling_industry/publications~~content/flat_panel_display~~.html~~-recycling-technologies-0).

(b) Recycling/reclamation of mercury ~~and~~or mercury compounds

~~a.~~(i) Thermal treatment

~~160.~~171. Thermal treatment facilities for ~~-~~wastes containing or contaminated with mercury or mercury compounds such as sewage sludge, contaminated soils or other wastes from contaminated sites ~~that are thermally treated~~ should be equipped with mercury vapour collection technology to recover mercury (ITRC, 1998; Chang and Yen,2006).

~~161.~~172. Thermal desorption is a process that uses either indirect or direct heat exchange to heat ~~organic~~ contaminants (primarily organics) to a high enough temperature to volatilize and separate them from a contaminated solid matrix and then either collect or destroy them. ~~In the case of~~Applied to mercury and its compounds, indirect thermal desorption with collection of mercury is the recommended option. Air, combustion gas or an inert gas is used as the transfer medium for the vaporized components. Thermal desorption systems are physical separation processes that transfer contaminants from one phase to another. A thermal desorption system has two major components; the desorber itself and the off-gas treatment/collection system~~.~~[41].

~~162.~~173. There are several evaporation processes, ~~namely~~including rotary kiln distillation, and vacuum thermal processing ~~and vacuum dry mixing~~.

~~163.~~174. The rotary kiln distillation serves to remove and recover the mercury in the waste such as, for example, mineral industrial slurries, slurries from the movement of natural gas, active carbons, catalysts, button cells or contaminated soil by means of evaporation and the recycling of the mercury-free product (e.g. glass, iron and non-ferrous metals, zeolites). Any pollutants or hydrocarbons and sulphur are removed in the treatment process.

~~164.~~175. The waste is fed evenly from a feed hopper via a dosage system to the rotary kiln. Waste that needs to be treated in the rotary kiln distillation should be free-flowing and conveyable. The waste is treated in the rotary kiln distillation at temperatures of up to 800°C. The materials used are moved evenly through the rotary kiln. The mercury in the waste is evaporated by heating the waste up to temperatures over 356°C. The required residence time of the waste in the rotary kiln depends on the input material but is usually between 0.5-1.5 h. The treatment is carried out at under-pressure to guarantee that the system operates safely. If necessary, nitrogen is added to create an inert atmosphere in the rotary kiln for higher safety. The stream of exhaust air flows to two gas scrubbers via a hot gas dust filter in which the mercury, water and hydrocarbons condense. The exhaust gas is then fed to an active carbon filter system for final cleaning[42].

~~165.~~176. Pre-treated waste, such as mercury-phosphor powder in fluorescent lamps, crushed lamp glass, cleaned mercury-~~containing~~added batteries, dewatered sewage sludge, and screened soil, may be treated by roasting/retorting facilities, equipped with a mercury vapour collection technology to recover mercury. However, it should be noted that volatile metals, including mercury and organic substances (including POPs), are emitted during roasting and other thermal treatments. These substances are transferred from the input waste to both the flue gas and the fly ash. Therefore, flue gas treatment devices should be ~~equipped~~used to capture volatilized pollutants and to prevent the pollutants from being emitted to the environment (see section III, H, 1 below).

~~166. In a vacuum dry mixer, pre-treatment and further treatment of sludge containing mercury can be carried out. Operation in vacuum atmosphere lowers the boiling temperature which provides for an~~

[41] The first large-scale thermal desorption unit for the treatment of mercury-containing wastes was constructed for the remediation of the Marktredwitz Chemical Factory (CFM) in Wölsau, Germany. The operation commenced in October 1993, including the first optimizing phase. Some 50,000 tons of mercury-contaminated solid wastes were treated successfully between August 1993 and June 1996. Thermal desorption units were also used to decontaminate the old chlor-alkali plant in Usti nad Labem in the Czech Republic and to decontaminate the soil in Taipei (Chang and Yen, 2006).

[42] www.dela-recycling.com

~~energy-efficient process and safe operation. Depending on the vacuum level and temperature reached at the operation of the plant, the mixer can be used for pre-treatment or further treatment of sludge. A two-stage treatment in a vacuum mixer has proven expedient when treating sludge containing mercury with high levels of water and hydrocarbons. In the first process stage, water and most of the existing hydrocarbons evaporate. The quantitative evaporation of the mercury takes place in the second process stage at the maximum treatment temperature. The mercury is condensed separately from the water and hydrocarbons and can be removed from the process. A vacuum unit is designed with a double jacket, indirectly heated with thermal oil, which gives an even distribution of heat into the treated input material. An even more efficient distribution of heat can be achieved with a heated shaft. The flue gas from the vacuum mixer is cleaned in a condensing unit and an activated carbon filter. The vacuum mixer is operated batch-wise ().~~

~~167.~~177. Vacuum thermal processing enables the treatment of thermometers, batteries, especially button cells, dental amalgam, electrical switches and rectifiers, fluorescent powder, exhaust tubes, crushed glass, soil, sludge, mining residues and catalyst material, inter alia. The process generally includes the following stages:

(a) Heating the input material in a special kiln or in a charging operation to evaporate the mercury contained in the waste at temperatures of between 340°C and 650°C and pressures of a few millibars;

(b) Thermal post-treatment of vapour containing mercury at temperatures ranging from 800°C to 1000°C, where, for example, organic components can be destroyed;

(c) Collecting and cooling of mercury-containing vapour;

(d) Distillation to generate pure liquid mercury.

~~168.~~178. The residue that remains at the end of the vacuum thermal processing is essentially mercury-free and is either recycled or otherwise disposed of depending on its composition~~.~~[43].

~~b.~~(ii) Chemical oxidation

~~169.~~179. Chemical oxidation of elemental mercury and organomercury compounds in waste is carried out to destroy the organics and to convert mercury so that it forms mercury salts. It is effective for treating liquid waste containing or contaminated with mercury. Chemical oxidation processes are useful for aqueous waste containing or contaminated with mercury such as slurry and tailings. Oxidizing reagents used in these processes include sodium hypochlorite, ozone, hydrogen peroxide, chlorine dioxide, and free chlorine (gas). Chemical oxidation may be conducted as a continuous or a batch process in mixing tanks or plug flow reactors. Mercury halide compounds formed in the oxidation process are separated from the waste matrix, treated and sent for subsequent treatment such as acid leaching and precipitation (United States EPA, 2007a).

~~c.~~(iii) Chemical precipitation

~~170.~~180. Precipitation uses chemicals to transform dissolved contaminants into an insoluble solid~~.~~, which may precipitate or be removed by flocculation or filtration. In coprecipitation, the target contaminant may be in a dissolved, colloidal, or suspended form. Dissolved contaminants do not precipitate, but are adsorbed onto another species that are then precipitated. Colloidal or suspended contaminants become enmeshed with other precipitated species or are removed through processes such as coagulation and flocculation. Processes to remove mercury from waste water can include a combination of precipitation and coprecipitation. The precipitated/coprecipitated solid is then removed from the liquid phase by clarification or filtration. More detailed information can be found in the report entitled “Treatment technologies for mercury in soil, waste, and water” (United States EPA, 2007d).

~~d.~~(iv) Adsorption treatment

~~171.~~181. Adsorption materials hold mercury on the surface through various types of chemical forces such as hydrogen bonds, dipole-dipole interactions and van der Waals forces. Adsorption capacity is affected by surface area, pore size distribution, and surface chemistry. Adsorption materials are usually packed into a column. Mercury or mercury compounds are adsorbed as liquid wastes pass through the column. The column should be regenerated or replaced with new media when adsorption sites become filled (United States EPA, 2007b). Spent adsorbent is a mercury waste.

~~172.~~182. Examples of adsorption materials include activated carbon and zeolite. Activated carbon is a carbonic material ~~having~~ that has many fine interconnected openings. It can typically have

[43] www.gmr-leipzig.de/gbverfahren.htm

a wooden base (coconut shells and sawdust), oil base or coal base. It can be classified, based on its shape, into powdery activated carbon and granular activated carbon. Many products are commercially available, offering the specific features of their individual materials. Mercury and other heavy metals as well as organic substances adsorb on activated carbon (Bansal, 2005). Zeolites are naturally occurring silicate minerals that can also be produced synthetically. Zeolites and clinoptilolite in particular, have a strong affinity for heavy metal ions where the adsorption mechanism is ion-exchange (Chojnacki et al., 2004). Ion exchange resins have proven useful in removing mercury from aqueous streams, particularly at concentrations in the order of 1 to 10 µg/L. Ion exchange applications usually treat mercuric salts, such as mercuric chlorides, that are found in wastewaters. This process involves suspending a medium, either a synthetic resin or mineral, into a solution where suspended metal ions are exchanged onto the medium. The anion exchange resin can be regenerated with strong acid solutions, but this is difficult since the mercury salts are not highly ionized and are not readily cleaned from the resin. The resin would therefore have to be disposed of. In addition, organic mercury compounds do not ionize, so they are not easily removed by using conventional ion exchange. If a selective resin is used, the adsorption process is usually irreversible and the resin should be disposed of as hazardous waste in a disposal facility not leading to recovery (Amuda, 2010).

~~173.~~183. Chelating resin is an ion-exchange resin that has been developed as a functional polymer and which selectively catches and removes ions ~~from solutions~~, including various ~~metal~~metals ions, ~~and separates them~~from solutions. It is made of a polymer base of three-dimensional mesh construction, with a functional group that chelate-combines metal ions. ~~As the material of the polymer base,~~ The most commonly used chelating resin is polystyrene ~~is most common~~, followed by phenolic plastic and epoxy resin. Chelating resins are used to treat plating wastewater to remove mercury and other heavy metals remaining after neutralization and coagulating sedimentation or to collect metal ions by adsorption from wastewater whose metal-ion concentration is relatively low. Chelating resin of mercury adsorption type can effectively remove mercury in wastewater (Chiarle, 2000).

~~c.~~(v) Distillation of mercury – purification

~~174.~~184. After waste treatment, collected mercury is subsequently purified by successive distillation (United States EPA 2000). High purity mercury is produced by distillation in many steps, permitting a high purity grade to be achieved in each distillation step.[42] ~~.~~ Such high purity mercury is required for many uses of mercury, or if the mercury is to be stored for a number of years, its high purity will help ensure that no chemical reactions between the container and impurities occur.

2. Operations not leading to recovery of ~~elemental~~ mercury or mercury compounds

~~175.~~185. Before disposing of ~~wastes consisting of elemental mercury and wastes containing or contaminated with~~ mercury wastes, they should be treated so as to meet the acceptance criteria of the disposal facilities (see section III, G, 2, (b) and (c) below). Wastes consisting of ~~elemental~~ mercury or mercury compounds should be solidified and/or stabilized before ~~being disposed of~~final disposal. The disposal of the wastes should be carried out according to national and local laws and regulations~~.~~, but should rely on a combination of effective S/S treatment and specially engineered landfills or permanent underground storage whenever possible. Treatment operations prior to D5 and D12 operations fall under operation D9.

(a) Physico-chemical treatment

~~a.~~(i) Stabilisation and solidification

~~176.~~186. Stabilisation processes include chemical reactions that may change the hazardous characteristics of the waste (by reducing the mobility and sometimes toxicity of the waste constituents). Solidification processes only change the physical state of the waste by using additives, (~~e.g.,~~e.g. converting a liquid into solid) without changing the chemical properties of the waste (European Commission, 2003). These two treatment methods are often used in conjunction with one another.

~~177.~~187. Solidification and stabilization (S/S) is applied, for example, to waste consisting of ~~elemental~~ mercury or mercury compounds and waste contaminated with mercury such as soil, sludge, ash, and liquid. S/S reduces the mobility of contaminants in the media by physically binding them within stabilized mass or inducing chemical reactions that may reduce solubility or volatility, or both, thereby reducing mobility (United States EPA, 2007b).

~~178.~~188. S/S is usually used for ~~various~~treating wastes containing inorganic constituents, such as sewage sludge, incinerator ash, liquid contaminated with mercury, and soils contaminated with mercury. ~~Mercury from these wastes is not easily accessible to leaching agents or thermal desorption~~

~~but is leachable when the stabilized waste is landfilled and kept at a landfill site for a long time, as is the case with other metals and organic compounds.~~ Mercury in the solidified and stabilized waste in ~~the~~a landfill can leach (i.e., dissolve and move from the stabilized waste through liquids in the landfill), migrate into ground water or nearby surface water and vaporise into the atmosphere under natural environmental conditions, although effective treatment will significantly reduce the rate of release to the environment.

~~179.~~189. S/S involves physically binding or enclosing contaminants within a stabilized mass (solidification) or inducing chemical reactions between the stabilizing agent and the contaminants to reduce their mobility (stabilization). Solidification is used to encapsulate or absorb the waste, forming a solid material, when free liquids other than elemental mercury are present in the waste. Waste can be encapsulated in two ways: microencapsulation and macroencapsulation. Microencapsulation is the process of mixing the waste with the encasing material before solidification occurs. Macroencapsulation refers to the process of pouring the encasing material over and around the waste mass, thus enclosing it in a solid block (United States EPA, 2007b).

~~180.~~190. Generally speaking, the solidification process involves mixing soil or waste with binders such as Portland cement, sulphur polymer cement (SPC), sulphide and phosphate binders, cement kiln dust, polyester resins, or polysiloxane compounds to create a slurry, paste, or other semi-liquid state, which is allowed time to cure into a solid form (United States EPA 2007b).

~~181.~~191. There are two main chemical approaches that can be applied to ~~wastes consisting of elemental~~ mercury ~~and~~ wastes ~~containing or contaminated with mercury~~ (Hagemann 2009):

(a) Chemical conversion to mercury sulphide; and

(b) Amalgamation (formation of a solid alloy with suitable metals).

~~182.~~192. A sufficient risk reduction is achieved if the conversion rate to mercury sulphide (percentage of reacted mercury) is near or equal to 100 per cent. Otherwise mercury volatility and leachability remains high, as is the case with amalgams (Mattus, 1999).

Stabilization as mercury sulphide

~~183.~~193. ~~Since the most common natural occurrence of mercury is as cinnabar (HgS) from which metallic mercury is derived,~~ One of the most important and well investigated approaches is the ~~reconversion~~conversion of elemental mercury ~~close~~ to ~~its natural state as~~mercury sulphide (HgS). ~~HgS. Wastes consisting of~~ is much less soluble and has lower volatility than most mercury compounds, and so is less mobile in the environment. Elemental mercury ~~are~~is mixed with elemental sulphur or with other sulphur-containing substances to form ~~mercury sulphide (~~HgS~~).~~. The production of HgS can result in two different types, alpha-HgS (Cinnabar) and beta-HgS (meta-cinnabar). Pure alpha-HgS (intensive red colour) has a slightly lower water solubility compared to pure beta-HgS (black colour). HgS is a powder with a density of 2.5-3 g/cm³.

194. In general, HgS is produced by blending mercury and sulphur under ambient conditions for a certain time, until mercury (II) sulphide is produced. To start the reaction process, a certain activation energy is required which may be provided by intensive mixing of the blend. Among other factors, higher shear rates and temperatures during the process support the production of the alpha phase, whereas a longer process time favours the creation of beta cinnabar. Excessively long milling in the presence of oxygen can lead to the production of mercury (II) oxide. As HgO has higher water solubility than HgS, its creation should be avoided by milling under inert atmospheric conditions or through the addition of an antioxidant (e.g. sodium sulphide). Since the reaction between mercury and sulphur is exothermic, an inert atmosphere also contributes to a safe operation. The process is robust and relatively simple to carry out. ~~The HgS is insoluble in water and non-volatile, chemically stable and nonreactive, being attacked only by concentrated acids.~~

195. The HgS is very insoluble in water and has very low volatility; it is chemically very stable and non-reactive, although exposure to ambient environmental conditions will result in its conversion to other mercury compounds over time. Isolation from the environment by encapsulation and disposal in a specially engineered landfill, or permanent underground storage, may be necessary to retain it as HgS. In addition, the fact that dissolved organic matters and high chloride concentrations in leachate increase mercury release from HgS (Waples et al., 2005; Science Applications International Corporation, 2002) suggest that elemental mercury treated as HgS should be disposed of without contact of water and other types of wastes, especially those containing organic matters and chloride. Moreover, since micro-organisms inhabiting acid mine drainage systems, which are dominated by Fe-oxidizing and S-oxidizing bacteria, in the microcosm with metacinnabar (beta-HgS) increase dissolved Hg concentrations (Jew et al., 2014), exclusion of influence of such microorganisms in

specially engineered landfills and permanent underground storage may be required for disposal of elemental mercury treated as HgS.

~~184.~~196. As a fine powdery material, its handling is subject to specific requirements (to avoid, for example, the risk of dust releases). This stabilization process leads to an increase in volume by ~300 per cent and in weight by ~16 per cent based on molecular weights compared to elemental mercury. For solidification of mercury sulphide, materials with low alkali content should be used as a recent study indicates that mercury release from mercury sulphide increases when pH value of eluate exceeds 10 (Mizutani et al., 2010).

~~185.~~197. A large scale stabilization process for waste consisting of elemental mercury with sulphur, forming mercury sulphide (HgS~~),~~) has been available~~. since 2010~~[44]~~.~~ The process ~~takes~~took place in a vacuum mixer operated in inert vacuum atmosphere which ~~ensures~~ensured good process control and safe operation. The mixer ~~is~~has been operated batch-wise~~, with 800 kg of metallic mercury in each batch.~~ A dust filter and an activated carbon filter ~~prevent~~prevented releases from the plant. The reaction between mercury and sulphur ~~takes~~took place at a stoichiometric ratio. The end product ~~consists~~consisted of red mercury sulphide with leaching values below 0.002 mg Hg/kg (tests according to EN12457/1-4). The end product is thermodynamically stable up to 350°C. ~~The vacuum mixing process ensures a safe operation i.e., there is no leakage during the operation and energy demand is reduced through a lowering of the boiling point. The waste acceptance criteria, including a leaching test according to European Council Decision 2003/33/EC of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC for the mercury sulphide, have been met. The mercury sulphide should preferably be disposed of in an underground facility.~~

Sulphur polymer stabilization/solidification (SPSS)[45, 46]

~~186.~~198. The Sulphur Polymer Stabilization Process (SPSS) ~~is~~[47] adds a ~~modification of~~ solidification step to sulphur stabilization, with the advantage of a lower chance of mercury vapour and leaching because the final product is monolithic with a low surface area. ~~Within this~~The process ~~elemental~~consists of two subsequent steps: mercury ~~reacts~~is stabilized with sulphur ~~to~~ as first step to form beta-mercury~~(II) sulphide. Simultaneously, the HgS~~ sulfide (meta-cinnabar dust: López et al, 2010, López-Delgado et al, 2012) and, in a second step, this mercury sulfide is ~~encapsulated and thus the final product~~incorporated and microencapsulated in a polymeric sulphur matrix at 135°C, obtaining a fluid that is ~~a monolith.~~ cooled to room temperature in moulds, to obtain solid blocks (monoliths). The second step of the process ~~relies on~~provides an additional barrier for mercury to prevent and avoid mercury releases to the environment minimizing with it the ~~use of ~ 95 per cent by weight~~possibility of ~~elemental sulphur and 5 per cent~~its conversion to other forms of ~~organic polymer modifiers, also called sulphur polymer cement (SPC). The SPC can be dicyclopentadiene or oligomers of cyclopentadiene.~~mercury. Mercury is transformed in the process ~~has to be carried out at a relatively high temperature of about 135°C, which may lead to some volatilization and thus emission of the mercury during~~which has low energy consumption, low mercury emissions, no water consumption and no effluents, and generates no other wastes. Security systems should be in place to prevent and avoid possible emissions of mercury and to ensure safe conditions for workers and for the ~~process. In any event, the process requires the provision of an inert atmosphere in order to prevent the formation of water soluble mercury(II) oxide. In the case of SPC, beta-HgS is obtained. The addition of sodium sulphide nonahydrate results in alpha-HgS as a product~~environment, including engineering controls to prevent possible ignition and explosions.

~~187.~~199. [A relatively high Hg load of the monolith ~~(~~ (about 70 per cent) can be achieved with this process ~~as there is no chemical reaction of the matrix required to set and cure.~~ The process is robust and relatively simple to implement and the product is very insoluble in water, has a high resistance to corrosive environment, is resistant to freeze-thaw cycles and has a high mechanical strength. ~~During the process, volatile losses are liable to occur and therefore appropriate engineering controls are needed. Engineering controls to avoid possible ignition and explosions are also necessary.~~

[44] The facility is currently not in operation; the company does not exist anymore. Whether or not the facility will be operated by another company is open at the moment.

[45] This section contains information provided by the CTNDM (Spain) For further information, please contact: info@ctndm.es or consult their website at: ~~http://~~www.ctndm.es.

[46] There is a standard definition for sulphur polymer cement in ASTM C1159-98.

[47] The project of an industrial plant in Spain to develop this process is already made and the budget for its construction is approved; the commercial availability of this plant is expected at the end of 2015.

~~Additionally, the volume of the resulting waste material is considerably increased.~~[48] It is demonstrated that this technology is directly applicable to elemental mercury with any degrees of purity, not needing previous distillation, and it is also directly applicable, without any previous treatment, to a wide range of mercury containing wastes. All the final stabilized-microencapsulated products (from metallic mercury, zinc waste, aluminum waste, fluorescent lamp dust and dental amalgam) are inert compact solids similarly stable and resistant to concrete, ensuring the complete immobilization of mercury, rendering it impermeable and with extremely low porosity, thereby minimizing the risk of releases to the environment. The selected final shape is a hard monolithic block, and the size of the final product can be adapted to a desired shape, depending on the chosen option to facilitate transport (López et al. 2014).~~]~~

~~188. Product stability is reported as the lowest leaching behaviour achieved at a pH value of 2 with 0.001 mg/l. In a more or less linear trend the leaching value reaches a maximum of ~ 0.1 mg/l at pH value of 12 and another example between 0.005 and 45 mg/l for different pH values. The reason for this wide range of leaching behaviour of the latter was not the pH dependency but a small amount of elemental mercury which still existed in the final product. The investor explained that product quality increased as the process became better controlled. No mercury emission from the product was reported (BiPRO 2010).~~

200. All leaching values obtained in both monolithic and crushed samples according to the EU standard (CEN/TS 14405:2004 and UNE-EN-12457) lead to concentrations well below 0.01 mg/kg (López et al. 2014). Thus, all the final stabilized and micro-encapsulated products meet the EU acceptance criteria for landfills for inert solid wastes (<0.01 mg/kg, as per Decision 2003/33/EC). US EPA Toxicity Characteristic Leaching Procedure (TCLP), Method 1311, was also used to the leaching behaviour of -stabilized-microencapsulated mercury samples (crushed) and all the results are below 125 µg/l [well lower than the limit value accepted for mercury (< 0.025mg/L)].

201. Another example of a similar technology is solidification of mercury sulphide (β-HgS) with modified sulphur. The first step is to form mercury sulphide by mixing mercury with a purity of 99.9 per cent or higher and sulphur powder, and the second step is to solidify the mercury sulphide with modified sulphur by mixing them for one hour and then heating them up at 130 degrees Celsius for one hour. Results of Japanese Leaching Test -13 of the solidified mercury sulphide range from 0.0009 to 0.0018 mg/L, which is below the elution test standard (0.005mg/L) (Committee on consideration of environmentally sound management of mercury waste, et al., 2014).

Stabilization and solidification with sulphur microcements[49]

202. The treatment of mercury wastes with sulphur microcements is a stabilization and solidification technology, which results in a solid matrix that ensures the confinement of mercury because of its precipitation in the form of very insoluble compounds, as oxides, hydroxides and sulfides. The technology is commercially available and has been already tested in wastes with low mercury contamination levels (Hg ≤ 2 per cent by weight).

203. Once the contaminated material to treat has been characterized, the amount and type of microcement suitable for the application is decided. The microcements must have certain characteristics to achieve an adequate stabilization and microencapsulation of the mercury contained in the contaminated material:

- They are inorganic and guarantee that all their particles are less than a certain size (a few microns);
- They have mercury stabilising components, such as alkali sulphides;
- They have very high mechanical properties, to avoid volatilization and leaching of mercury;
- They should have a blast furnace slag percentage over 60 per cent, a portland clinker component C3A content lower than 3 per cent and an alkali content below 0.6 per cent.

204. The process includes the mixture of mercury contaminated waste with the sulphur microcement and water; the mixture is then discharged into the desired mould and is matured over a 24- to 48 hour period in watertight and leak-protected areas. The final product can take different forms: the ones with less exposed surfaces, like large cubic blocks, are recommended for the most contaminated waste.

[48] ~~For further information see the mercury safe deposit (MERSADE) project at http://www.mersade.eu/.~~

[49] This section contains information provided by Cement International Technologies S.L. For further information, please contact: info@cementinternationaltechnologies.com, or consult their website at: http://; www.cemintech.com.

205. The technology has been tested, among others, on waste material containing mercury obtained from the dredging of contaminated sludge from the Flix dam in the province of Tarragona in Spain. The final products ensure a high level of strength and durability and enable a safe handling and transport. The leaching values following tests according to standard UNE-EN 12457-4:2003 with a water/solid ratio of 10/1 are below 0,003 mg/kg, well below the EU acceptance criteria for landfills for inert solid wastes (<0.01 mg/kg, as per Decision 2003/33/EC). It is an inert product, and has high strength and durability enabling a safe mechanical handling and transport.

Amalgamation

~~189.~~206. Amalgamation is the dissolution and solidification of mercury in other metals such as copper, nickel, zinc and tin, resulting in a solid, non-volatile product. It is a subset of solidification technologies. Two generic processes are used for amalgamating mercury in wastes: aqueous and non-aqueous replacement. The aqueous process involves mixing a finely divided base metal such as zinc or copper into a wastewater that contains dissolved mercury salts; the base metal reduces mercuric and mercurous salts to elemental mercury, which dissolves in the metal to form a solid mercury-based metal alloy called amalgam. The non-aqueous process involves mixing finely divided metal powders into waste elemental mercury, forming a solidified amalgam. The aqueous replacement process is applicable to both mercury salts and elemental mercury, while the non-aqueous process is applicable only to elemental mercury. However, mercury in the resultant amalgam is susceptible to volatilization or leaching. Therefore, amalgamation is typically used in combination with an encapsulation technology, although based on these concerns, it should not be considered as a first option for treating waste elemental mercury (United States EPA 2007b).

~~b.~~(ii) Soil washing and acid extraction

~~190.~~207. Soil washing is an *ex situ* treatment of soil and sediment contaminated with mercury. It is a water-based process that uses a combination of physical particle size separation and aqueous-based chemical separation to reduce contaminant concentrations in soil. This process is based on the concept that most contaminants tend to bind to the finer soil particles (clay and silt) rather than the larger particles (sand and gravel). Physical methods can be used to separate the relatively clean larger particles from the finer particles because the finer particles are attached to larger particles through physical processes (compaction and adhesion). This process thus concentrates the contamination bound to the finer particles for further treatment. Acid extraction is also an *ex situ* technology that uses an extracting chemical such as hydrochloric acid or sulphuric acid to extract contaminants from a solid matrix by dissolving them in the acid. The metal contaminants are recovered from the acid leaching solution using techniques such as aqueous-phase electrolysis. More detailed information can be found in "Treatment technologies for mercury in soil, waste, and water" (United States EPA 2007b).

(b) Disposal in specially engineered ~~landfill~~landfills

~~191.~~208. Following stabilization and/or solidification, waste containing or contaminated with mercury that meets the acceptance criteria for specially engineered landfills defined by national or local regulations, may be disposed of in specially engineered landfills. Some jurisdictions have defined acceptance criteria for landfilling of wastes containing or contaminated ~~with~~ mercury or mercury compounds. Under European Union legislation only wastes with leaching limit values of 0,2 and 2 mg Hg/kg dry substance at a liquid-solid ratio of 10 L/kg can be accepted in landfills for non-hazardous and hazardous wastes, respectively. Under United States mercury waste treatment regulations, only low concentration mercury wastes can be treated and landfilled~~.~~ (high concentration waste must be retorted for mercury recovery). Treated mercury waste must leach less than 0.025 mg/L mercury (by TCLP testing) to be accepted for landfill disposal. Under Japanese legislation, treated wastes with mercury concentration in excess of 0.005 mg/L (Leaching Test Method: Japanese Standardized Leaching Test No. 13 (JLT-13) (Ministry of the Environment Notification No. 13~~)~~) should be disposed of at a specially engineered landfill in Japan (Ministry of the Environment, Japan, 2007b). In addition, disposal of certain ~~wastes containing or contaminated with~~ mercury wastes in landfills is banned in some countries.

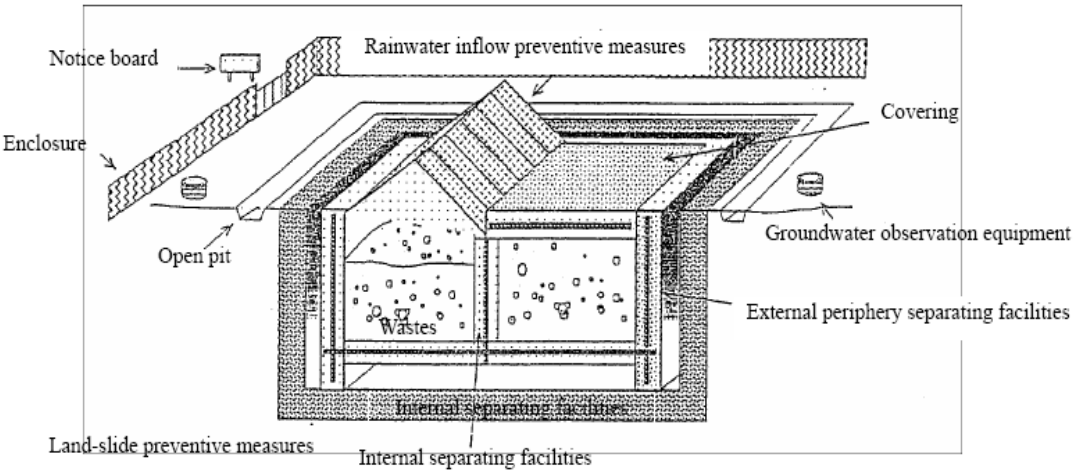
~~192.~~209. A specially engineered landfill is an environmentally sound system for solid waste disposal and is a site where solid wastes are capped and isolated from each other and from the environment. All aspects of landfill operations should be controlled to ensure that the health and safety of everyone living and working around the landfill are protected, and the environment is secure (SBC, 1995b).

~~193.~~210. In principle, and for a defined time period, a landfill site can be engineered to be environmentally safe subject to the site being appropriate and with proper precautions and efficient

management. Specific requirements should be met pertaining to site ~~selection~~location, design and construction, landfill operations and monitoring for specially engineered landfills, in order to prevent leakages and contamination of the environment. Control and oversight procedures should apply equally to the process of site selection, design and construction, operation and monitoring, as well as closure and post-closure care (SBC, 1995b). Permits should include specifications regarding types and concentrations of wastes to be accepted, leachate and gas control/collection systems, groundwater monitoring, on-site security, and closure and post-closure requirements.

211. Particular attention should be paid to the measures required to protect groundwater resources from leachate infiltration into the soil. Protection of soil, groundwater and surface water should be achieved by the combination of a geological barrier and a bottom liner system during the operational phase and by the combination of a geological barrier and a top liner during the closure and post-closure phase. A drainage and collection system for leachate should be installed within the landfill that will allow leachate to be pumped to the surface for treatment prior to discharge to water systems. Moreover, monitoring procedures should be established for the operation and post-closure phases of a landfill so that any possible adverse environmental effects of the landfill can be identified and the appropriate corrective measures taken. The choice of landfill development and lining method should be made in light of the site, geology and other project-specific factors. Appropriate geotechnical engineering principles should be applied to different aspects of the specially-engineered landfill such as the construction of the dykes, cut slopes, landfill cells, roadways and drainage structures (Canadian Council of Ministers for the Environment CCME) 2006). For example, the landfill site could be enclosed in watertight and reinforced concrete, and covered with the sort of equipment which prevents rainwater inflow such as a roof and a rainwater drainage system (figure ~~-~~6) (Ministry of the Environment, Japan, 2007a). A number of liner and leachate control systems have been documented for their effectiveness under varying conditions. The Basel Convention Technical Guidelines on Specially Engineered Landfills explain in detail a few other approaches to engineered containment systems that may be considered if the conditions are appropriate (SBC, 1995b).

Figure 6: Example of specially engineered landfill (Ministry of the Environment, Japan, 2007a)



~~**Figure -6** Example of specially engineered landfill (Ministry of the Environment, Japan 2007a)~~

~~194.~~212. For further information about specially engineered landfills, see the Basel Convention Technical Guidelines on Specially Engineered Landfill (D5) (SBC 1995b).

(c) Disposal in permanent storage (underground facility)

~~195.~~213. Following solidification or stabilization, if appropriate, ~~wastes containing or contaminated with~~ mercury wastes[50] which meet the acceptance criteria for permanent storage may be permanently stored in special containers in designated areas such as an underground storage facility.

~~196.~~214. The technology for underground storage is based on mining engineering, which includes the technology and the methodology to excavate mining areas and construct mining chambers as tessellated grid of pillars.[51] ~~Disused~~[52] Decommissioned mines could be used for the

[50] ~~This includes~~Mercury wastes, with the exception of wastes consisting of ~~elemental~~ mercury ~~after stabilization~~ or ~~solidification~~mercury compounds.

[51] ~~In Germany, for example, significant experience on underground storage of hazardous waste is available.~~

[52] Germany, for example, has significant experience on the underground storage of hazardous waste.

permanent storage (disposal) of solidified and stabilized waste once they have been specifically adapted for the purpose.

197.215. In addition, the principles and experience in the underground disposal of radioactive waste can be applied to the underground storage of wastes containing or contaminated with mercury. wastes While excavation of a deep underground repository using standard mining or civil engineering technology is a possibility, it is limited to accessible locations (e.g. below surface or nearshore), to rock units that are reasonably stable and without major groundwater flow, and to depths of between 250 m and 1000 m. At a depth greater than 1000 m, excavations become increasingly technically difficult and correspondingly expensive (World Nuclear Association, 2010).

198.216. The following publications contain further detailed information on permanent underground storage for wastes containing or contaminated with mercury. wastes.

(a) European Community. 20032003b. Safety Assessment for Acceptance of Waste in Underground Storage -Appendix A to Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:011:0027:0049:EN:PDF;

(b) BiPRO. 2010. Requirements for Facilities and Acceptance Criteria for the Disposal of Metallic Mercury. Available at: http://ec.europa.eu/environment/chemicals/mercury/pdf/bipro_study20100416.pdf;

(c) International Atomic Energy Agency. (IAEA) 2009. Geological Disposal of Radioactive Waste: Technological Implications for Retrievability. Available at: http://www-pub.iaea.org/MTCD/publications/PDF/Pub1378_web.pdf;

(d) World Nuclear Association. 2010. Storage and Disposal Options. Available at: http://www.world-nuclear.org/info/inf04ap2.html;

(e) Latin America and the Caribbean Mercury Storage Project. 2010. Options analysis and feasibility study for the long-term storage of mercury in Latin America and the Caribbean. Available at: http://www.unep.org/chemicalsandwaste/Mercury/InterimActivities/Partnerships/SupplyandStorage/LACMercuryStorageProject/tabid/3554/language/en-US/Default.aspx; and

(f) Asia-Pacific Mercury Storage Project (2010): Options analysis and feasibility study for the long-term storage of mercury in Asia. Available at: http://www.unep.org/chemicalsandwaste/Mercury/InterimActivities/Partnerships/SupplyandStorage/AsiaPacificMercuryStorageProject/tabid/3552/language/en-US/Default.aspxhttp://www.unep.org/hazardoussubstances/Mercury/InterimActivities/Partnerships/SupplyandStorage/AsiaPacificMercuryStorageProject/tabid/3552/language/en-US/Default.aspx.

199.217. Permanent storage in facilities located underground in geohydrologically isolated salt mines and hard rock formations is an option to separate hazardous wastes from the biosphere for geological periods of time. A site-specific risk assessment according to pertinent national legislation such as the provisions contained in Appendix A to the Annex to European Council Decision 2003/33/EC of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC should be performed for every planned underground storage facility.

200.218. Wastes should be disposed of in a manner that excludes (a) any undesirable reaction between different wastes or between wastes and the storage lining; and (b) the release and transport of hazardous substances. Operational permits should define the waste types that should be generally excluded. Isolation is providedWastes should be isolated by a combination of engineered and natural barriers (rock, salt, clay) and no obligation). Facilities should be checked or monitored periodically to actively maintainassure that the facility is passed on to future generationscontainment remains secure and stable. This is often termed a multi-barrier concept, with the waste packaging, the engineered repository and the geology all providing barriers to prevent any mercury leakage from reaching humans and the environment (BiPRO, 2010; European Community, 2003; IAEA, 2009; World Nuclear Association, 2010).

201.219. Specific factors which can affect the behaviour of mercury in the host rock and the geological environment, such as layout, containments, storage place and conditions, monitoring, access conditions, closure strategy, sealing and backfilling and depth of the storage place, which affect the behaviour of mercury in the host rock and the geological environment, need to be considered separately from the waste properties and the storage system. Potential host rocks offor permanent

storage ~~for wastes containing or contaminated with~~ of mercury ~~are~~wastes include salt rock and hard rock formations (igneous rocks, e.g. granite~~or~~, metamorphic rocks,- gneiss ~~including~~ sedimentary rocks e.g. limestone or sandstone). (BiPRO, 2010; European Community, 2003; IAEA, 2009; World Nuclear Association, 2010).

~~202.~~220. The following considerations should be borne in mind when selecting a permanent underground storage site for the disposal of ~~wastes containing or contaminated with~~ mercury wastes:

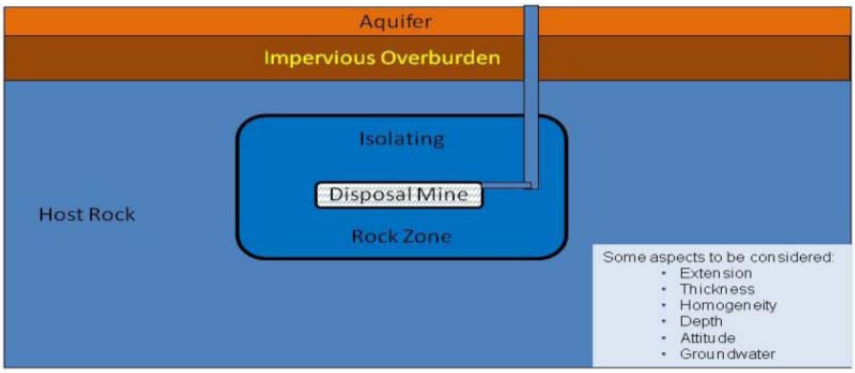
(a) Caverns or tunnels used for storage should be completely separated from active mining areas and areas that maybe reopened for mining;

(b) Caverns or tunnels should be located in geological formations that are well below zones of available groundwater or in formations that are completely isolated by impermeable rock or clay layers from water-bearing zones; and

(c) Caverns and tunnels should be located in geological formations that are extremely stable and not in areas subject to earthquakes.

In order to guarantee complete inclusion, the disposal mine and any area around it which might be affected by the disposal operations (e.g. geomechanically or geochemically) should be surrounded by a host rock (called Isolating Rock Zone) of sufficient thickness and homogeneity, with suitable properties and at suitable depth (see figure -7). As a basic principle, a long-term risk assessment should be able to prove that the construction, the operation and the post-operational phase of an underground disposal facility would not lead to any degradation of the biosphere. Consequently, appropriate models must be used to analyse and assess all technical barriers (e.g. waste-form, backfilling, sealing measures), the behaviour of the host and surrounding rock, overburden rock formations and the sequence of possible events in the overall system.

Figure 7: Concept of complete inclusion (schematic) (courtesy: GRS)



~~**Figure -7 Concept of complete inclusion (schematic) (courtesy: GRS)**~~

~~203.~~221. If the rock formation under consideration shows any deficiencies (e.g. of homogeneity or thickness), a multi-barrier system can compensate for the missing or inadequate barrier properties of the host rock. In general, a multi-barrier system of this kind may be composed of one or several additional barrier components (see table -5 and figure -8) that can help to achieve the ultimate goal, viz. to durably isolate the wastes from the biosphere.

~~204.~~222. A long-term safety assessment (see above) should be conducted to ascertain the need for and the mode of action of the multi-barrier system within the disposal system. By way of example, the geological formation(s) overlaying a disposal mine ('overburden') may be effective in different ways by:

(a) Protecting the underlying host rock from any impairments of its properties; and/or

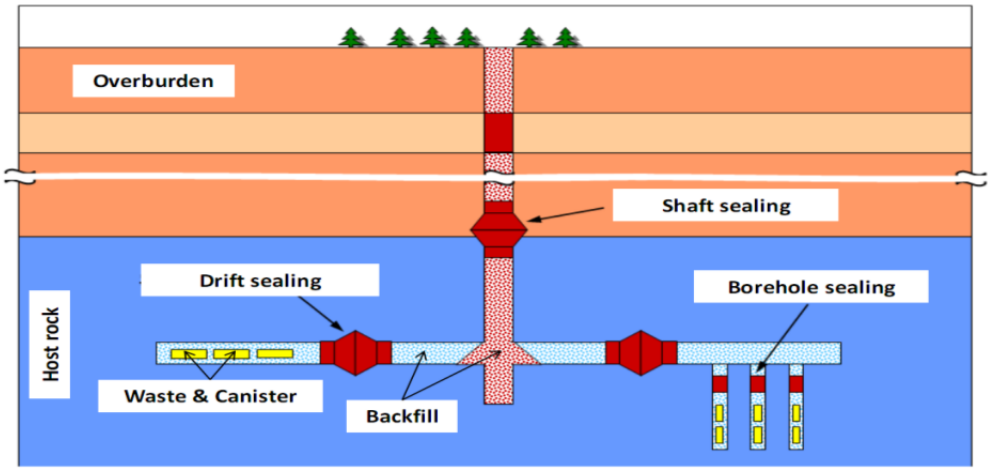
(b) The provision of additional retention capacities for contaminants which might be released from the disposal mine under certain circumstances.

Table -5: Possible components of a multi-barrier system and examples for their mode of action

Barrier component	Example for mode of action
Waste content	Reducing the total amount of contaminants to be disposed of
Waste specification	Treatment of waste in order to get a less soluble contaminant
Waste canister	Bridging of a limited time period until natural barriers become effective

Barrier component	Example for mode of action
Backfill measures	Backfill of void mine spaces to improve geomechanical stability and/or to provide special geochemical conditions
Sealing measures	Shaft sealing should provide the same properties where the natural barrier(s) is(are) disturbed by mine-access
Host rock	Complete inclusion of contaminants (in ideal case)
Overburden	Additional natural (geological) barrier, e.g. overlaying clay layer with sufficient thickness and suitable properties

Figure 8. Main components of a multi-barrier system and their layout within the system (schematic) (courtesy: GRS)



205.223. In general, an underground disposal concept as described above, including all the criteria, requirements and final layout ~~etc.,~~ should be designed according to waste-specific and site-specific criteria, taking into consideration all relevant regulations (e.g. European Community, 2003). To give a rough idea of the depth and thickness of different types of host rock, ~~the following~~ table 6 lists typical dimensions, based on current experience and plans.

Table 6: Typical values of vertical thickness of host rock body and potential disposal depth (after Grundfelt et al., 2005)

Geosystem		Thickness of host rock body	Potential disposal depth
Host rock	Variant		
Rock salt	Salt dome	up to > 1,000 m	800 m
Rock salt	Layered salt	app. 100 m	650 – 1,100 m
Clay / Claystone		up to 400 m	400 – 500 m
Rocks under clay cover		app. 100 m	500 – 1,000 m

H. Reduction of mercury releases from thermal treatment and ~~disposal~~landfilling of waste

1. Reduction of mercury releases from thermal treatment of waste

~~206.~~224. Mercury ~~may currently still~~ added products should not be ~~contained in~~disposed of together with municipal waste~~, e.g., in batteries, thermometers, fluorescent lamps or mercury switches.~~ whenever possible. Separate collection of ~~these~~mercury wastes leads to a reduction of overall mercury loads in mixed MSW ~~but~~, however, collection rates of 100 per cent are not achieved in practice. Consequently, wastes containing or contaminated with mercury or mercury compounds may be combusted whereby, by reason of its low boiling point, almost all the mercury in the waste is transferred to combustion gas and little mercury remains in bottom ash. Most of the mercury in combustion gas within a waste combustion unit is in the form of elemental mercury~~, but most of the elemental mercury~~ and transforms to divalent mercury after passing through the combustion unit, and part of the divalent mercury ~~is transferred~~transfers to fly ash. The divalent mercury is assumed to be mercuric chloride; consequently, flue gas treatment devices that can effectively remove such mercuric chloride and elemental mercury should be selected. In addition, waste that potentially contains or is contaminated with mercury such as poorly segregated waste from healthcare facilities, should not be incinerated in an incinerator without flue gas treatment devices (Arai et al~~.~~ ,, 1997). Emission and effluent standards for mercury should be set and the mercury level of treated flue gas and wastewater should be monitored to ensure mercury releases into the environment are kept to a minimum. Such practices should also be applied in other thermal treatment of waste such as vacuum-sealed roasting facilities.

~~207.~~225. Primary techniques for ~~preventing mercury releases to air from waste incineration are those which prevent or control, if possible,~~reducing the inclusion of mercury in the waste stream~~, such as~~ include the following (European Commission, 2006):

(a) Efficient removal of mercury-added products from the waste stream~~,~~ (e.g. separate collection of certain types of batteries, dental amalgam (using amalgam separators) before these wastes are co-mingled with other wastes or wastewaters);

(b) Notifying waste producers of the need to segregate mercury;

(c) Identification and/or restriction of receipt of potential ~~wastes containing or contaminated with~~ mercury wastes; and

(d) Where such wastes are known to be received – control of feeding such waste to avoid overload of abatement system capacity.

~~208.~~226. Secondary techniques for preventing mercury releases to air from the waste stream include treatment of flue gas. The European Union ~~established standards in~~Directive on Industrial Emissions (2010/75/EU) (European Community, 2010b), which repealed and replaced the Directive on the Incineration of Waste (2000/76/EC~~) (European Community 2001), such as emission~~), sets standards for release limit values for discharges of waste water from the cleaning of flue gases 0.03 mg/L for mercury and its compounds, expressed as mercury (Hg), and an air emission limit of 0.05 mg/m^3 ~~for~~over a sampling period of a minimum 30 minutes ~~average~~ and ~~0.1 mg/m^3 as~~a maximum eight hours ~~average limit~~ for mercury and its compounds, expressed as mercury (Hg). The Protocol on Heavy Metals within the framework of the UNECE Convention on long-range transboundary air pollution, as amended by EB Decision 2012/5, sets legally binding limit values for the emission of mercury of 0.05 mg/m^3 for ~~hazardous waste incineration and 0.08 mg/m^3 for municipal~~ waste incineration.

~~209.~~227. The selection of a process for control of mercury ~~abatement~~in flue gas emissions depends upon the chlorine content of the burning material. At higher chlorine contents, mercury contained in the crude flue gas will be increasingly in the oxidized form, which can be deposited and captured in wet scrubbers. In incineration plants for municipal and hazardous wastes, the chlorine content in the ~~average~~typical waste is usually high enough, ~~in~~under normal operating ~~states~~conditions, to ensure that Hg is present mainly in the oxidized form. Volatile Hg compounds, such as $HgCl_2$, will condense when flue-gas is cooled, and dissolve in the scrubber effluent. The addition of reagents for the specific removal of Hg provides a means for removing it from the process. It should be noted that in the incineration of sewage sludge, mercury emissions are mostly in the elemental form, due to the lower chlorine content of the waste than in municipal or hazardous waste. Consequently, special attention must be paid to capturing these emissions. Elemental mercury can be removed by transforming it into oxidized mercury; this is done by adding oxidants and then depositing it in the scrubber or ~~deposing~~depositing it directly on sulphur doped activated carbon, hearth furnace coke, or zeolites. Removal of heavy metals from wet scrubber systems can be achieved by flocculation, where

metal hydroxides are formed under the influence of flocculation agents (poly-electrolytes) and $FeCl_3$. For the removal of mercury, complex-builders and sulphides (e.g. Na_2S, Tri-Mercaptan, etc.) are added.

~~210.~~228. Mercury in flue gas can be removed by adsorption on activated carbon reagents in an entrained flow system whereby activated carbon is injected into the gas flow. The carbon is filtered from the gas flow using bag filters. The activated carbon shows a high adsorption efficiency for mercury as well as for PCDD/PCDF. Different types of activated carbon have different adsorption efficiencies. This is believed to be related to the specific nature of the carbon particles, which are, in turn, influenced by the manufacturing process (European Commission, 2006). Static bed filters of grained Hearth Furnace Coke (HFC – a fine coke of 1.25 mm to 5 mm) are effective in depositing almost all emission relevant flue-gas components, in particular, residual contents of hydrochloric acid, hydrofluoric acid, sulphur oxides, heavy metals (including mercury), sometimes to below the detection limit. The depositing effect of the HFCs is essentially based on mechanisms of adsorption and filtration. In general, incinerators ~~are~~should be equipped with flue gas treatment devices ~~so as not~~ to ~~release~~capture NO_x, SO_2 ~~and~~, particulate matter (PM), ~~and these devices can capture~~ mercury vapour and particulate-bound mercury as a co-benefit. Powdered activated carbon (PAC) injection is one of the advanced technologies used for mercury removal in incinerators or coal fired power plant. Mercury adsorbed on activated carbons can be stabilized or solidified for disposal (see section III, G, 2, (a), a above)

~~211.~~229. For the reduction of mercury emissions from waste incineration, the following documents also provide technical information:

~~(a) National legislation, e.g., European Union Directive 2000/76/EC on Waste Incineration;~~

~~(b) UNEP (2002): Global Mercury Assessment, http://www.unep.org/hazardoussubstances/LinkClick.aspx?fileticket=Kpl4mFj7AJU%3d&tabid=3593&language=en-US;~~

~~(c) European Commission (2006): Integrated Pollution Prevention and Control Reference Document on the Best Available Techniques for Waste Incineration, http://eippcb.jrc.es/reference/wi.html;~~

(a) ~~UNEP (2010c~~UNECE Heavy Metals Protocol under LRTAP Convention and Guidance document on best available techniques for controlling emissions of heavy metals and their compounds from the source categories listed in annex II~~,~~. The protocol is available at: http://www.unece.org/fileadmin/DAM/env/documents/2012/air/Guidance_document_on_best_available_techniques_for_controlling_emissions_of_HM.pdf;

~~(d)~~(b) UNEP. 2010b. Study on mercury sources and emissions and analysis of cost and effectiveness of control measures "UNEP Paragraph 29 study" (UNEP(DTIE)/Hg/INC.2/4), http://www.unep.org/chemicalsandwaste/Mercury/Negotiations/INC2/INC2MeetingDocuments/tabid/3484/language/en-US/Default.aspx; ~~and~~

(c) UNEP. 2002. Global Mercury Assessment. This report is available at: ~~,~~ http://www.unep.org/chemicalsandwaste/LinkClick.aspx?fileticket=Kpl4mFj7AJU%3d&tabid=3593&language=en--US; and

~~(e)~~ European Commission. 2006. Integrated Pollution Prevention and Control Reference Document on the Best Available Techniques for Waste Incineration. This report is available at: ~~,~~ http://eippcb.jrc.es/reference/wi.html~~UNECE Heavy Metals Protocol under LRTAP Convention.~~

(d) ~~;~~

(e) National legislation, e.g. European Union Directive 2010/75/EU on Industrial Emissions;

~~212.~~230. When a wet scrubber is used as one of the flue gas treatment methods, it is essential to treat the wastewater from the wet scrubber.

2. Reduction of mercury releases from landfills

~~213.~~231. When landfilling of wastes containing or contaminated with mercury or mercury compounds is unavoidable (operation D1), there are three types of mercury release ~~channels~~pathways from sanitary landfills to the environment: releases from the working face of landfills, the leachate and the landfill gas. The most important sites of mercury emissions are from the working face and the methane vents (Lindberg and Price, 1999). ~~It is reported that mercury releases through leachate are~~

~~fairly minimal compared to those through landfill gas (Yanase *et al*. 2009; Takahashi *et al*. 2004; Lindberg *et al*. 2001). Mercury transferred to leachate can be removed by leachate treatment, which is the same as that for wastewater from a wet scrubber of waste incinerators.~~ ~~Mercury releases from landfills can be reduced through prevention of wastes containing or contaminated with mercury going into landfills and prevention of landfill fires.~~

~~214.~~232. Daily landfill cover should be applied to reduce the direct release of mercury from wastes that have been newly added to landfills (Lindberg and Price 1999~~), and the potential for~~). Landfill fires~~.~~ can also result in increased mercury releases. For prompt application of soil cover in case of landfill fire, materials for soil cover should be stocked and machines used for applying soil cover for fire extinguishing purpose (e.g. dump truck, dozer shovel) should be provided for.

~~215.~~233. It is reported that mercury releases through leachate are fairly minimal compared to those through landfill gas (Yanase et al., 2009; Takahashi et al., 2004; Lindberg et al., 2001). Mercury transferred to leachate can be removed by leachate treatment, which is the same as that for wastewater from a wet scrubber of waste incinerators.

~~216.~~234. A landfill gas capture system should be installed to capture mercury vapour and methylmercury, in order to prevent release into the atmosphere.

I. Remediation of contaminated sites

~~217.~~235. Mercury-contaminated sites are widespread around the world and are largely the result of industrial activities, primarily mining, non-ferrous metals mining and ore processing, chlorine production, and the manufacture of mercury-added products. The vast majority of contamination in ~~those~~mining sites is the result of ASGM using mercury; an activity that has largely ceased or is subject to regulatory and engineering controls in ~~developing~~developed countries, but which continues in the developing world~~ at large sites and in the form of ASGM~~. Sites with mercury-contaminated soils and large mine tailings, or sites with widely dispersed areas of contamination that has migrated via water courses and other elements, are a result of both historic and current operation. ~~This section summarizes: (a) both the established and newer remediation techniques available for clean up; and (b) the emergency response actions appropriate when a new site is discovered.~~

236. The Minamata Convention contains provisions that require the development of detailed technical guidance for addressing contaminated sites (see paragraph 25 above).

1. Identification of contaminated sites and emergency response

~~218.~~237. A mercury-contaminated site that poses a threat to human health or the environment can be identified through:

(a) Records identifying past industrial or other activities at the site

~~(a)~~(b) Visual observation of the site conditions or attendant contaminant sources;

~~(b)~~(c) Visual observation of manufacturing or other operations known to have used or emitted a particularly hazardous contaminant;

~~(c)~~(d) Observed adverse effects in humans, flora, or fauna presumably caused by the proximity to the site;

~~(d)~~(e) Physical ~~(e.g., pH)~~ or analytical results showing contaminant levels; and

~~(e)~~(f) Reports from the community to the authorities of suspected releases.

~~219.~~238. Sites contaminated with mercury are similar to other contaminated sites in that mercury can reach receptors in a variety of ways. Mercury is particularly problematic because of its hazardous vapour phase, its low level of observable effects on animals, and different levels of toxicity depending on form (i.e.~~,~~ elemental mercury vs. methylmercury). Mercury is also readily detectable using a combination of field instruments and laboratory analysis. Sites contaminated with mercury may also be contaminated with other pollutants. Site assessment and remediation activities should consider all possible on-site pollutants, as this is likely to be the most cost-~~-~~effective overall approach to making the site available for further use.

~~220.~~239. The first priority is to isolate the contamination from the receptors as far as possible in order to minimize further exposure. In this way, sites contaminated with mercury are similar to a site with another potentially mobile, toxic contaminant.

~~221.~~240. If the site is residential and relatively small, ample guidance for emergency response is available from the United States EPA in their Mercury Response Guidebook, which was designed to address small- to medium-sized spills in residences (United States EPA, 2001).

~~222.~~241. Alternatively, for larger sites resulting from informal mercury use in developing countries (e.g. ASGM), recommendations for response are outlined in Protocols for Environmental and Health Assessment of Mercury Released by Artisanal and Small-Scale Gold Miners (GMP, 2004).

2. Environmentally sound remediation

~~223.~~242. Remedial actions (clean-ups) for sites contaminated with mercury are dependent on a variety of factors that define the site and the potential environmental and health impact. In selecting an initial group of treatment technologies for screening and then choosing one or a combination of techniques and technologies, the factors involved in selection include:

(a) Environmental factors:

(i) The amount of mercury released during operations;

(ii) The origin of the contamination;

(iii) The chemical state of mercury on the contaminated site;

(iv) The number, size, and location of mercury hotspots (requiring remediation);

(v) For mining operations, the properties from which the mercury is mined including, soil characteristics, etc.;

(vi) Methylation potential of the mercury;

(vii) Leaching potential of mercury from the contaminated media (e.g. soils and sediments);

(viii) Background mercury contamination - regional atmospheric mercury deposition not related to localized sources;

(ix) Mercury mobility in aquatic system; ~~and~~

(x) The presence and levels of other pollutants, particularly pollutants that may be treated, or partially treated by methods applied to mercury; and

~~(x)~~(xi) Local/State/Federal clean -up standards: water, soils/sediment, air.

(b) Receptor;

(i) Bioavailability to aquatic biota, invertebrates, edible plants; and

(ii) Mercury concentrations in receptors – human, animal and plants to indicate exposure.

~~224.~~243. Once these factors have been assessed, then a more complete analysis of the appropriate remediation techniques can commence. Depending on the severity, size, level and type of mercury contamination, other contaminants present, and the receptors, it is likely that a remedial plan that utilizes several techniques may be developed that most efficiently and effectively reduces the toxicity, availability and amount of mercury contamination at the site. More details of remediation techniques are found in "Mercury Contaminated Sites: A Review of Remedial Solutions" (Hinton, 2001) and "Treatment Technologies for Mercury in Soil, Waste, and Water" (United States EPA, 2007b)[53]. Information about remediation cases is available for Minamata Bay, Japan (Minamata City Hall, 2000) and chemical plant area in Marktredwitz, Germany (North Atlantic Treaty Organization Committee on the Challenges of Modern Society, 1998).

J. Health and safety

~~225.~~244. Employers should ensure that the health and safety of every employed person is protected while they are working. Every employer should obtain and maintain insurance, under an approved policy from an authorized insurer that provides a sufficient level of insurance coverage in case of liability (compensation) for bodily illness or injury sustained by employees arising out of and in the course of their employment~~.~~, as appropriate under national law. Health and safety plans should

[53] Additional information is available on United States EPA websites, e.g. Mercury Treatment Technologies (available at: http://www.clu-in.org/contaminantfocus/default.focus/sec/Mercury/cat/Treatment_Technologies/) and Policies and Guidance (available at: http://www.epa.gov/superfund/policy/guidance.htm).

be in place at all facilities that handle ~~wastes consisting of elemental~~ mercury ~~and wastes containing or contaminated with mercury~~wastes to ensure the protection of everyone in and around the facility. Such a plan should be developed for each facility by a trained health and safety professional with experience in managing health risks associated with mercury.

~~226.~~245. Protecting workers who are engaged in the management of ~~wastes consisting of elemental~~ mercury ~~and waste containing or contaminated with mercury~~ wastes and the general public can be achieved by in the following ways:

~~(a) Keep workers and the public away from all possible source of wastes;~~

(a) ~~Control wastes so that the possibility of~~Allowing access to the facility to only authorized personnel;

~~(b)~~ Ensure occupational exposure ~~is minimized; and~~

~~(c)~~(b) ~~Protect workers~~limits to hazardous substances are not exceeded by ensuring that ~~personal~~personnel use appropriate protective equipment ~~is used.~~;

(c) Ensure appropriate ventilation of the facility to minimize risk from exposure to volatile substances or substances which can become airborne; and

(d) Ensure that all national/regional laws on -workplace health and safety are complied with.

~~227.~~246. Guideline values for mercury concentrations in drinking water and ambient air have been established by WHO; they are 0.006mg/L (inorganic mercury) and 1 µg/m^3 (inorganic mercury vapour) respectively (WHO, 2006; WHO Regional Office for Europe, 2000). Governments are encouraged to monitor air and water in order to protect human health, especially near sites where management activities of ~~waste consisting of elemental~~ mercury ~~and~~ wastes ~~containing or contaminated with mercury~~ take place. Some countries have established permissible levels of mercury in the working environment (e.g. 0.025mg/m^3 as Hg for inorganic mercury excluding mercury sulphide and 0.01mg/m^3 as Hg for alkylmercury compounds in Japan; waste management operations should be conducted so as to satisfy permissible levels of mercury in the working environment and facilities where these operations are conducted should be designed and operated so as to minimize mercury releases to the environment as far as technically possible.

~~228.~~247. Special attention should be paid to sites where mercury-added products are handled. Within the waste stream, mercury emissions from mercury-added products can create exposures that raise health concerns and contribute to environmental releases at multiple points. Waste collectors, truck drivers and workers at transfer stations can be exposed to brief peaks of mercury vapour when handling such waste. Waste management employees at the “working face” of a landfill – the active area where waste is dumped, spread, compacted and buried – can be exposed to mercury vapour repeatedly. The informal waste sector involved in scavenging landfills for reclaimable items can be chronically exposed. Venting points for methane gas generated from decayed organic wastes are additional sources of mercury release and exposure.

~~229.~~248. Disposal facilities, especially where mercury recovery operations are conducted, also have a high risk of mercury exposure. Major activities with a high risk include crushing fluorescent lamps, extracting elemental mercury from mercury-added products such as thermometers and barometers, thermally treating wastes containing mercury or contaminated with mercury, and stabilization/solidification of elemental mercury.

~~230.~~249. Employee training in effective ESM and workplace health and safety should be provided, also to ensure employee safety against mercury exposure and accidental injury during waste management.

~~231.~~250. The basic level of knowledge employees need includes:

(a) The definition of ~~wastes consisting of elemental~~ mercury ~~and~~ wastes ~~containing or contaminated with mercury~~ and chemical aspects of mercury with its adverse effects;

(b) How to identify and segregate such waste from other wastes;

(c) Occupational safety and safeguarding health against mercury exposure;

(d) Use of personal protective equipment, such as body covering, eye and face protection, gloves and respiratory protection;

(e) Proper labelling and storage requirements, container compatibility and dating requirements, closed-container requirements;

(f) How to technically deal with ~~wastes consisting of elemental mercury and wastes containing or contaminated with mercury~~mercury wastes, particularly used products containing elemental mercury such as thermometers, barometers, etc., using the equipment available in the facility;

(g) Uses of engineering controls in minimizing exposure; and

(h) How to respond in an emergency if mercury in waste is accidentally spilled.

~~232.~~251. It is important to have worker insurance and employer liability insurance in order to be better prepared for accidents or injuries sustained by workers in the facility, as appropriate under national law.

~~233.~~252. In addition, the Awareness Raising Package (UNEP, 2008d) is recommended for use in employee training. All training materials should be translated into local languages and made accessible to the employees.

K. Emergency response

1. Emergency response plan

~~234.~~253. Emergency response plans should be in place ~~for~~ at each stage of the mercury ~~in production, in use, in~~waste processing chain (e.g., generation, storage, ~~in~~ transport, treatment or recovery, and ~~in~~ disposal ~~sites.~~). While the emergency response plans can vary according to the activities at each waste management stage and the physical and social conditions of each site, the ~~principle~~principal elements of an emergency response plan include identifying potential hazards, legislation governing emergency response plans, actions to be taken in emergency situations including mitigation measures, personnel training plans, communication targets (fire services, police, neighbouring communities, local governments, etc.) and methods in case of emergency, and testing methods and frequencies of emergency response equipment.

~~235.~~254. When an emergency occurs, the first step is to investigate the site. The person in charge should approach cautiously from upwind, secure the scene and identify the hazard. Placards, container labels, shipping documents, material safety data sheets, car identification charts, and/or knowledgeable persons on the scene are valuable information sources. The need to evacuate, availability of human resources and equipment, and possible immediate actions should then be assessed. In order to ensure public safety, an emergency response agency call should be made and, as an immediate precautionary measure, the spill or leak area should be isolated for at least 50 meters in all directions. In case of fire, an extinguishing agent suitable for the type of surrounding fire should be used, whereas water should not. For further information, the "Emergency response guidebook" (United States Department of Transportation, Transport Canada, and the Secretariat of Communications and Transportation of Mexico (SCT) 2008) is helpful.

2. Special consideration for spillage of ~~elemental~~ mercury or mercury compounds

~~236.~~255. Spillage of ~~elemental~~ mercury ~~accidentally~~or mercury compounds occurs primarily when waste mercury-added products are broken. Most of these cases seem to involve mercury-~~containing~~added glass thermometers ~~which are widely used in the world but~~ easily broken. Although the mercury in each glass thermometer is about 0.5-3 g and does not usually lead to serious health problems, mercury spills should be considered hazardous and should be cleaned up with caution. ~~If anybody~~Indoor areas should be adequately ventilated. If a person experiences shows discomfort following a mercury spill, a medical doctor and/or environmental health authorities should be contacted immediately.

~~237.~~256. If the spill is small and simple (e.g. on a non-porous area such as linoleum or hardwood flooring, or on a porous item that can be thrown away ~~(~~such as a small rug or mat), it can be cleaned up ~~personally.~~by an individual. If the spill is large, or complex (e.g. on a rug that cannot be discarded, on upholstery or in cracks or crevices~~,~~), it may be necessary to hire a trained professional to contain or clean up the spill. Large spills involving more than the amount of mercury found in a typical household product should be reported to the local environmental health authorities. If there is any uncertainty as to whether a spill should be classified as "large", the local environmental health authorities should be contacted to be on the safe side. Under certain circumstances, it may be advisable to obtain the assistance of qualified personnel for professional clean-up or air monitoring, regardless of spill size (Environment Canada 2002).

~~238.~~257. Spills of elemental mercury in the course of commercial activities and in households have the potential to expose workers and the general public to hazardous mercury vapours. In addition,

the spills are both costly to clean up and disruptive. Clean-up procedures for small mercury spills are found in United States EPA, 2007c.

~~239.~~258. Critical to determining what type of response is appropriate for any mercury spill is evaluating its size and dispersal and whether the necessary clean-up resources and expertise are available. Professional help should be sought in the following cases:

(a) The amount of mercury could be more than 2 tablespoons (30 millilitres). Larger spills should be reported to the authorities for oversight and follow-up;

(b) The spill area is undetermined: If the spill was not witnessed or the extent of the spill is hard to determine, there could be small amounts of mercury that are hard to detect and that necessitate clean-up efforts;

(c) The spill area contains surfaces that are porous or semi-porous: Surfaces such as carpet and acoustic tiles can absorb the spilled mercury and make clean-up practically impossible; and

(d) The spill occurs near a drain, fan, ventilation system or other conduit: mercury and mercury vapours can quickly move away from the spill site and contaminate other areas without being easily detected.

~~240.~~259. Scattering of spilled mercury (e.g. by using water jets) should as much as possible be avoided because it significantly increases the evaporation rate. (World Chlorine Council, 2004)

L. Awareness and participation

~~241.~~260. Public awareness and participation play key roles in implementing ESM of ~~wastes consisting of elemental mercury and wastes containing or contaminated with mercury.~~mercury wastes. Public participation is a core principle of the Basel Declaration on Environmentally Sound Management and many other international agreements. It is essential that the public and all stakeholders have a chance to participate in the development of legislation, policy, programmes and other decision-making processes related to mercury.

~~242.~~261. Articles 6, 7, 8 and 9 of the 1998 Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters require specific action pertaining to public participation in specific government activities, the development of plans, policies and programmes, and the development of legislation, and call for access to justice for the public with regard to the environment.

~~243.~~262. When initiating activities such as the collection and recycling of waste containing mercury, it is ~~essential to ensure~~advisable to obtain participation and cooperation from the consumers who generate mercury-containing waste. Continuous awareness-raising is a key to the successful collection and recycling of waste containing mercury. Encouraging public involvement in designing a collection and recycling system for waste containing mercury, ~~which provides participating residents~~by providing them with information about the potential problems caused by the environmentally unsound management of such waste, would help to increase consumer awareness.

~~244.~~263. Public awareness and sensitization campaigns for local communities and citizens are important elements in promoting public participation in the ESM of ~~wastes consisting of elemental mercury and wastes containing or contaminated with mercury.~~mercury wastes. In order to raise the awareness of citizens, the authorities concerned, e.g. local governments, need to initiate various awareness-raising and sensitization campaigns to enable citizens to take an interest in protection against the adverse effects to human health and the environment. In addition, it is important to involve community-based societies in the campaigns because they have a closer relationship with residents and other stakeholders in the communities (Honda, 2005).

~~245.~~264. Programmes for public awareness and public participation should generally be developed around a waste management situation at national/local/community level. Table ~~-~~7 shows an example of programmes for public awareness and participation. There are four elements: publications, environmental education programmes, public relations ~~(PR)~~ activities and risk communication, which citizens can easily access in public places (Honda, 2005).

Table 7: Programmes for public awareness and public participation

	Contents	Expected results
Publications	• Booklet, pamphlets, brochures, magazines, posters, web-sites, etc., in various languages and dialects to simply explain mercury issues • Guidebooks on how to dispose of waste	• Knowledge sources • Explanation of how people can handle mercury-added products and dispose of waste
Environmental Education Programmes	• Voluntary seminars • Community gatherings • Linkages with other health workshops • Demonstration of take-back programme • Scientific studies • Tours to facilities, etc. • eLearning	• Raising knowledge • Sharing common issues • Opportunities to discuss environmental issues directly
Activities	• Take-back programmes • Mercury-free product campaigns • Waste minimization campaigns • Community gatherings • House-to-house visit	• Implementation of environmental activities among all partners • Environmental appeal for citizens • Closer communications
Risk Communication	• Mercury exposure in general living environment • Safe level of mercury exposure • Mercury pollution levels • PRTR • Fish consumption advisories (only for populations that consume large amounts of fish) • Rice consumption advisories • Response to mercury spills from mercury-added products	• Proper understanding of safe- and risk levels of mercury exposure, in appropriate circumstances • Avoidance of overreaction

~~246.~~265. As part of environmental education programmes, publications provide basic knowledge of mercury properties, mercury toxicology, the adverse effects to human health and the environment, waste-related issues and mercury exposure from waste as well as how to manage waste. Publications should be translated into the locally relevant languages and dialects to ensure the information is communicated efficiently to the target population.

~~247.~~266. The components of an environmental education programme on ~~wastes consisting of elemental mercury and wastes containing or contaminated with mercury~~mercury wastes are as follows (Honda, 2005):

(a) Awareness and sensitivity to the environment and environmental challenges;

(b) Knowledge and understanding of the environment and environmental challenges;

(c) Attitudes of concern for the environment and a motivation to improve or maintain environmental quality;

(d) Skills to identify and help resolve environmental challenges; and

(e) Participation in activities that lead to the resolution of environmental challenges.

~~248.~~267. The partners for programmes on public participation can be summarized as follows (Honda, 2005):

(a) Officials and staff in governments who work for environmental issues;

(b) People who are interested in environmental problems and have a high potential to understand quickly and disseminate information to others:

(i) Children and students ~~at schools, undergraduate students at universities~~;

(ii) Teachers ~~of primary~~ and ~~middle schools, sometimes University~~ professors;

~~(c) Men~~Leaders and ~~women~~representatives from local communities and groups; ~~and~~

~~(d) Retired persons with a suitable education.~~

~~(e)~~(c) People who work in the environmental fields at the local or community level:

(i) Non-governmental organizations ~~(NGOs)~~;

(ii) Small and medium-sized enterprises; and

(iii) Local producers, collectors and recyclers; ~~the~~ disposal facility owners ~~that~~, operators, and workers who handle mercury waste.

~~(f)~~(d) People who ~~used~~are, or reside, in proximity to ~~live at polluted~~waste management or mercury contaminated sites;

~~(g)~~(e) Local organizations;

~~(h)~~(f) City residents; and

~~(i)~~(g) Enterprises.

~~249.~~268. To ensure that mercury releases from collection, transportation and disposal of waste are kept to a minimum, it is important to raise the awareness of the parties concerned (e.g. transporters, recyclers, and treatment operators). This can be achieved through: awareness-raising activities such as seminars, which can provide information about new systems and regulations and opportunities for information exchange; preparing and distributing leaflets; and disseminating information via the internet.

Annex to the technical guidelines

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