



Hazardous Wastes from Agriculture and from Health

The existence of counterfeit and substandard chemicals and medical drugs in some countries of the region, is related to poor data, low enforcement of already outdated legislation, scarce quality control, lack of coordination amongst concerned authorities and low levels of awareness and capacity. Porous border control is also a major issue here. The build up of hazardous wastes also happens due to inadequate transportation, poor storage (loss of quality, poor stock management such as disregard for the First-In First-Out principle or FIFO).

3.1. Pesticides

The use of pesticides has become an important source of hazardous wastes. As reported by delegates of many country during the meeting, most SEAR countries run the risk of purchasing substandard chemicals, which becomes a major issue, in the absence of regular quality control. Such bulk quantities of chemicals are inefficient and tend to remain unused, accumulating to become hazardous, obsolete pesticides. Countries without an adequate legislation that guarantees quality for locally manufactured pesticides run a similar risk. Often the process of pesticide manufacture generates hazardous wastes. After use, empty pesticide containers such as metal drums, plastic jars, paper and cardboard used for wrappings, jute and other bags, add to the volume of polluted wastes. Empty pesticide containers are often re-used, despite some awareness about the environmental health risks posed. Leftover pesticides are often buried, or discharged in water bodies. Stocks of

obsolete pesticides are often stored under poor conditions, allowing theft and leakages to the soils and groundwater. Alternatively, if not re-used, they are buried or burnt in the open.

A survey on the fate of empty pesticide containers, carried out in **Nepal**, showed that 44% threw away the empty pesticides containers; 16% buried them; 4% reused them for storing water at home; 6% stored empty containers to keep cooking oil; 30% disposed them in public garbage containers (Source: Annex 10, P11).

In most disaster prone SEAR countries, constant inadequacies between the demand for and supply of pesticides and/or drug donations, have always lead to the unnecessary accumulation of chemical stocks in excessive volumes. This has resulted in stockpiling of obsolete pesticides and /or of outdated medical drugs. Information on obsolete stocks is presented in Table 2.

Stocks of hazardous wastes from agriculture and/or their inadequate disposal, present major public health risks either through direct exposure or indirectly through the environment. Improper storage, handling, transportation, treatment and disposal of hazardous wastes can threaten human health and the environment through leakage of toxins into groundwater, soil, and the atmosphere. Populations may be adversely affected when toxic wastes are ingested through contaminated water sources and polluted air, and when poor labour practices put workers in direct contact with hazardous wastes (Annex 10, P3).

Table 2 Annual consumption of pesticides in some countries of the SEA Region

Country	Area (km2)	Consumption of pesticides (Metric Tons active ingredient)	Comments
Bangladesh	144 000	25 466 (2005)	Empty containers are often re-used for water, oil and food storage. Consumed 15 376 MT in 2001. Currently using 18gm a.i /Ha.
India	3 287 000	48 350 (2003)	India is 4th largest producer of agricultural chemicals after USA, Japan and China. Produced 2 350 MT in 1950, 46 000 MT in 2000. Hazardous waste generated during manufacture, after banning use and de-phasing labels and from lack of adequate stock management.
Indonesia	1 905 000	2 500 (2002)	
Myanmar	676 000	6 332 (2006)	Market dominated by private sector. In 2005, 4 000 Mt insecticides consumed.
Nepal	147 000	177 (2004)	Inadequate implementation of existing laws. Nepal faces serious concerns about smuggling substandard pesticides across its borders. It imports most pesticides from India (90%), for an annual volume worth 2 million USD. Consumed 146 MT in 2001. Currently using 43 gm a.i./Ha. 251 trade names and 75 technical products registered.
Sri Lanka	66 000	4 850 (2004)	There are 50 formulation and pesticide marketing companies. Volumes consumed have not increased significantly since 1990.
Thailand	513 115	39 904 (2002)	

Source: Country presentations at the workshop (Annex 10), WHO (2005)

Box 2 Pesticide residues in food

In **Myanmar**, the presence of pesticide residues in vegetables, sediments, weeds and drinking water in and around the Inlay Lake has been reported, many of them being organochlorine compounds such as DDT, Aldrin and their derivatives. Country delegates opined that integrated pest management schemes were needed to reduce these problems in future. Further, there is a need for updating national pesticide legislation, ideally, along the lines of the FAO Code of Conduct. To achieve this, Myanmar would need support. (Annex 10, P7).

More than 550 food samples were analysed in **India** between 2000 and 2003: 117 cereals, 91 pulses, 131 spices, 15 meat products, 50 milk products, 119 vegetables and fruits, 62 tea/coffee, 49 oil/fats, 30 oil seeds, 34 baby foods, 10 dry foods. All samples contained DDT amongst other unwanted residues, albeit below the national standards valid at the time. (Source; WHO, SEARO, 2003).

3.2. Health care wastes

Health care wastes (HCW) are generated in the process of providing medical services. They are hazardous by nature and are basically classified in infectious and non infectious wastes. They can be

solid or liquid, but gas emissions from medical waste incineration are also considered health care wastes. Outdated pharmaceuticals are also contributing to the stocks of hazardous waste generated by the health sector. HCW pose significant health hazards

Table 3 Estimated health care waste generation in some SEAR countries, 2000 (based on 1kg/bed/day)

Country	Bed Strength	Estimated volumes (Metric tons daily)	Estimated annual volumes (Metric tons)
Bangladesh	50 885	51	18 615
Bhutan	1 361	1.4	511
India	746 048	746	273 020
Indonesia	133 566	136	49 640
Maldives	653	0.7	255
Myanmar (*)	31 563	32	11 680
Nepal	6 654	7	2 555
Sri Lanka	65 515	65	31 025
Thailand	141 526	142	51 830
Sum	1 177 771	1 180	4 30 700

Source: Strengthening of Hazardous Waste Management in the Countries of South East Asia, WHO SEARO, 2000.

(*): At the workshop, Myanmar reported that 172 tons of HCW had been incinerated in 2004, and 50 tons of sharps wastes buried in sharps pits.

in all SEAR countries, as they are, to a large extent, ill-managed throughout the life cycle and often disposed of by inadequate incineration.

The daily amount of health care wastes generated in the SEAR countries' health facilities, is estimated to be over 1000 metric tons (see Table 3). Most of these wastes are not segregated—infectious and non infectious items are discarded together – and most often, disposed of under very poor conditions. SEARO data was presented and is summarised in Table 3.



Burning waste in a drum incinerator on the rooftop of a hospital, Nepal (Photo: WHO)

Problems with incineration of health care wastes

The facilitator from India presented the current challenges posed by the use of incinerators in health care facilities in the country.

By incinerating, the aim of complete combustion of waste to totally sterile ashes, is achieved. However a major health problem is created by some of the HCW components, mainly PVC containing materials such as plastics, which can



India: Wrongly understood worker's safety. Photo: SHRISTI

emit highly toxic dioxins and furans. The ashes remain hazardous because they are still sharp and are often contaminated with heavy metals, like mercury. Most health care settings in SEAR have opted for setting up sound HCW management systems, yet many have chosen to install small scale incinerators, as they appear to be a cheaper solution.

Properly designed and operated, dual-chamber, controlled-air, small-scale incinerators represent an improvement over uncontrolled drum or pit burning practices. But, they require pollution control devices to minimize emissions. Numerous design, construction, site selection, operational and management deficiencies result in poor performance. Based on available surveys, such weaknesses are common, not the exception. Thus, incinerator emissions of both conventional (e.g., particulate matter) and toxic pollutants (e.g., dioxin/furans) may pose risks that potentially impact:

- ◆ Health staff and patients in health care facilities;
- ◆ Waste workers and incinerator operators;
- ◆ Local communities, through both inhalation exposure and through the consumption of locally-produced food

that becomes contaminated from incinerator emissions;

- ◆ Regional/global environment, through the discharge of toxic and persistent chemicals. Incineration of health-care waste, producing relatively high emissions of persistent compounds controverts the Stockholm Convention aimed at elimination of these compounds.

The availability of incineration may negatively affect the development and use of preferred waste treatment options. Still, cost-effectiveness of incineration does not appear to be favourable over autoclaving in developed countries. Several low-cost non-incineration technologies suitable for small quantities of waste in remote areas, have been demonstrated in India. (Sources: Annex 10, P20, and "Assessment of Small-Scale Incinerators for Health Care Waste" By S. Batterman, WHO, 2004.)

Legislation

Most countries in SEAR lack, or are only in the process of drafting specific health-care wastes legislation. This was confirmed by the participants, and is shown in Table 4. The participants felt that the case for sounder management of

Table 4 Status of SEAR countries regarding national policy on health-care waste management (2005)

Country	Legislation has been passed	Policy and guideline published	National committee	Sub-national committee
Bangladesh	In process	2001 and 2004	In process	In process
Bhutan	In process	1998 and 2005	No	No
India	1998	2000 and 2005	Yes	Partially
Indonesia	In process	In process	In process	No
Maldives	In process	In process	Not available	Not available
Myanmar	No	No	No	No
Nepal	In process	In process	In process	In process
Sri Lanka	Yes	2001	No	No
Thailand	2002	2000	In process	In process

Source: WHO, SEARO, 2005

Box 3**BMW Rules in India**

Ministry of Environment & Forest (MoEF) proposed the first draft rules in 1995. The rules recommended on-site incinerators for all hospitals with more than 50 beds. At the same time, in a public interest case, the Supreme Court of India, in March 1996, ordered the inclusion of alternate technologies and their standards in the Rules. The second draft rules were notified in 1997. The final rules (July 1998) and were called Bio-Medical Waste (Management & Handling) or BMW Rules 1998 (see website at: http://dpcc.delhigovt.nic.in/act_bmw.htm). A first amendment (March 2000) changed Schedule VI of the rules, concerning having waste management facilities for treatment of waste. The second amendment to the rules (June'2000) nominated Pollution Control Boards/Committees as Prescribed Authorities, since the work involved a lot of technical intervention like monitoring the air emission from the incinerators and the waste water effluents. Source: Annexe 10, P20.

wastes issued from health services needed to be addressed in particular.

Mercury

The participants recognized that health care facilities are one of the main sources of mercury release into the atmosphere, because of emissions from the incineration of medical waste mixed with mercury-containing medical devices. Currently, all SEAR countries allow unrestricted use of mercury thermometers. Only a few local initiatives have adopted resolutions encouraging physicians and hospitals to reduce and eliminate their use of mercury-containing equipment such as thermometers and sphygmomanometers. Such initiatives were reported by participants from **India** and the **Maldives**.

Mercury is a naturally occurring heavy metal. At ambient temperature and pressure, mercury

is a silvery-white liquid that readily vaporizes and may stay in the atmosphere for up to a year. Mercury ultimately accumulates in lake sediments, where it is transformed into its more toxic organic form, methyl mercury, which accumulates in fish tissue. It may be fatal if inhaled, and harmful, if absorbed through the skin. If absorbed in the blood through the lungs, it may cause harm to the nervous, digestive, respiratory system and to the kidneys, besides causing lung damage. Adverse health impacts from mercury exposure can be: tremors, impaired vision and hearing, paralysis, insomnia, emotional instability, developmental deficits during foetal development, and developmental delays during childhood. Recent studies suggest that mercury may have no threshold, below which adverse effects do not occur.

The most common potential mode of occupational exposure to mercury is through inhalation of

Box 4**Mercury in gold mining, Indonesia**

In 2002, 44000 industrial and small-scale gold mining operations were recorded, more than 200 tons of mercury is employed annually. Small-scale gold mining co-exists with large-scale mining and is economically viable. It is simple to do, and can be a part-time job before the harvest season. Large amounts of mercury are used in the process. Big mining operations ultimately convert to toxic swamps, the mercury-contaminated waters of which are used by local populations for all purposes, with contaminated fish becoming a regular part of the local diet. A schematic presentation of long-term environmental and health problems from mercury pollution, showed that once it occurs, human and environmental toxicity persists for over 150 years and affects multiple generations. A comprehensive scheme for managing the health aspects of mercury pollution was offered which describes the pathways for screening, diagnosis, treatment and surveillance in these populations. Source: University of Indonesia, Annexe 10, P4.

metallic liquid mercury vapours. If not cleaned up properly, spills of even small amounts of elemental mercury, such as from breakage of thermometers, can contaminate indoor air above recommended limits and lead to serious health hazards. Since mercury vapour is odourless and colourless, people can breathe mercury vapour without realising that they have done so.

Dental amalgam, the most commonly used dental filling material, is a mixture of mercury and a metal alloy. In 1991, WHO confirmed that mercury contained in dental amalgam is the greatest source of mercury vapour in non-industrialized settings, exposing the concerned population to mercury levels significantly exceeding those set for food and for air.

Box 5 Step Guide to Clean-Up of mercury spill

1. Remove jewellery

Remove all jewellery from hands and wrists so the mercury cannot combine with the precious metals.

2. Put on old clothes

Change into old clothes and shoes that can be discarded if they become contaminated.

3. Evacuate area

Remove everyone from the area where cleanup will take place and shut the door. Turn off interior ventilation system to avoid dispersing mercury vapour throughout the facility.

4. Identify surface

Wood, linoleum, tile and any other like surfaces can easily be cleaned. Carpet, curtains, upholstery or other such surfaces cannot. These items should be discarded according to the disposal means outlined below. (For carpets, only the affected portion needs to be cut out and removed.)

5. Wear gloves

Put on rubber or latex gloves. Place all broken objects on a paper towel. Fold the paper towel and place in a zip lock bag. Secure the bag and label it as containing items contaminated with mercury.

Note: When labelling bags, do so as directed by your local health or fire department to prevent confusion about contents.

6. Locate mercury beads

Locate all mercury beads, then carefully use the cardboard to gather them together. Use slow sweeping motions to prevent accidentally spreading the mercury. Small and hard-to-see beads can be located with the flashlight: hold it at a low angle close to the floor in a darkened room and look for additional glistening beads of mercury that may be sticking to the surface or have gathered in small cracked areas of the surface. Note: Mercury can move a surprisingly long distance hard and flat surfaces: be sure to carefully inspect the entire room.

7. Use eyedropper

Use an eyedropper or syringe (without a needle) to draw up the mercury beads. Slowly and carefully transfer the mercury into an unbreakable plastic container with an air tight lid (such as a plastic film canister). Place the container in a zip-lock bag. Label the bag as containing items contaminated with mercury. After you remove larger beads, use sticky tape to collect smaller hard-to-see beads. Place the duct tape in a zip lock bag and secure.

Note: Powdered sulphur or zinc stains mercury a darker colour and can make smaller beads easier to see. Be careful not to breath the powder, as it can be mildly toxic.

8. Put everything into rubbish bag

Place all materials used during the cleanup, including gloves, into a rubbish bag. Seal the rubbish bag and label it.

Contd...

9. Final disposal

Contact your local hospital manager responsible for toxic clean up and proper disposal, to ensure disposal in accordance with local or state laws. In their absence, collect the mercury spill waste in a secured steel drum ventilated to outside air.

10. Outside ventilation

Keep the affected area ventilated to the outside (with windows open and fans running) for at least 24 hours after your successful cleanup. If sickness occurs, seek medical attention immediately. Note: This guide only applies to small spills, such as a broken thermometer. In the event of large spills, turn down the temperature, turn off internal ventilation, open the window, and inform your local health and safety authority.

Six things you should NEVER do:

1. Never use a vacuum cleaner to clean up mercury: The vacuum cleaner will vaporise the mercury and drastically increase exposure in the area.
2. Never use a broom to clean up mercury: it breaks up the mercury droplets and moves them around, making it harder to decontaminate the area.
3. Never pour mercury down the drain: it can lodge in the plumbing, and contaminate the septic tank and sludge in sewage treatment plants.
4. Never wash mercury-contaminated items in a washing machine: mercury can contaminate the sewage system and the washing machine.
5. Never continue wearing shoes and clothing that might have been contaminated in the mercury spill: this increases the wearer's exposure and helps spread contamination.
6. Never burn shoes, clothing, fabric or anything that has been contaminated with mercury: this puts mercury into the atmosphere.

