3R approach towards bio-medical waste management

7th IconSWM Conference

15-17 December 2017, Hyderabad, India

Anupam Khajuria

Researcher

United Nations Centre for Regional Development (UNCRD), Japan

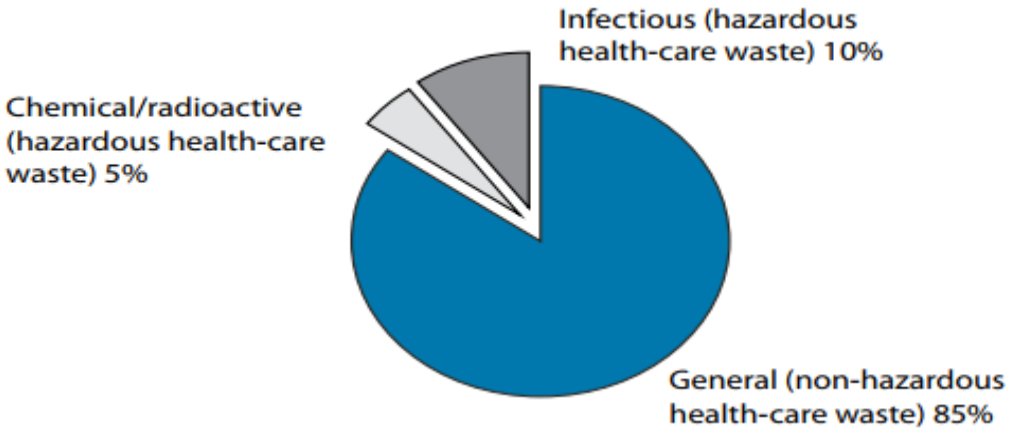
Kindly go to www.menti.com and use the code 48 23 19

Contents

- *Introduction*
- *Quantification of bio-medical waste*
- *Categories, treatment and disposal system of bio-medical waste*
- *Risks and impact on health and environment*
- *Rules and regulations*
- *3R (Reduce, Reuse and Recycle) strategies and policies*

Introduction

- “Bio-medical waste" means any waste generated during the diagnosis, treatment or immunisation of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps.



- Healthcare and hospitals are responsible for the waste they produce and must ensure the handling, treatment and disposal of that waste will not have harmful consequences for public health or the environment.

- Veterinary Waste: Animals (tissue and blood) with zoonotic disease.

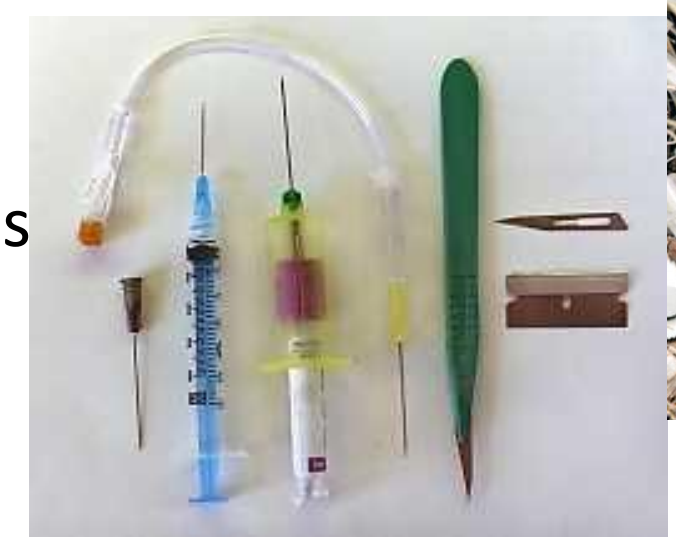
75 - 90 % of hospital wastes are similar to household refuse or municipal waste and do not entail any particular hazard.

Source: Bio-Medical Waste Management Rules, 2016 (MoEF&CC, 2016 c)

http://www.searo.who.int/srilanka/documents/safe_management_of_wastes_from_healthcare_activities.pdf

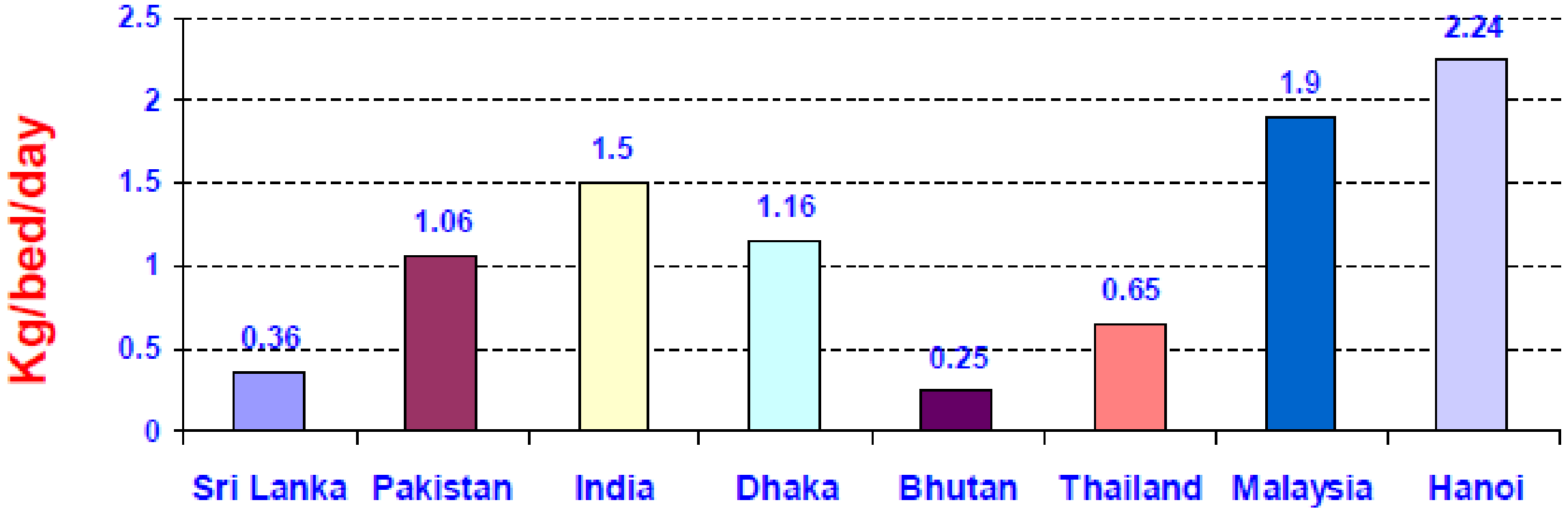
Classification

- **Solids:**
  - ❖ Catheters and tubes
  - ❖ Disposable masks and scrubs and tools
  - ❖ Medical gloves
  - ❖ Wound dressings
  - ❖ Human Body Parts
- **Liquids:**
  - ❖ Blood
  - ❖ Body fluids and tissues
  - ❖ Cell, organ and tissue cultures
- **Sharps:**
  - ❖ Blades (Razor or Scalpel)
  - ❖ Material made up glass such as slides
  - ❖ Needles



Quantification

- ***1.0-1.5 kg/bed/day in a large hospital, and***
- ***0.3 kg/bed/day in a small hospital.***



Source: http://www.env.go.jp/recycle/3r/en/asia/02_03-2/05.pdf

Quantification of bio-medical waste in India

❖ ***Generation of bio-medical waste in India***

- ❑ Quantity of bio-medical waste generated in Tonnes/day : 484
- ❑ Quantity of bio-medical waste treated in Tonnes /day : 447
- ❑ No. of healthcare facilities: 1,68,869
- ❑ No. of beds : 17,13,816
- ❑ No. of Common Bio-medical Waste Treatment Facilities (CBWTFs) : 226 [198 (in operation) + 28 (CBWTFs under installation)]
- ❑ No. of healthcare facilities (HCFs) using CBWTFs: 1,31,837
- ❑ No. of HCFs having treatment & disposal facilities: 22,245
- ❑ No. of healthcare facilities applied for authorization: 1,06,805
- ❑ No. of healthcare facilities granted authorization: 1,05,270

❖ ***Treatment equipment installed by Common Bio-medical Waste Treatment Facilities (CBWTFs)***

· No. of incinerators : 198 · No. of autoclaves: 189 · No. of microwaves: 06 · No. of Hydroclave: 03 · No. of Shredders: 202	· Quantity of bio-medical waste generated in Tonnes/day: 484 · Quantity of bio-medical waste treated in Tonnes /day: 447 · No. of HCFs violated BMW Rules: 7,894 · No. of Show-cause notices/Directions issued to defaulter HCFs: 4,391

Categories, treatment and disposal system in India

Color of Bin	Waste	Treatment
Yellow Bin	Soiled waste, Infectious waste Swabs, Gauze, Bandages, Linen, Body parts, Discarded Medicines etc	Incineration
Red Bin	Infected plastics Catheters, tubing's, IV bottles, Gloves, Blood Bags etc	Autoclaving & recycling
White Bin	Needles with or without syringes, scalpels, blades etc	Autoclaving & recycling to foundries
Blue Bin	broken glass, vials & ampoules etc	Autoclaving and recycling
Green Bin	Food waste , Fruit peels/seeds with no polythenes etc	Composting

- *Medical waste management is 80% segregation and 20% technology*
- *Incineration: Pathological Waste and Body Parts , no chlorinated plastics*
- *Autoclaving: All except body parts and pathological waste*
- *Microwaving: All except pathological waste and metals*
- *Chemical: Mainly plastics*

http://mpcb.gov.in/biomedical/pdf/BMW_Rules_2016.pdf

Categories, treatment and disposal system in India

Category	Waste category	Treatment
Category 1	Human anatomical waste	Incineration /burial
Category 2	Animal waste	Incineration /burial
Category 3	Microbiology & biotechnology waste	Incineration /alternate
Category 4	Waste sharps	Disinfection & autoclaving/microwaving/shredding & mutilation
Category 5	Discarded medicines, cytotoxic drugs	Incineration /landfill
Category 6 & 7	Solid waste	Autoclaving, microwaving & mutilation for category 7
Category 8	Liquid waste	Disinfection
Category 9	Incineration ash	Landfill
Category 10	Chemical waste	Drainage /secured landfill after treatment

Risks and impact on health and environment

❖ ***Groups of persons are potentially exposed***

INSIDE THE HEALTHCARE UNIT:-

care staff (doctors, nursing staff, auxiliaries), stretcher-bearers, scientific, technical and logistic personnel (cleaners, laundry staff, waste managers, carriers, maintenance personnel, pharmacists, laboratory technicians, patients, families and visitors).

> risk of trauma (waste category 1);
> risk of infection (waste categories 1 and 2);
> chemical risk (waste categories 3 and 4);
> risk of fire or explosion (waste categories 3 and 4);
> risk of radioactivity (waste category 5, which is not dealt with in this manual).

OUTSIDE THE HEALTHCARE UNIT:-

off-site transport personnel, personnel employed in processing or disposal infrastructures, the general population (including adults or children who salvage objects found around the hospital or in open dumps).

Source: https://www.icrc.org/eng/assets/files/publications/icrc-002-4032.pdf

Risks and impact on health and environment

❖ Threats to Health

– 4 needle stick accidents per 100 beds in a year

– Infectious rate by needle stick accidents

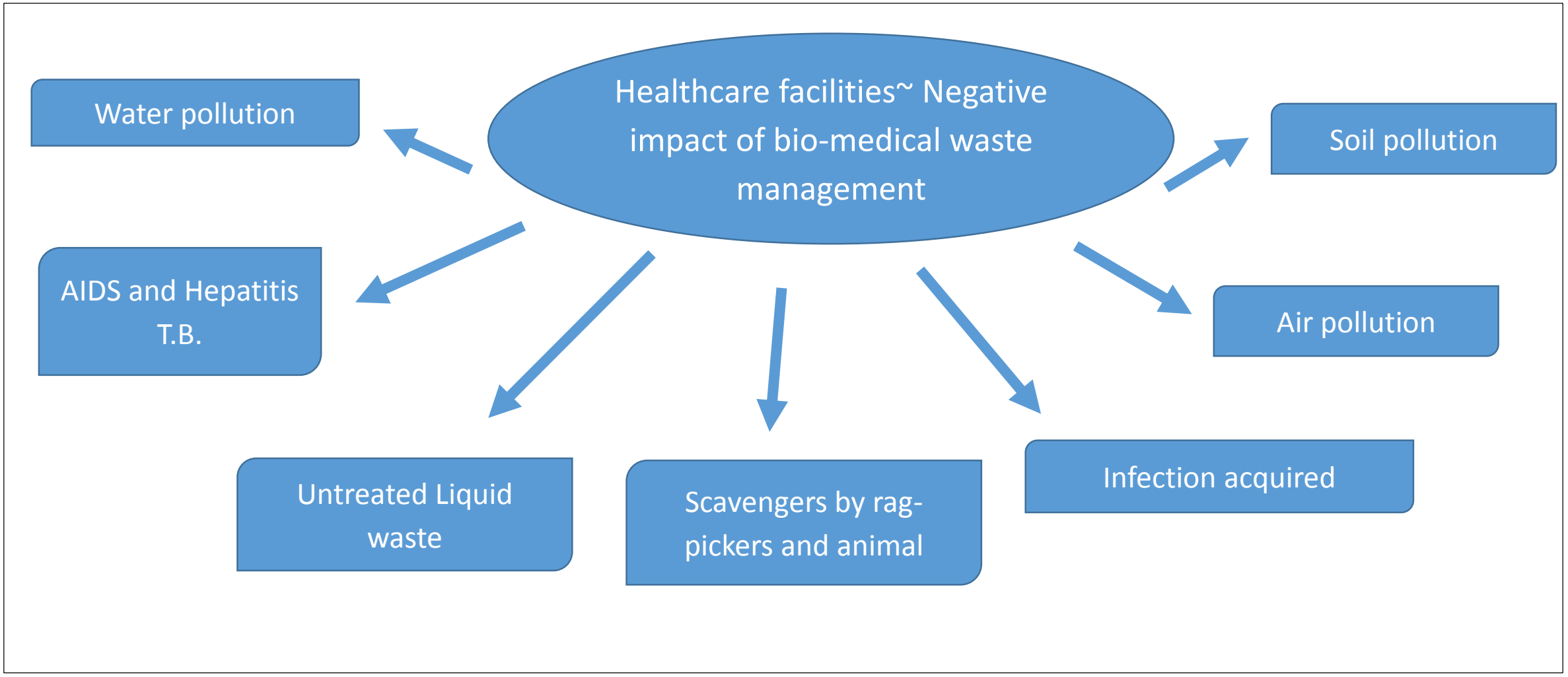
- HBV 10 ~ 35%
- HCV 2 ~ 5%
- HIV 0.2 ~ 0.5%

❖ Threats to Environment

Cause environmental pollution

https://www.google.co.jp/search?q=bio-medical+waste&rlz=1C1CAFB_enJP726JP726&source=lnms&tbm=isch&sa=X&ved=0ahUKEwidt8DolrPXAhVDwbwKHcKlD44Q_AUICigB&biw=907&bih=542#imgdii=jqeH6TERGPUhqM:&imgrc=IyRVHkZbs-KCgM:

Negative impact of improper Bio-medical waste management system



Mentimeter Questionnaire Slide-1

Are you aware of any legislation application to bio-medical waste management?

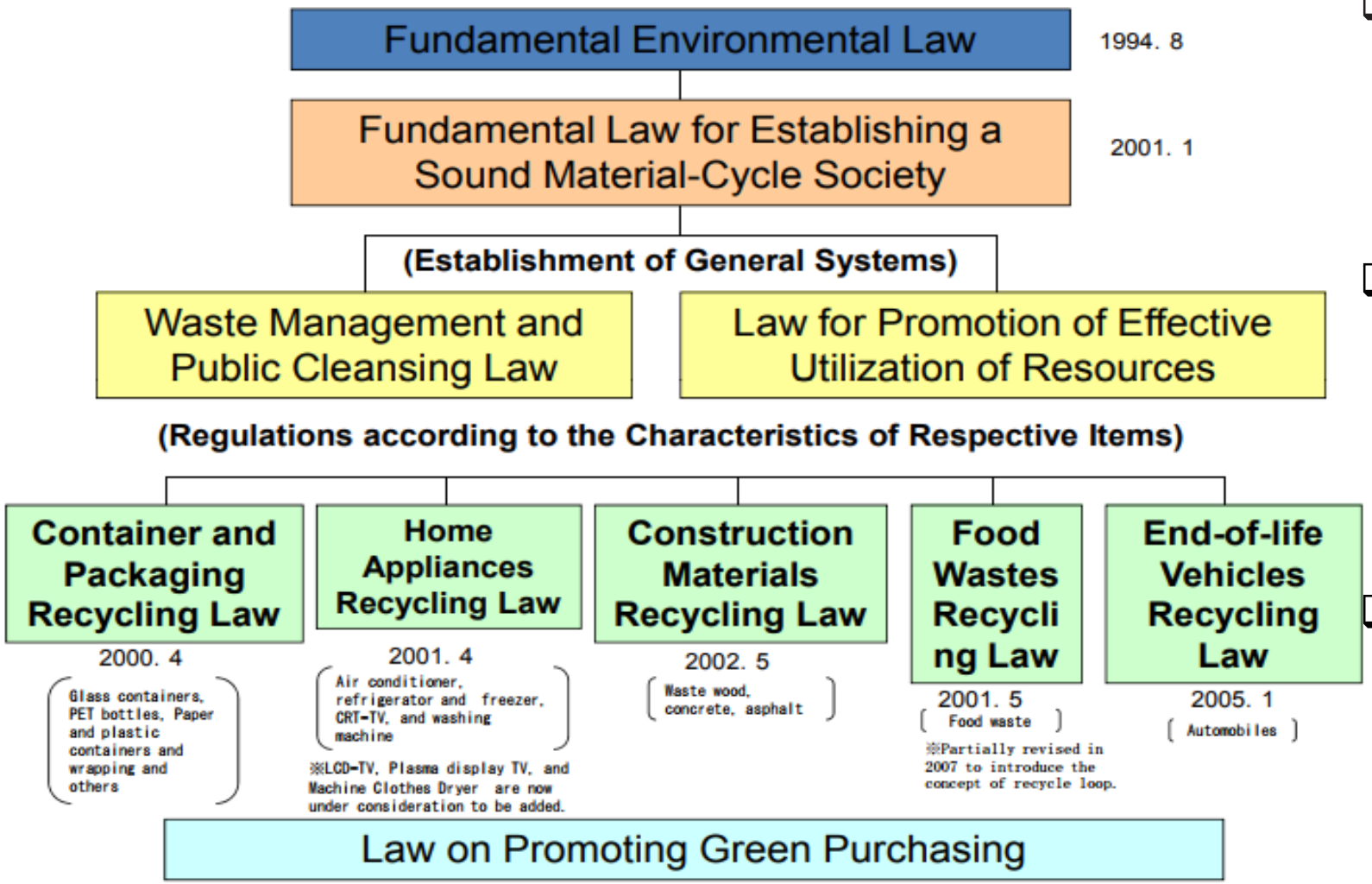
Rules and Regulations

❖*International agreements*

- **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal** (UNEP, 1992): The main objectives of the Basel Convention are to minimize the generation of hazardous wastes, treat those wastes as close as possible to where they were generated and reduce transboundary movements of hazardous wastes.
- **Stockholm Convention on Persistent Organic Pollutants** (UNEP, 2004): This convention aims to reduce the production and use of persistent organic pollutants and to eliminate uncontrolled emissions of substances such as dioxins and furans.
- **Minamata Convention on Mercury** (UNEP, 2009):The Minamata Convention for Mercury is a global treaty to protect human health and the environment from the adverse effects of mercury. The major highlights of the Minamata Convention on Mercury include a ban on new mercury mines, the phase-out of existing ones, control measures on air emissions, and the international regulation of the informal sector for artisanal and small-scale gold mining.

Rules and Regulations

❖Japan laws and regulations

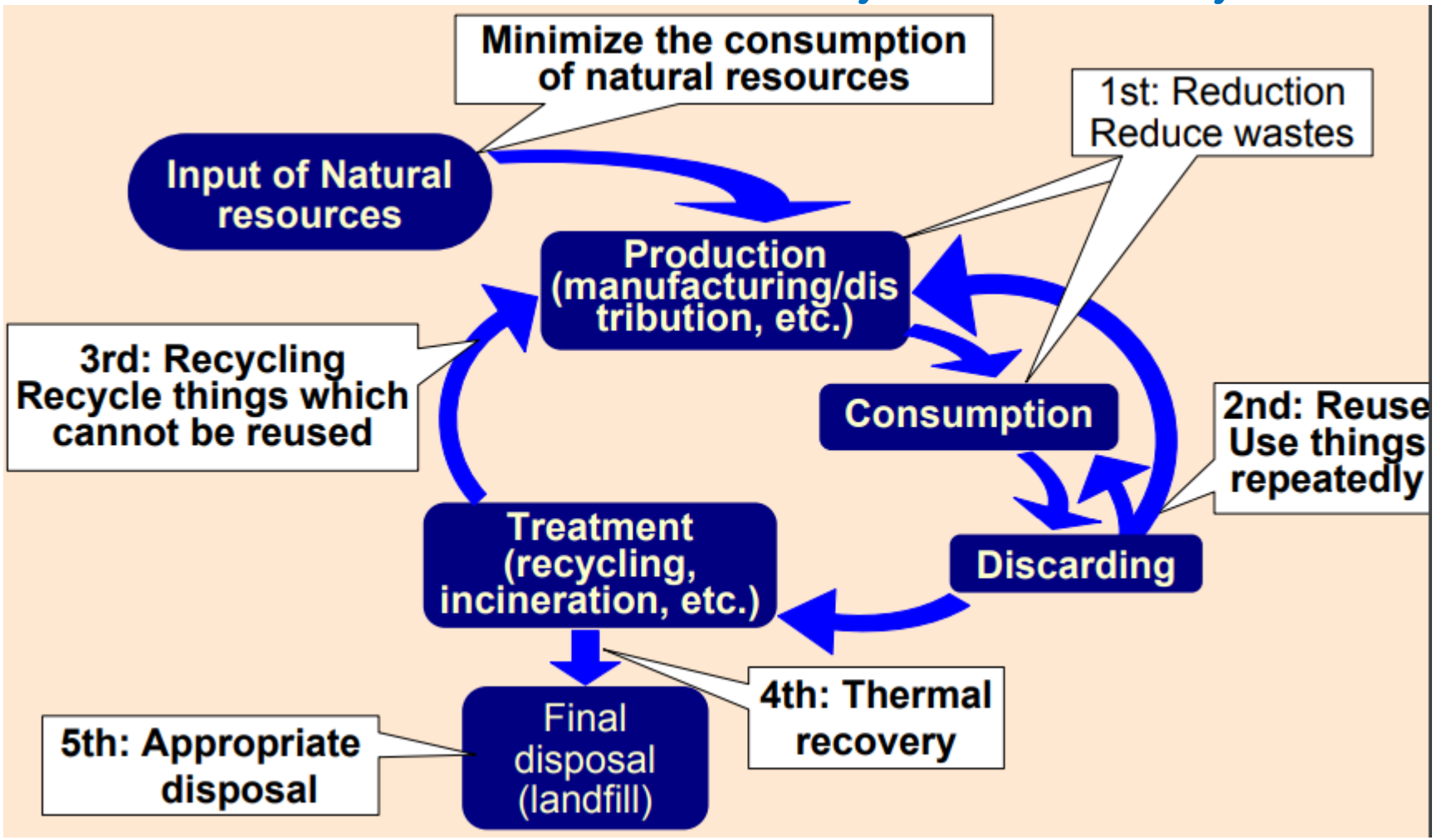


- In Japan, the Waste Management and Public Cleansing Law (hereafter, Waste Management Law) prescribes the necessary management structure to **control waste environmentally**.
- Japan endeavors to **establish a Sound Material-Cycle Society** in which the consumption of natural resources is reduced and the burden on the environment is minimized, toward the sustainable development.
- **Promoting 3Rs** (Reduce, Reuse, Recycle), as well as by ensuring the appropriate disposal of waste materials, making use of natural systems of material circulation.

Waste generators (hospitals and clinics) are responsible for disposal of their HCW in accordance with the regulations

Source;Legislative System of Waste Management in Japan

The sound material-cycle society



A society where the consumption of natural resources is minimized and the environmental load is reduced as much as possible through implementation of *3R measures* and appropriate disposal.

Source;Legislative System of Waste Management in Japan

Rules and Regulations

❖ Bio-Medical Waste Management Rules, 2016 in India

- ❑ The Rules apply to all persons who generate, collect, receive, store, transport, treat, dispose or handle bio-medical waste in any form :-Rules under the Environment (Protection) Act, 1986
  - I draft-1995, II draft- 1997
  - Final rules notified on 27th July 1998, Bio Medical Waste (Management & Handling) Rules, 1998
  - Amendments-2003 latest
- ❑ New Rules Notified on 28.3.16, Bio medical Waste Management Rules,2016

Sr. No.	1998	2016
1	Occupiers with more than 1000 beds require to obtain authorization	Every occupier generating BMW, including health camps require to authorization
2	Operator duties absent	Duties of the operator listed
3	Biomedical waste divvied in ten categories	Bio-medical waste dived in 4 categories
4	Rules restricted to HCEs with more than 1000 beds	Treatment and disposal of BMW made mandatory for all the HCEs
5	Schedule I, II, III, IV, V	Change of Schedule I, II, III, IV
6	No format of annual report	A format for annual report appended with the rules

Major modifications

❖ *Bio-Medical Waste Management Rules, 2016 in India*

❖*Duties of Occupier*

- Ensure that bio-medical waste is handled without any adverse effect to human health and environment
- Shall be segregated at the point of generation as per the color codes in Schedule I.
- Bio-medical waste shall not be mixed with any other waste
- Segregation, packaging, transport and storage in accordance with Schedule I and in compliance with standards in Schedule II

❖*Duties of Operator of CBMWTF*

- Timely collection from occupier, treatment and disposal Schedule I and in compliance with standards in Schedule II
- Establish Bar coding and Global positioning system
- Maintain a log book and all records for at least 5 years
- Provide training and ensure safety of all workers handling waste
- Display details of authorization, treatment, annual report etc on its web-site

Major modifications

❖ ***Bio-Medical Waste Management Rules, 2016 in India***

❖***Records***

❖***Accident Reporting*** – Form I

❖***Authorization*** – Form II and III

❖***Annual reports (Returns)*** – Form-IV, on or before the 30th June of every year.

❖***Maintenance of records*** related to generation, collection, reception, storage, transportation, treatment, disposal or any other from of handling of bio-medical waste – Log books and records

Coordination between hospitals, communities & waste disposal companies

- Local Medical Associations should play a key role
- Build Networks for small clinics
- Social Contribution against illegal dumping
- History shows that medical waste increases in accordance with industrialization
- Appropriate treatment system is essential

Important steps need to do ~Bio-medical waste management system

- Bio-medical waste ***must be separated*** from “normal domestic and municipal waste”.
- Separation of waste is the responsibility of the waste generator ***at the point of origin*****.**
- Waste in ***bio-medical or yellow bags*** is considered ***Infectious*** by default.

- ***The disposal company or transporter can refuse to pick up mixed waste*****,** regulations bio-medical waste cannot be compacted and there are relatively strict regulations regarding the transport of biomedical waste.

- Personnel handling biomedical waste are required to have ***appropriate protection***.

3R (Reduce, Reuse and Recycle) strategies and policies

❖Reducing the amount of waste at source

-- Generate less waste: less wrapping material, returning gas cylinders to the supplier for refilling.

-- Equipment that can be reused such as tableware that can be washed rather than disposable tableware.

❖Sorting at source

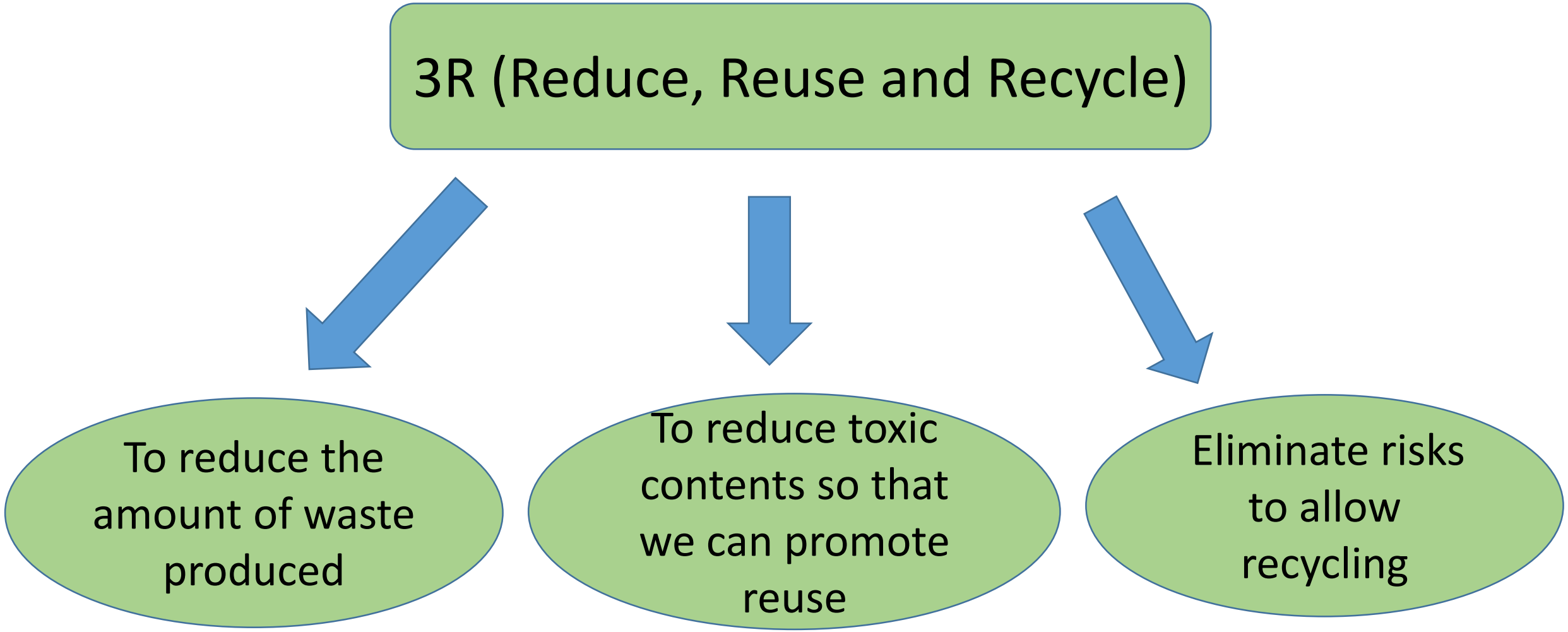
– Segregating waste is the best way to reduce the volume of hazardous wastes requiring special treatment.

❖Recycling

– Recycling of batteries, paper, glass, metals and plastic.
– Composting of plant waste (kitchen and garden wastes).
– Recycling of the silver used in photographic processing.
– Recovering energy for water heating for example

It is prohibited to re-use needles or syringes.

3R (Reduce, Reuse and Recycle) strategies and policies



Mentimeter Questionnaire Slide-2

Do you think proper bio-medical waste management should be achieved through effective implementation of 3R policies and plans?

Proper and effective bio-medical waste management system should be a social responsibility and everybody should get involved.

Thank you very much for your kind attention