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3R in Construction and Demolition Waste (CDW)

– potentials and constraints

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Agenda

- Definition of Construction and Demolition Waste (CDW)
- Relationship between the 3R concept and CDW
- Situation in Germany
- Examples in Asia
  - Indonesia
  - Thailand
  - India
- Possible applications
- Conclusion

Construction and Demolition Waste

- **Construction waste:** mainly leftovers from new construction materials (e.g. cut-offs, damaged materials), packaging waste, used materials during construction and all other wastes typical for activities on a construction site.
- **Demolition waste:** collection of all construction materials from a building, after removal of certain (hazardous) parts (e.g. asbestos, mercury containing parts, tar, PVC).
- DW is much larger in volume than CW.

Construction waste

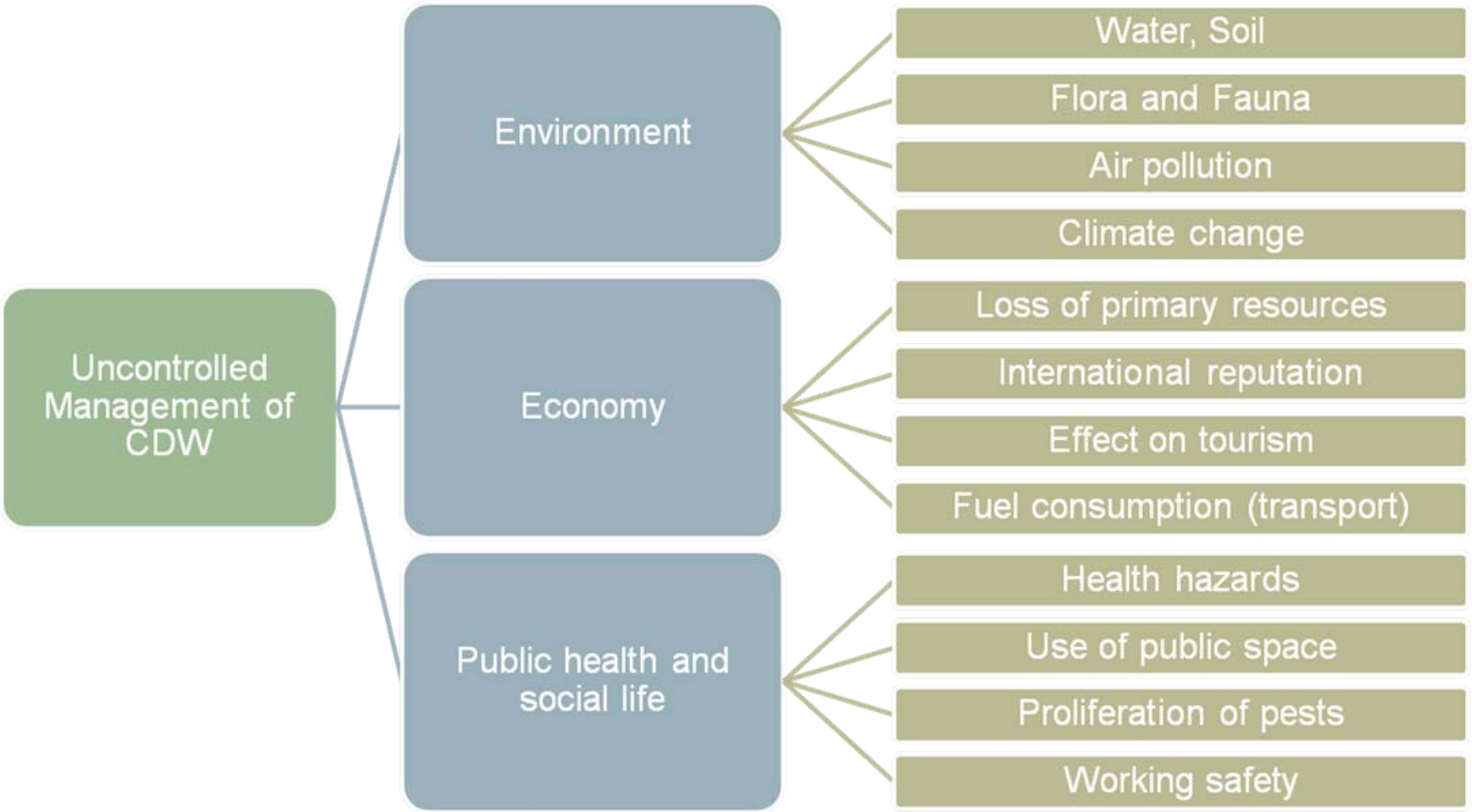
Demolition waste

Facts around CDW

- **Concrete** is the second most consumed material after water and is the basis for the urban environment
  - Consumption worldwide:
    - 1950: less than 2 to 2.5 billion tonnes
    - 2006: between 21 and 31 billion tonnes
- **CDW** can constitute up to 50% of the MSW
- In many industrialized countries reuse and recycling of CDW is an integrated part of their SWM schemes and achieve recycling quotas of up to 90 % and more
- Countries such as the Netherlands and Japan achieve near complete recovery of waste concrete

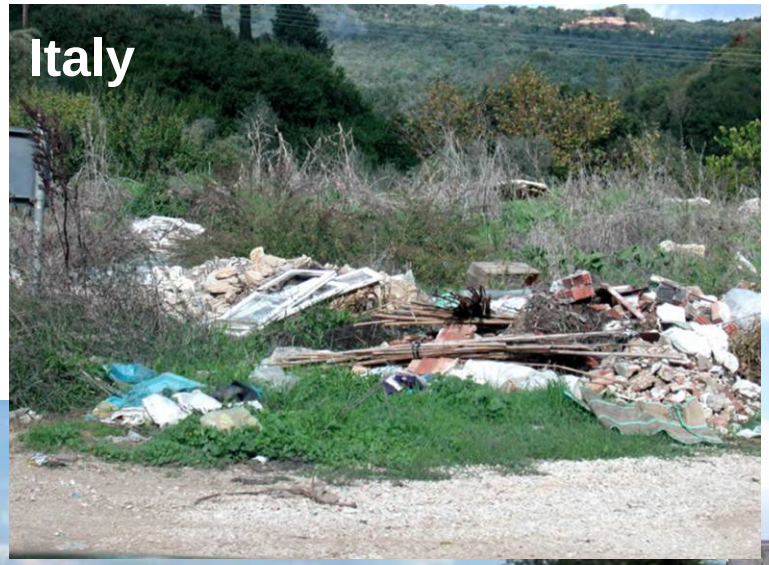
CDW Recycling technology

Negative Impacts of CDW (1)

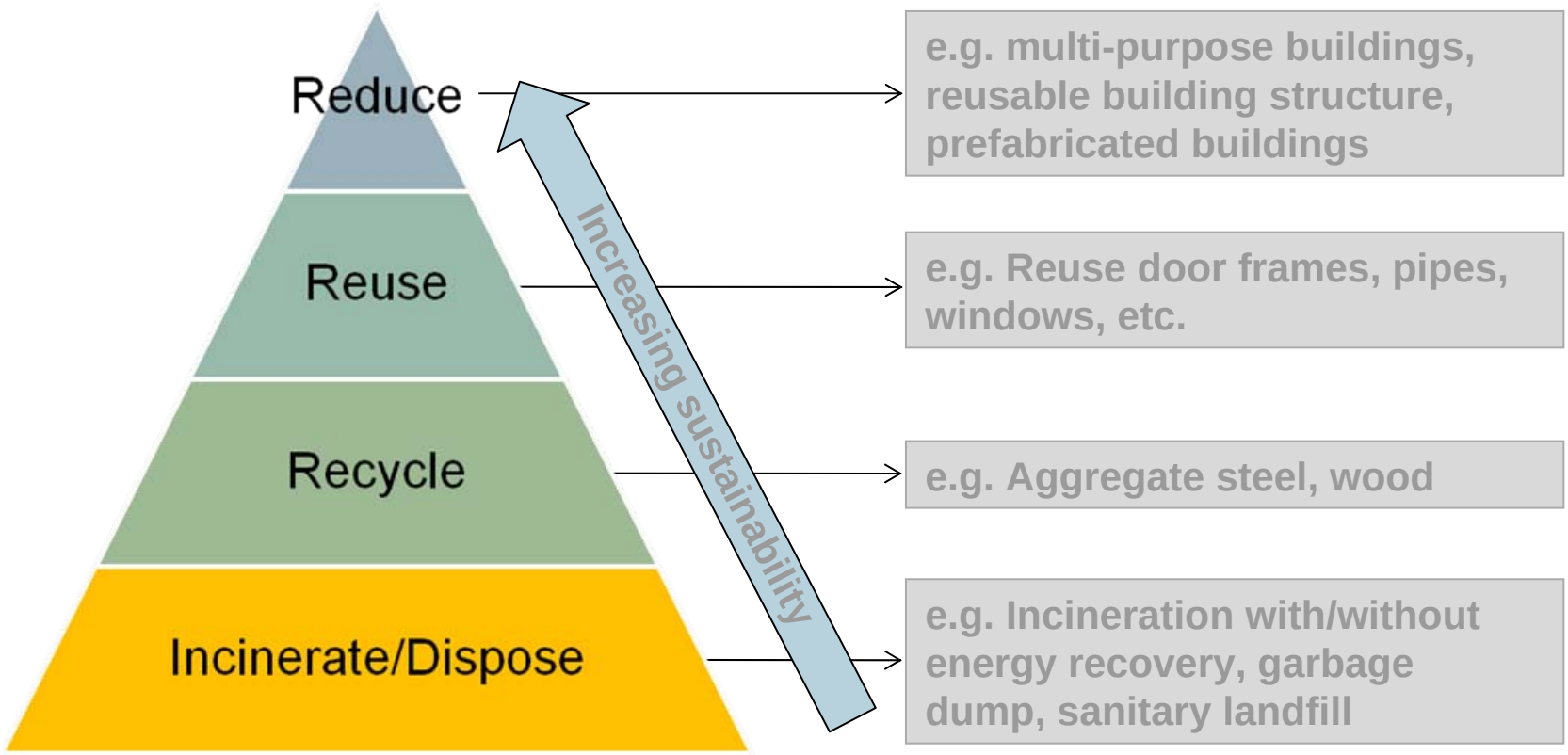


Source: Fimpel Consult

Negative Impacts of CDW (2)



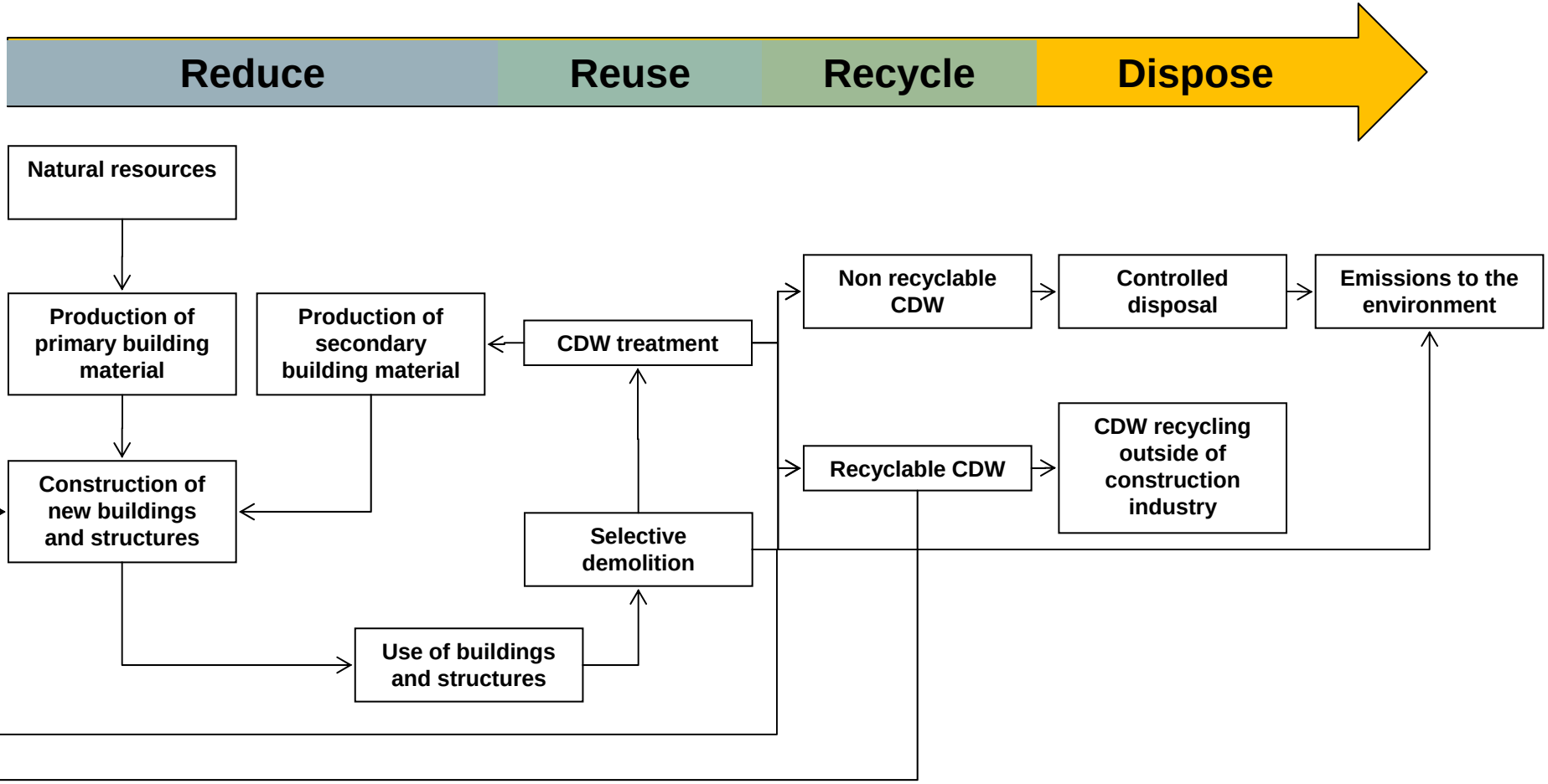
Solutions for CDW according to 3R



Predesigned and prefabricated houses

Reusing doors and frames

Close-loop solution for CDW



Economic advantages

- **Economic impulses →**
  - Improvement of the income situation of the recycling industry
  - More jobs for workers with low and high qualification levels
  - Recovery of costs associated with transportation and tipping fees
  - Good quality of waste materials stimulated by better prices
- **Reduction of disposal costs →**
  - Less wastes end up in landfills, increasing lifetime and reducing costs
- **Conservation of natural resources →**
  - Return of waste materials into the materials' cycle
  - Reduction of the dependency on primary materials
- **Lower costs of new constructions →**
  - Lower prices than new materials

CDW Recycling

Environmental advantages

- **Natural resources →**
  - Less primary resources, smaller raw materials warehouse, lower landscape consumption
- **Reduction of CO_2-Emissions →**
  - Less production energy when recycling
  - Smaller transport distances
- **Elimination of illegal and unauthorised dumping →**
  - Recycling discourages illegal dumping and reduces negative environmental effects upon groundwater, surface-water, air, flora & fauna and landscape
- **Improvement of air quality →**
  - Controlled disposal of non-mineral CDW means to be able to prevent ignition and incineration of e.g. rubber and plastic

Social and health advantages

- **Reduction of health hazards generated by illegal deposits →**
  - Reduction of proliferation of pests if CDW is deposited on controlled sites
  - Emissions into the air or leaching of toxic substances into the soil and/or groundwater affect the population
  - Unstable dumps and deposits are dangerous for civilians and workers
- **Reduction of health hazards generated by incineration →**
  - Uncontrolled incineration of CDW can cause emissions of toxic compounds or substances such as dioxins
- **Better use of public space →**
  - Lower growth rate of landfills and more space for productive uses, e.g. green or living areas

CDW Recycling

Instruments

- **Life Cycle Analysis (LCA)** → consider each state of the product's life
  - environmental criteria: resource use, embodied energy, embodied pollution, recyclability, material efficiency, product life
  - Green Paper on Integrated Product Policy (IPP) → Producer Responsibility
- **Design and planning** → considerations around new projects
  - resource saving, flexibility for future changes, durable and non-toxic products, recycled products, labelling of products, no overestimation of quantities, planning future deconstruction
- **Tendering** → clarify major requirements before beginning projects
  - certified contractors, minimize waste, management plans, payment on fulfilment
- **During and after construction** → waste minimization
  - organized site, supply just in time and with minimum packaging, separation of materials, appropriate disposal
- **During renovation and deconstruction** → waste minimization
  - licensed contractors, renovation or deconstruction plan, separation of wastes, controlled deconstruction

Prerequisites

- **Research and development →**
  - universities, research institutes and private companies
- **Legislation and enforcement →**
  - legal framework, licensing, sanctions and fees
- **Economic incentives to support the market →**
  - high landfill taxes, taxes for quarrying, import duties for raw materials, etc.
- **Establishment of professional associations →**
  - representation of members and industry in legislative venues; facilitation of interaction between members and organizations; provide information
- **Certification →**
  - quality assurance
- **Information exchange →**
  - workshops, seminars, training programmes to achieve progress
- **Promotion of CDW reuse and recycling →**
  - gain general acceptance, e.g. campaigns, green procurement mandatory for government and communal buildings

Situation in Germany

- CDW recycling was introduced beginning the 1980s
- Generation (2007): 201.8 Mio.tons (57% of the total generated wastes)
  - 64 % soil from excavation, 25% mineral CDW, 8 % from road rehabilitation; 3 % construction waste
- Recycling rate (2007): 89.2 %
- Extensive legislation and administrative directives on reuse and recycling of CDW;
  - e.g.: source separation at construction and selective demolition are compulsory
- Extensive monitoring system on quality and quantities
  - self-commitment on achieving high recycling rates
- Decreasing CDW intensity (kg CDW / GDP)

CDW Container

Separation during demolition

Reusing Berlin Wall in a recycling plant

n Darmstadt

Garden and Landscape architecture in Munich

Examples in Asia (1)

- Indonesia
  - Treatment, reuse, recycle of debris waste generated by the Indian Ocean Tsunami (around 854 000 m^3)
  - Common CDW
  - ✓ Partnerships with the Ministry of Environment, local government agencies, civil society organizations, technology suppliers and other agencies
  - ✓ DEBRI-Project (UNEP) with three key pillars:
    - ✓ (a) technology support
    - ✓ (b) capacity building
    - ✓ (c) economic instruments

Reparation of window frames and doors

Examples in Asia (2)

- Thailand
  - No legislation on CDW management
  - No CDW recycling facility or CDW-disposal site in Bangkok
  - Debris wastes from the tsunami were disposed in landfills
  - Reusable items are removed and marketed by private companies
  - ✓ 2007: Baseline study on quantities of CDW produced in Bangkok
  - ✓ 2009: Estimation of CW generation and management in Thailand
  - ✓ Joint project between Ministry of Environment and GTZ with recommendations on CDW management
  - ✓ The Bangkok Metropolitan Administration plans CDW processing facilities and introduction of collection, transportation and disposal fees

Construction activities after the tsunami

Examples in Asia (3)

- India
- Manual on MSW Management includes a chapter on CDW but states that CDW is not reused or recycled in India
- TIFAC reports that some demolition contractors have recovery rates from 25% in old buildings to 75% in new buildings, but that these activities are not widely practiced
  - ✓ 18th November 2008: Constitution of Working Group on MSW, Plastic, Demolition and Packaging Waste with a Working Sub-Group on construction and demolition waste 16th April
  - ✓ Regular meetings: Nov. 2008, Jan. 2009, Apr. 2009

Construction activities after the tsunami

Possible applications

- Information exchange → good practices of other countries
- Awareness campaigns
- Research and development technologies → waste mapping, standards
- Institutional and legal basis → consider participation of the industrial branch
- Required infrastructure → consider privatisation
- Strengthening the market → taxes on landfilling, importing raw material and quarrying virgin material, tax exemptions for recycled materials

Traditional construction with recycled materials

Conclusion

- **Reduction of energy consumption as well as of CO_2-Emissions**

Production energy of recycled materials is considerably less than the energy used to produce and transport primary construction materials.

- **Reduction of environmental degradation**

Illegal dumping of waste and excessive extraction of natural resources has negative environmental effects.

- **Reduction of health hazards generated by illegal deposits**

Proliferation of pests can be reduced if CDW is reduced, reused, recycled and minimal quantities are deposited on controlled landfills

- **Improvement of air quality**

Emissions due to production and uncontrolled disposal or burning are reduced.

Thanks for your attention!

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