Urban Pathways

Factsheet

Construction and demolition waste management

Wuppertal Institut

UN HABITAT FOR A BETTER URBAN FUTURE

UN environment

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Urban
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The Urban Pathways project helps delivering on the Paris Agreement and the NDCs in the context of the New Urban Agenda and the Sustainable Development Goals. It has established a facility in close cooperation with other organisations and networks active in this area to support national and local governments to develop action plans and concrete implementation measures to boost low-carbon urban development. This builds on UN-Habitat's role as "a focal point on sustainable urbanisation and human settlements including in the implementation and follow-up and review of the New Urban Agenda". The project develops national action plans and local implementation concepts in key emerging economies with a high mitigation potential. The local implementation concepts are being developed into bankable projects, focusing on the access to urban basic services to create a direct link between climate change mitigation and sustainable development goals.

Project concept

The project follows a structured approach to boost Low Carbon Plans for urban mobility, energy and waste management services that deliver on the Paris Agreement and the New Urban Agenda. The project works on concrete steps towards a maximum impact with regards to the contribution of urban basic services (mobility, energy and waste management) in cities to global climate change mitigation efforts and sustainable and inclusive urban development. This project makes an active contribution to achieve global climate change targets to a 1.5°C stabilisation pathway by unlocking the global emission reduction potential of urban energy, transport and resource sectors. The project will contribute to a direct emission reduction in the pilot and outreach countries, which will trigger a longer term emission reduction with the aim to replicate this regionally and globally to make a substantial contribution to the overall emission reduction potential.

Project aims

This project implements integrated urban services solutions as proposed in the New Urban Agenda providing access to jobs and public services in urban areas, contributing to equality and social coherence and deliver on the Paris Agreement and the Sustainable Development Goals. This is the first dedicated implementation action oriented project, led by UN-Habitat to deliver on inclusive, low-carbon urban services. Securing sustainability and multiplier effect, the project aims to leverage domestic and international funding for the implementation projects that will follow from this initiative.

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In brief

Urbanisation and population growth leads to a massive increase in construction activities for housing, offices, industry and infrastructure. The exploitation of raw materials (gravel, sand, etc.) causes environmental impacts (land use, impacts on water bodies and GHG emissions), specifically when transport distances for construction materials increase due to local shortages in rapidly urbanising areas (CPCB, 2017).

At the same time, the amount of construction and demolition (C&D) waste is increasing due to urban re-development and constitutes a problem of disposal. In many countries, C&D waste is the most important waste stream (by mass) and space for disposal is limited. A high share of this waste stream is disposed in landfills or illegally dumped on public land, along roads, or along river banks. On the other hand, C&D waste could be reused or recycled as a source of secondary raw material when possible, or otherwise safely disposed. C&D waste management serves as a crucial link in achieving circular economy and sustainable development goals related to sustainable cities and communities (SDGs 11.6,11.C) and resource consumption and production (SDGs 12.2, 12.1, 12.2, 12.4, 12.5, 12.7) among others. Some cities in developed countries (e.g. Auckland, New Zealand) and developing countries (e.g. Delhi, India) have initiated the efficient use of resources and minimisation of waste in construction a demolition projects.

Sustainable management of C&D waste includes three key phases:

- ***Dismantling and selective demolition*** of buildings and other civil structures help recovering reusable components and materials such as frames and doors, electrical and plumbing fixtures, flooring materials, glass, wood etc. Reusable components can directly be sold.
- ***The remaining C&D waste fractions*** can be separated and sorted on-site or in treatment plants. Some fractions can directly be treated and used at the construction site (e.g. in road substructures). Other fractions are sent to recycling facilities and treatment plants, or used as fuel for energy recovery. The remaining non-recyclable waste is prepared for disposal after separating hazardous waste fractions such as asbestos or treated wood.
- ***High-grade recycling materials*** can then enter the market for building materials (e.g. as aggregates for cement) after undergoing a quality assurance process. The market uptake can be fostered by municipal procurement activities

Examples Measures

Results

Results

Processed C&D waste can replace up to 20% of primary material in structural constructions such as buildings or bridges (CPCB, 2017). Roads or other non-structural projects can – in theory – completely be built from recycled content. Systematic dismantling, demolition, and recycling of C&D waste increases the availability of raw materials; saves locally scarce resources such as gravel, sand, or rocks; reduces transport distances and fuel consumption from the exploitation of building materials; and avoids land conversion and interference with ground water bodies from extraction activities. Moreover, the amount of C&D waste that uses scarce landfill space or is dumped uncontrolled on private or public land is also reduced. Selective dismantling and treatment of C&D waste is labour intensive and thus creates urban employment opportunities too.

Technical & Financial Considerations

Technical and Financial considerations

Some of the key technical and financial considerations that cities must take into account before embarking on implementing a C&D waste management programme are described below.

- ***The market for recycled building material*** critically depends on its acceptance on the part of architects, developers, and house owners. Concerns about the quality of 'used' materials and liability issues often hamper the demand for recycled content.
- ***Selective dismantling of buildings*** and the separating of waste fractions is more expensive than the unsorted demolishing and disposal of C&D waste – which often makes recycled material more expensive than virgin material.
- ***In order to avoid the contamination of soil*** and ground water and air pollution, storage and treatment facilities of demolished waste should meet minimum standards e.g. for drainage and water treatment systems.
- ***As of yet in many countries***, both the amount of sorted and pre-treated C&D waste and the demand for high-quality secondary material often is too small and/or volatile to justify investments in treatment facilities. The capital cost of industrial scale C&D waste ventures increases with their capacity, from about EUR 250,000 for a 20 ton/hr plant to about EUR 800,000 for a 100 ton/hr plant in most OECD countries. (Ulubeyli, Kazaz, & Arslan, 2017).

Policy Legislation

Policy/legislation

C&D waste management is a complex system with many different actors involved. Price and cost structures are key for enhancing the use of recycled material. Setting up a functioning market for recycled building material requires political interventions targeted at specific groups. Key components of such a framework comprise:

Regulation:

- ***Making sorting and separation*** of C&D waste streams legally binding;
- ***Legally requiring projects*** to submit waste management plans for C&D waste;
- ***Legally requiring a documentation*** of materials used for all new buildings (e.g. as in certification of green building); and
- ***Prohibiting landfilling of unsorted*** and untreated C&D waste.

Influence markets and incentive structures:

- ***Applying gate fees for the disposal*** of recyclable C&D waste fractions;
- ***Making secondary material cheaper*** compared to primary material, for example, by levying taxes on primary raw materials (e.g. Swedish gravel tax) or applying reduced VAT rates on recycled content; and
- ***Actively demanding the use*** of recycled materials in public tendering. A steady and predictable demand for secondary building material from public building activities can facilitate private investments in treatment and recycling technology.

Create options:

- ***Providing collection centres*** for small quantity waste generators;
- ***Capacity building:*** Provide training material for C&D framework implementation and undertake capacity building activities for all stakeholders. For example, toolkit for C&D waste management rules 2016, India, aids the stakeholders to comprehend their roles in implementing these rules (NPC, 2017).

Whether a certain measure can be implemented on the city level or on other political levels depends on the legal system of the respective country. A comprehensive policy mix generally will combine measures on the national and the city level.

Institutions

Institutions

Having a strong national framework for waste management helps its successful implementation on the municipal level. These national frameworks are usually coordinated and prepared by the environmental ministry. Other relevant departments on the national level comprise urban development and housing, transport and infrastructure, and finance (for taxes and fees).

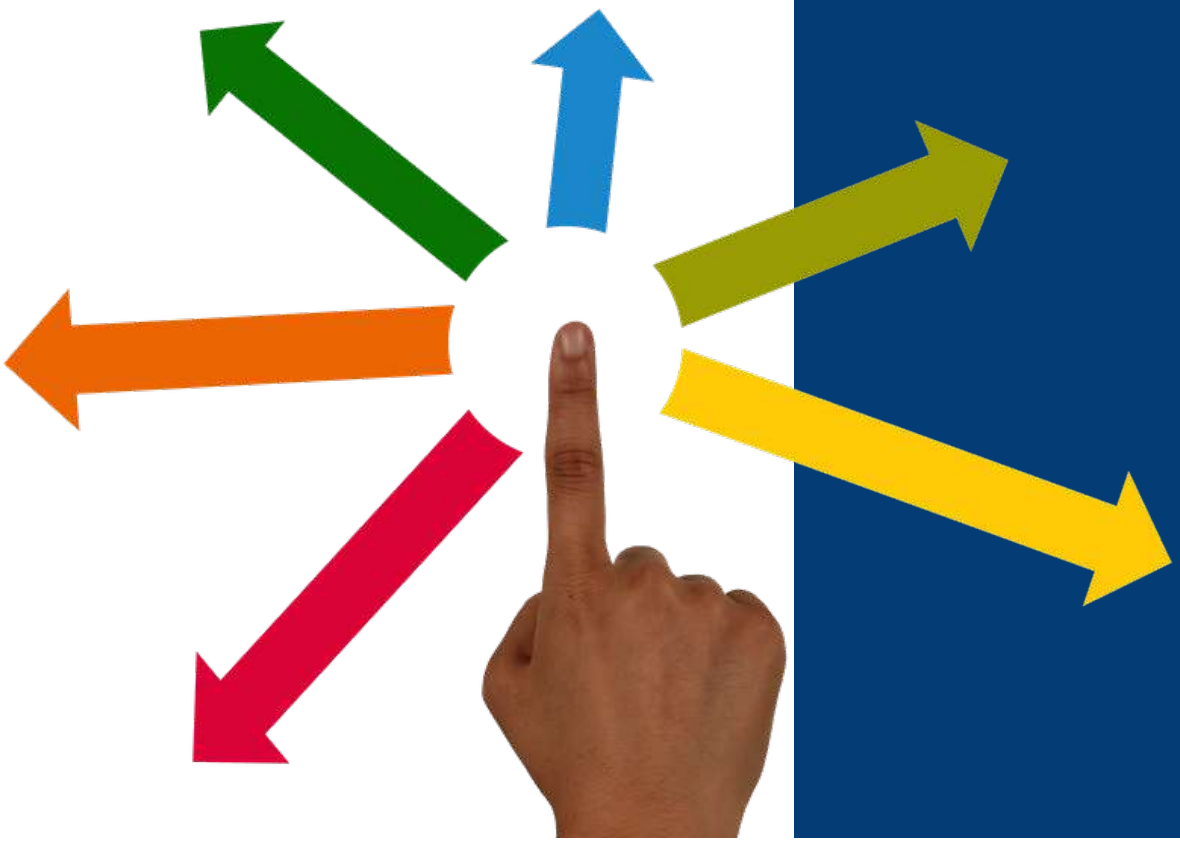
Municipalities implement waste related national legislation and can take their own initiative to carry the activities. Cities often own (or procure) public waste services, recycling facilities, and landfills and define disposal fees. They also enforce building codes and procure construction and demolition services and thus can influence C&D waste management practices and the use of recycled material via their tendering processes.

Standardisation organisations facilitate the development of technical standards and guidelines for the design and construction of buildings (including documentation of materials used), for dismantling and demolition activities, and for transport, storage and recycling of C&D waste. Standards also specify the use of recycled material in building projects. Architects and construction firms can refer to these standards when using recycled material.

Transferability

Transferability

Identifying the nature, composition and quantity of C&D waste is a prerequisite to replicate an appropriate good practice example. The composition of C&D waste varies from city to city, although, most modern construction throughout the world consists of reinforced cement concrete (RCC). Where a national legislation for C&D waste processing exists, cites can support its implementation by procuring the necessary funds and technology, through various financing and technology transfer measures. In the absence of such a national framework, cities can develop individual policy measures for reducing or reusing or recycling C&D waste. Individual polices can be designed depending upon the prevailing construction practices and existing infrastructure for waste management.



Case Study: Delhi - India

Context

Delhi is the capital city of India with over 11 million inhabitants. The city produces about 4,000 to 4,600 tons of C&D waste per day. The bulk of inert C&D waste is disposed in designated landfills, and dumped illegally in open spaces, water bodies and the flood plains of river Yamuna (Global Recycling, 2016). To address the environmental damage caused by improper disposal of C&D waste and to realize its lost value, IL&FS Environmental Infrastructure & Services Limited (IL&FS EISL) in partnership with Municipal Corporation of Delhi (MCD) set up a C&D waste processing plant in Burari, North Delhi, which is also India's first. In a public private partnership (PPP), MCD gave around 7 acres of land for a period of 10 years to IL&FS EISL and the plant was commissioned in 2009 (Bansal, Mishra, & Bishnoi, 2017). The plant was a fixed-type C&D waste processing plant with a processing capacity of 500 tonnes per day (TPD). It was set up in a narrow strip of land measuring about 25 meters and consists of feeder, screening, cleaning, washing and process water recycling technologies. Compact and modular design of the plant enabled to establish C&D waste treatment plant in the heart of the city (CDE, 2015).

In action

In action

IL&FS collects and transports mixed C&D waste to the plant from 28 designated points in three zones under the North MCD. MCD collects and transports the waste from the remaining areas. C&D waste that arrives at the plant site is first segregated to remove unwanted materials such as plastic, metal, wood and laminates, glass, textile, packaging materials etc. Un-recyclable materials such as plastic and wood are sent to waste-to-energy plant in South Delhi (Nath, 2014; Bansal et al., 2017). From the remaining waste, whole bricks are recovered for resale and large concrete blocks are broken down into smaller pieces measuring about 200-400mm. The plant then process small pieces of concrete into sizable aggregates suitable for making concrete for non-structural purposes (Bansal et al., 2017). Treated and washed sand is used for construction. The plant uses about 10-12 tank loads of treated effluent water for washing process and further recycles the water, which makes the plat a zero-discharge facility.

Results

Results

On an average, the Burari C&D waste processing diverted 0.3 million tonnes of C&D debris from the flood banks and landfills annually. Washed sand recovered from concrete helps in reducing the demand for sand mining from riverbeds (Nath, 2014). Recovered concrete is used to make non-structural concrete elements such as such as kerbs, pavers, tiles etc. and is also used in road laying. Due to the success of the plant, its capacity has been increased to over 2,000 TPD by 2017 and a second plant is being planned in East Delhi (TNN, 2017). Further, Indian Ministry of Environment, Forest and Climate change has facilitated the speedy set up of C&D waste processing facilities by removing the necessity of its public hearing. As a supplemental measure, Delhi Government supports the public procurement of C&D waste materials by mandating the inclusion of 2% of construction waste in new buildings and 10% of recycled product for road works (CDE, 2015).

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