Resource Synergies for an Urbanising India

31% urbanisation: 377 million people in 2011 :: 50% urbanisation: 600 million people in 2030

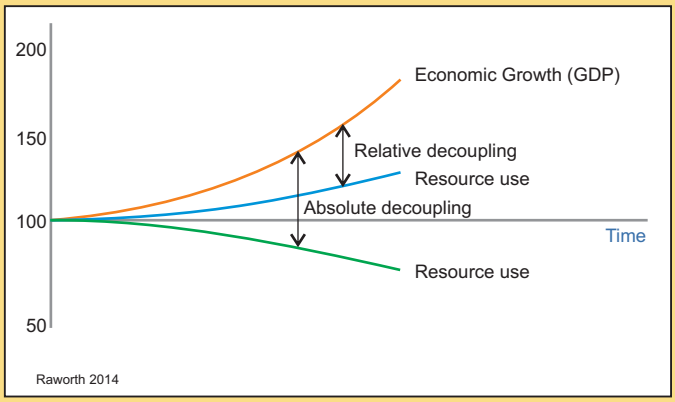
India's construction sector 3rd largest globally by 2018

30% electricity consumption & 24% GHG emissions

200 billion bricks need 350 million tonnes of brick-earth 1.75 lakh sq. km. land annually

1.7 to 2.0 lakh hectare land required for housing

Sand shortage of 91,667 million tonnes at the end of 2011



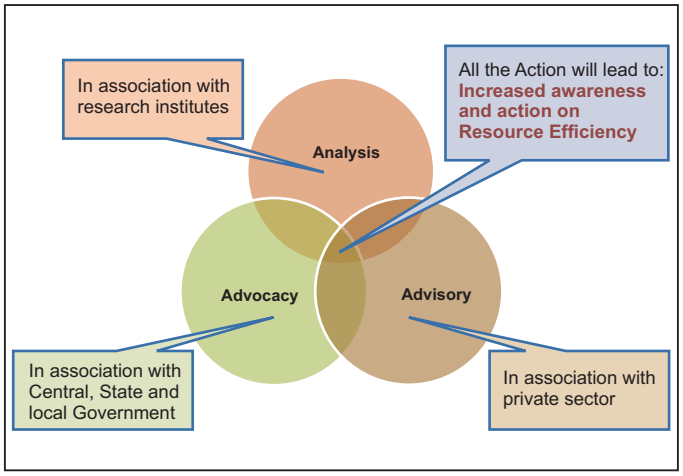
Concept of Decoupling

Decoupling refers to the discontinuance of "economic goods" from the "environmental bads". There are two types of decoupling; relative and absolute decoupling. Relative decoupling relates to "doing more with less" to reduce adverse environmental impacts while achieving higher economic activity. Absolute decoupling relates to the reduction of direct inputs such as material and energy to achieve higher economic output.

Programme Framework

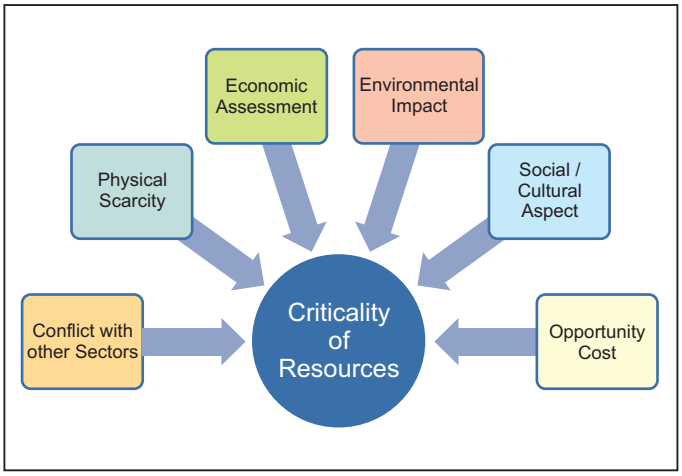
The programme adopts a 3 fold approach:

- Research and analysis of sector-specific potential & constraints
- Consultative dialogue for awareness and advocacy
- Advisory services for projects to enhance resource synergies.



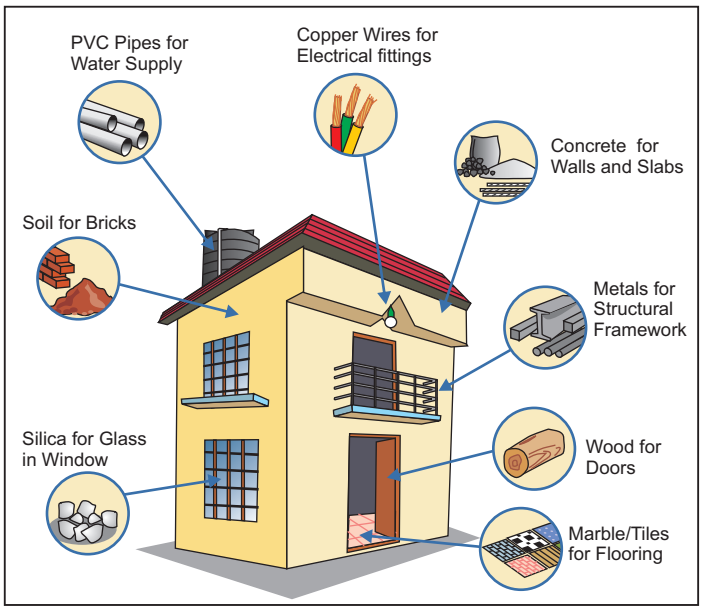
Critical Resources

The anticipated increase in demand for natural resources will exert added pressure on limited stocks. Therefore, identification of critical resources and the possible conflicts among sectors is the first step towards developing synergies.



Understand resource conflicts across various sectors like construction, agriculture, industry, etc. to identify the opportunities across sectors to ensure resource synergies in India's urban transformation.

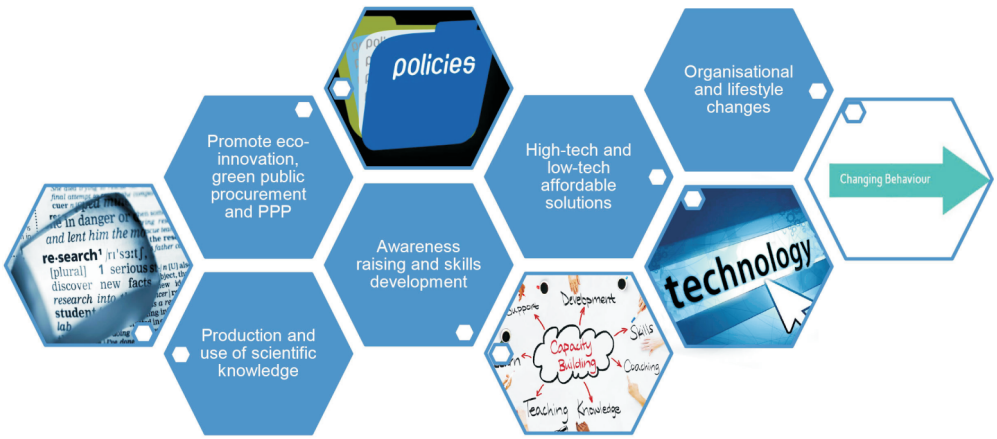
Resources Used in a Building



Eco-Friendly Urban Building Design

The DA building in New Delhi is a classic example of decoupling, showcasing environmentally and economically sound construction solutions. Virgin material was replaced by secondary raw material like fly ash and stone dust, reducing embodied energy by 30%. Compressed earth blocks were made by reusing soil recovered from earlier demolished structure. Ferro-cement channels have replaced heavy concrete slabs. Stone flooring pattern reduce stone wastage to less than 5%. The spatial configuration is based on passive design and vernacular architecture to save 40% in operational energy. The indoor temperature range of 18^0 to 30^0 celsius, to reduce ecological footprint. Rain water harvesting and waste water treatment on site reduce the water footprint.

Means of Implementation for Resource Synergies



C&D Waste Management

The Ahmedabad Municipal Corporation (AMC) is the 2nd ULB after Delhi to install and operate a C&D waste recycling unit with a processing capacity of 1000 tonnes per day. The project running on PPP basis with Ahmedabad Enviro Projects Ltd. (AEP) since June 2014 processes and recycles C&D waste into aggregates. These aggregates are used to prepare finished products (paver blocks, kerbstones, concrete tiles, prefabricated structures etc.) which are sold under the trademark Nu-Earth materials, used by the ULB and local contractors. This resource efficient way of recycling is a replicable model and promotes the concept of circular economy by reusing piles of waste as building materials.

Low Carbon Cement

Limestone Calcined Clay Cement (LC^3) a new type of cement is a blend of limestone and calcined clay that reduces CO_2 emissions by up to 30%. The major innovation in LC^3 is that it combines the use of abundantly available low-grade kaolinite clay and 15% of limestone, with no reduction in mechanical performance. The additional alumina in the metakaolin reacts with the ground limestone, leading to a less porous material and therefore equal strength with higher levels of clinker substitution. LC^3 is a viable option as it uses existing equipment, reduces clinker content and optimises the synergy between already known chemical systems.

HEINRICH BÖLL STIFTUNG

Limestone Calcined Clay Cement LC3

Development Alternatives

Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra
Embassy of Switzerland in India

EPFL ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of: Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety of the Federal Republic of Germany

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