Construction and Demolition Waste in Developing Countries

Workshop Documentation

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**Motivation and Background**

Since July 2003, Holcim Ltd. (one of the world’s leading suppliers of cement, aggregates, ready-mix concrete and asphalt) and the GTZ have established a successful cooperation in the framework of a Public Private Partnership (PPP), supported by the German Ministry for Economic Cooperation and Development (BMZ), and coordinated by the University of Applied Sciences Northwestern Switzerland (FHNW), with the objective to improve waste management in selected developing countries and increase of resource efficiency in the cement and construction industry.

In the first Partnership (PPP 1) from 2003 to 2006, GTZ-Holcim developed internationally acceptable guidelines for the co-processing of waste materials in cement production. These guidelines were published in July 2006. Holcim and GTZ then extended their partnership to 2008 (PPP 2) in order to advance the implementation of the guidelines and to look into additional subjects of sustainable construction. One main area of the present PPP 2 is the development of concepts showing the potential & significance of reuse of construction and demolition waste for its contribution to sustainable development.

This workshop on Construction and Demolition Waste Management is a kick-off meeting to:

- develop proposals of promoting CDW
- highlight the pros and cons of different approaches of CDW
- decide on steps for further action

So the first targets are to clarify the commitment to the issue, to discuss, whether CDW-Management is an issue at all and if that’s the case, to develop first ideas and next steps that have to be taken.

To clarify these questions, the participants worked first in 5 groups at 5 different topics on the issue, afterwards in 3 groups to put the first ideas in concrete terms.

### 2. Introduction on CDW-Management

#### 2.1. Introduction (G. Wehenpohl, GTZ and B. Kueng, Holcim)

Until now the topic of managing and recycling construction and demolition waste (CDW) has no real priority in most countries (even in developed countries). Developing countries, which started activities in this field, are e.g. Thailand, Brazil, Palestine or Mexico. In Chile the government currently implements the policy of extended producer responsibility into law, which will have also influence on the building industry.

In Europe 3 billion tonnes of aggregates are used in the building sector per annum and 1,6 billion tonnes cement. Holcim achieved a replacement of 15% fossil resources in the cement production by using alternative fuel. There are even plants that use up to 60 – 70% waste/alternative fuels. Additional to alternative fuels Holcim stresses also on replacement of raw material in the cement process that are gener-
ated by-products from other industry (steel, flags, fly ash) to reduce the consumption of virgin limestone.

Holcim chose two activity fields within sustainable development – first climate relevant emissions (e.g. use of alternative fuels) and second biodiversity which is regarded as a future challenge in sustainable activities compared to climate change nowadays.

According to the contents of PPP 2 also the issue of sustainable construction and end of life of Holcim products become more important for further activities.

2.2. Relevance of construction and Demolition Waste in Development Cooperation (D. Mutz, FHNW)

In Europe 200 – 400 tons construction material per person is contained in buildings and infrastructure. The present turnover is 4-8 t construction material per person and year, 60-70% of generated waste is CDW.

Developing Countries do not pay CDW-Management special attention. Landfill fees are low (if any) and wild dumping is not persecuted. It is not clear by now, where CDW ends up in developing countries.

When speaking of CDW-Recycling it is also important to mention that mainly downcycling is practised, that means in the house-building sector recycled materials are not used. Nevertheless the building activities worldwide (apart from Europe or US) are increasing rapidly and with it the demand for raw material (i.e. for cement or aggregates). By the limited stock of natural resources the anthropological stock for material will become more and more attractive and important for the industry.

Another problem related to the anthropological material stock is the increasing amount of toxic substances in buildings due to a broad variety of building materials that affects the recyclability of minerals greatly for further use. Further information on this subject can be found under www.coprocem.com.

2.3. Promotion of Construction and Demolition Waste Management in Developing Countries (K. Mukerji, Consultant of GTZ)

Construction and demolition waste, commonly abbreviated as CDW, can constitute up to 50% of all solid waste generated in a country. It originates from various events, both natural and man-made, and is of a very diverse nature. It can be of mineral or organic origin, inert or hazardous, homogeneous or mixed.

Construction waste occurs on account of building constructions and building renovations, and results from surplus material (excess supplies), damaged or broken material (which is thus unusable), cut-off pieces, processing waste (e.g. sawdust, metal spoils), dismantled shuttering, used-up tools and accessories, packaging and garbage generated by the people on the construction sites.

Demolition waste can result from natural disasters (earthquakes, hurricanes, tsunamis); wars, civil conflict, vandalism and other man-made events; accidents (impact,
explosions, fires, collapse of weak structures); or from the demolition of built structures (including roads, bridges, etc.) for renovation or complete removal or renewal. Every part of the structure, from the roof down to the foundations, and even the surrounding terrain, can be a constituent of demolition waste.

All this CDW has to be removed from the place of origin – in most cases it is considered unusable and is discarded. This has been common practice both in industrialized as well as developing countries for the most part of the 20th century, and in most countries until today.

The central question for the workshop and further activities is: what is required to increase awareness of CDW in developing countries? So five focal areas were identified.

1. Information exchange and awareness campaigns
2. Research and development of technologies (i.e. surveys kind/quantities CDW, technical guidance and funds, PPP, research institutes partnership)
3. Development of institutional and legal basis
4. Establishment of the requisite infrastructure (i.e. transfer stations, treatment plants, quality testing, collection)
5. Strengthening the market

Further information about CDW-Management practice in industrialised and developing countries as well as case studies and recommendations can be found in the study “Reuse and Recycling of Construction and Demolition Waste” by Kiran Mukerji on behalf of GTZ-Holcim, prepared as background document for and presented during the workshop.

2.4. Discussion remarks

In the discussion the already mentioned targets have been emphasised, One of the main questions were, whether efficient and sustainable CDW-Management is already state of the art in industrialised countries and therefore mainly technology transfer is needed or whether CDW is a global problem? According to this it was also mentioned, to consider, if CDW is really seen as a problem in Developing Countries and what kind of problem. The lack of efficient CDW-Management can lead to increasing demand of landfill volume, hazardous wastes from construction and demolition sites can cause health problems (asbestos, liquids). On a more global scale, it may be reasonable to promote CDW recycling, to satisfy the increasing demand of raw materials for building activities and to reduce the emissions responsible for global warming by using products with less energy demand in the production process.

All these remarks show that it is very important to clarify the reason why CDW-Management should be generally promoted and what is to be gained by that. Taking a look at several European countries, the motivations for CDW-recycling are quite different: In Germany the reason was mainly lack of space for further landfills and not necessarily a resource problem, although the German waste law aims for the closed loop recycling economy. In the Netherlands natural gravel deposits were scarce and the recycling of concrete to gain recycled aggregate economically quite attractive. So it will be crucial to analyse the situation in developing countries carefully, because of the different reasons why CDW Management should be promoted in the particular
country. On the other hand, the global view is also needed to justify the application of funds.

The following examples from developing countries and the results of the group work discussions should either help to answer these questions or to identify the need for action.

3. Examples of CDW Management in selected (Developing) Countries

3.1. Management of CDW – Experiences from the Palestinian Territories

The Palestinian Territories (PT) are considered a multi-conflict zone. Because of the very fragile state of the Palestinian Authority there is only a very weak legislative framework and a national solid waste strategy does not exist so far. This leads to growing amount of uncontrolled dumped solid waste – especially CDW – as well as to increasing environmental damage caused by the wild landfills. Due to the continuing unstable situation the amount of CDW (destruction of buildings) is increasing.

At the same time the population growth rate is enormous (around 3.5 % in the West Bank and 4% in the Gaza Strip) which effects the need for raw materials. The economic situation is regarded as poor with an unemployment rate above 50% (2000: 20%) and estimated 58% of the population living under the poverty line (2000: 20%). Nevertheless, there exists a relatively functional formal democratic system (with deficits regarding the internal appliance of democratic mechanisms) and a high level of education.

Several studies and activities on CDW-Management have been carried out for the region of Gaza strip (40 km length, 6-12 km width, 1.4 Mio inhabitants), such as

- Recycling and Reuse of CDW in Palestine (Samuel Schmid, FHNW, 2005)
- Italian crusher donated to Rafah Municipality
UNIDO Project: Cleaning of The West Bank and Gaza Strip (€ 2.5 Million)
UNDP Project: Cleaning of the DW of the former Israeli settlements (USD 25 Million)

Those projects led to using recycled CDW, i.e. for filling/leveling of low lying areas (about 11,500 m$^3$ in 2 areas), layers for 180,000.00 m$^2$ of agricultural roads, 310,000 m$^3$ in construction of Gaza Fishery Harbor, covering material in Gaza Landfill (layer 10-20 cm), production of concrete hollow blocks (individual initiatives) and 6,500 ton as sub-base and base course in 2007. The estimated accumulated available quantities of CDW-recycling material are so far 1.5 – 2 m$^3$ (i.e. 3-4 Mio t). This quantity is scattered in more than 30 sites all over Gaza Strip. The size of these sites varies from few hundreds to ten thousands of tons. All these sites are illegal due to the absence of any official site designated for such purpose. Few months ago, the current location of the crushing plant operated by Rafah Municipality in the south of the Gaza Strip was designated as the official site for dumping solid waste in order to be used as a raw material for the crusher. In addition about 500,000 t of the demolition waste of the former Israeli Settlements were collected, sorted and preliminarily crushed to pieces less than 50cm, as preparation for crushing to less than 5cm.

The per capita annual generation of CDW in the Gaza Strip is about 0.1 m$^3$, which counts up to 150,000 m$^3$/year.

The production costs of recycled aggregate are about 2.3 $/t, the selling price for sub-base and bottom layer base course is 5$/t. Natural material base course costs 8.5 $/t. This shows an economic advantage to use recycled material. About 6,000 t recycled material have been sold between June and November 2007.

Overall there is a good potential market for the recycled CDW, but needs to be developed further. Clear specifications need to be developed and according to the specifications quality control and quality assessment is crucial to stabilize the quality and meet the market demands. Until now awareness at the decision making and consumer levels, as well as relevant regulations and mechanisms to enforce these regulations, are lacking.

3.2. Current practice in CDW Management in Thailand

Usually it is very difficult to select data on the amount of generated CDW in developing countries. For Bangkok in Thailand some data has been collected on CDW.

- In the year 2005, approximately 128,800 t of building related construction waste was generated in Bangkok.
- The amount of CDW generated from demolition activities in 2005 has been estimated (10% of new building activities) about 370,000 t.
- The average generation rates of demolition waste are 984.66 kg/m$^2$ (residential demolition) and 1,803.94 kg/m$^2$ (non-residential demolition) which is much more relevant than waste from construction (56.23 kg/m$^2$ residential and 30.47 kg/m$^2$ non residential).

So overall nearly 500,000 tons CDW was generated in Bangkok 2005 which means 0.2 kg per capita per day. Whereas the amount of Municipal solid waste was 1.25 kg per capita per day.
These data show, that either industrialised circumstances cannot be transferred to developing countries (60-70% of generated waste overall is CDW) or that there is a huge gap between real CDW amount in Bangkok and the so far estimated amount (only 16% of all waste). And if these data are realistic, there remains the problem to explain to governmental and local authorities, why CDW Management is so important compared to other waste-related activities.

In Thailand, construction companies segregate only valuable materials from building sites, such as steel, aluminium, wood frames. Concrete debris and cut off piles are mixed with other types of waste and disposed of as fill material. Thailand is also facing the problem of most developing and industrialised countries that CDW is often disposed of by illegal dumping.

CDW generated from ready-mix concrete is used to produce concrete blocks or as filling material. Construction material faculties sell the remaining valuable parts (such as steel) for recycling and demolished concrete parts are sold for use as filling material. The CDW generated from demolition companies is classified into three types: reusable (parts are sold as second hand construction materials, such as doors, windows, etc.), recyclable (mainly steel, aluminium scrap and copper from wires) and mixed CDW (concrete debris, bricks). Although some demolition companies provide own storage sites for sorting and storing remaining filling material, health and safety measures are rarely considered. Because of lacking knowledge and awareness, hazardous materials (i.e. asbestos) are often mixed with other CDW-components.

There is no CDW recycling facility or CDW-disposal site in Bangkok, but the Bangkok Metropolitan Administration plans to set up CDW processing facilities as well as introduce collection, transportation and disposal fees for CDW to encourage companies to segregate CDW.

Further activities should focus on clear rules and operational guidelines in the CDW management. Information and knowledge-building activities are necessary to increase the amount of operational staff that has skill and competence in effective and proper waste minimization at source, waste segregation, reuse, recycling, transportation and disposal. Additional proposed solutions for various aspects (administration, investment, legislation, further support) can be found in the presentation in the annex.

### 3.3. Current Situation in Germany

In Germany 200.7 Mio t CDW were generated in 2004. The annual report of the Arbeitsgemeinschaft Kreislaufwirtschaftsträger Bau (organisation of the voluntary agreement of the German building and CDW-recycling industry) shows that 64% of CDW is ground excavation, 88% of this fraction is recycled. The mineral fraction (construction waste, demolition waste from buildings and streets) of CDW is 36% of the total amount and their recycling rate 68.5%. Although the fraction of construction waste from building sites is comparatively low with 1.9 Mio t (0.9% of total CDW) 74% of this fraction is disposed of in landfills and only about 5 % is recycled. As in other countries, traditional use for recycling CDW in Germany is still in road construction and substructures, although the amount of high quality recycling materials of CDW that can be used as concrete aggregates tripled in the last two years.
Apart from a quite successful recycling practice (mainly downcycling, but nevertheless, most of CDW is recycled and construction waste rates are decreasing constantly due to better waste separation and reduction strategies on building sites) the problem the CDW industry in Germany faces at the moment is that legislation changes due to higher focus on ground and groundwater protection and that will probably lead towards higher limit values for eluates from CDW generated material. This would mean the end of recycling options in many cases and therefore the legislation process (national and EU) is carefully watched by the building and recycling industry.

This example also shows the difficulties of establishing CDW Management in developing countries, as well as the importance of best practice examples (that took place these last 10 years of reporting). (data 2004, source: Monitoring Report 2004 on CDW, Arbeitsgemeinschaft KREISLAUFWIRTSCHAFTSTRÄGER BAU [www.arge-kwtb.de], Berlin, 28. February 2007)

4. Workshop Results Part 1: Requirements for Promotion of CDW in Developing Countries

In the first part of the group work facts were gathered on the question “What is required to promote CDW in developing countries?”. For five areas, described in 2.4., first recommendations were formulated and have been discussed under the following aspects:

- remarks and issues that have been left out,
- possible approaches to support the strategies,
- pros and cons of the different approaches in promoting CDW Management and
- possible steps for further actions containing promising approaches

So for each area first recommendations are presented and the results of the group discussion documented on the boards. In the tables several elements are marked in the colours yellow, green and blue. These show the approaches, the participating groups GTZ (yellow), Universities and research (green) and Holcim (blue) would like to focus on in further activities or are interested in basically. Some issues are interesting for two or all groups, so the elements are marked multicoloured. In the second part of the group work (see chapter 4) elaborated on these selected topics.
4.1. Information Exchange and Awareness Campaigns

The biggest problem is that most people are not aware about CDW issues, or they may be aware, but have no idea where to start tackling the issues. So the best way is for them to learn from others through:

- Public awareness campaigns in the media.
- International seminars and workshops.
- Increased reporting of good practices in other countries.
- Active interaction with stakeholders in governments and industry.

The group discussion should clarify, if there are any other means of information exchange and creating awareness.

Further questions are:

- Who should take the lead?
- How can these activities be implemented?
- Where can the funds come from?
- What are the constraints and how could they be overcome?

Table 1: Results of thematic working group “Information Exchange and Awareness Campaigns”

<table>
<thead>
<tr>
<th>Remarks &amp; issues that have been left out:</th>
<th>Possible approaches</th>
<th>Pro + cons of different approaches in promoting CDW Management</th>
<th>Possible steps for further action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who is the right address of information?</td>
<td>Cooperate with conventional Material producers (no competition recycling-products versus conventional)</td>
<td>Who should take the lead? - Producer… - Government…</td>
<td>Define clearly “why” work with CDW</td>
</tr>
<tr>
<td>It is not seen as a priority by the citizens/politicians</td>
<td>Increase knowledge (studies and research)</td>
<td>Collect information and prepare them that it can be used for info-/ and awareness campaigns</td>
<td></td>
</tr>
<tr>
<td>Lack of knowledge what is CDW (composition) and its environmental impacts – show consequences rather than explain them</td>
<td>Build awareness about the impacts of inadequate management of CDW</td>
<td>Identify the stakeholders</td>
<td></td>
</tr>
</tbody>
</table>
The main challenges that have been identified are:

- to define clearly why it is important to work on the topic CDW (this is regarded as a prerequisite for awareness and lobbying campaigns)
- for the above mentioned clarification, information about environmental impacts, quantities of CDW, role of CDW within the waste management etc. is crucial to bring forward arguments
- to find relevant target groups/stakeholders for information and awareness campaigns
- to provide information for the several target groups
- training and networking

Overlapping issues with the other areas are especially to gather information on the environmental impact and performance of CDW and providing training and information material. Naturally most of the approaches lie within the competence of GTZ activities especially awareness campaigns and the task to bring the relevant stake-

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Approaches</th>
</tr>
</thead>
<tbody>
<tr>
<td>As other problems are not solved (other kind of MSW/criminality) nobody</td>
<td>Training material for the diff. stakeholders</td>
</tr>
<tr>
<td>takes care of CDW</td>
<td>government, companies, social</td>
</tr>
<tr>
<td>Increasing quantities of CDW especially in emerging countries (China,</td>
<td>Realise closed (confident.) workshops with stakeholders</td>
</tr>
<tr>
<td>Russia, India)</td>
<td></td>
</tr>
<tr>
<td>Positioning of CDW within the waste hierarchy and strategy</td>
<td>Creation of networks/platforms for change of information dissemination</td>
</tr>
<tr>
<td>Considering the waste hierarchy for the development of CDW concepts</td>
<td></td>
</tr>
<tr>
<td>Market transparency of CDW</td>
<td></td>
</tr>
</tbody>
</table>

| Differentiate target groups                                               | But differentiate purposes/technical functions                            |
| - construction companies                                                  | Low requirements – RC mat.                                                |
| - demolition companies                                                    | High requirements – RC+New Mat.                                           |
| - users/population                                                        | Highest – New Mat.                                                        |
| - decision makers/owners                                                  | This approach can produce acceptance problems!!!                         |

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- for the above mentioned clarification, information about environmental impacts, quantities of CDW, role of CDW within the waste management etc. is crucial to bring forward arguments
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- to provide information for the several target groups
- training and networking

Overlapping issues with the other areas are especially to gather information on the environmental impact and performance of CDW and providing training and information material. Naturally most of the approaches lie within the competence of GTZ activities especially awareness campaigns and the task to bring the relevant stake-
holders together. The information gathering remains mainly with universities and research and providing practical experience with companies like Holcim.

4.2. Research and Development of Technologies

Relatively little research into CDW technologies is taking place in developing countries, so what kind of research is needed?

Some proposals:

- Surveys of the kind and quantities of CDW generated and development of concepts to channel them away from legal and illegal landfills.
- Development of concepts to reduce, reuse and recycle CDW.
- Development of designs of structures to minimize CDW.
- Development of improved recycled products that can compete with new products in terms of quality and costs.

Technical guidance and funds will be needed to conduct such research and development work, calling for:

- Cooperation with foreign research institutes
- Public Private Partnerships
- Incorporation of CDW activities in development aid projects

Table 2: Results of thematic working group “Research and Development of Technologies”

<table>
<thead>
<tr>
<th>Remarks &amp; issues that have been left out:</th>
<th>Possible approaches</th>
<th>Pro + cons of different approaches in promoting CDW Management</th>
<th>Possible steps for further action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harmonisation of definition</td>
<td>Aiming for high quality No difference between virgin/natural material and recycling material</td>
<td>Propose and adopt proper definitions for “products” derived from CDW</td>
<td></td>
</tr>
<tr>
<td>Assembling of data -technical - impact</td>
<td>Collection of data in comparable manner</td>
<td></td>
<td>Research partnership between industrialised and developing countries</td>
</tr>
<tr>
<td>CDW and its link to climate change</td>
<td>Unified approach in testing of environmental properties worldwide (standards)</td>
<td></td>
<td>Involve not only universities, but also other stakeholders (regulators, private sector, …)</td>
</tr>
<tr>
<td>Too many methodologies exist – harmonise</td>
<td>Building on already existing activities: - end of waste - CEN – 351 - ER3 CPD</td>
<td></td>
<td>Holcim initiate an activity in recycling/re-use of CDW in Europe and Asia</td>
</tr>
</tbody>
</table>
Important objectives for research and development are:

- Harmonisation of definition of CDW
- Assembling and providing relevant environmental data in CDW
- Harmonisation of testing methods and standards as prerequisite for certification
- Collection of best practice examples (technology) from industrialised and developing countries and critical review of technologies to assess their suitability for developing countries

Overlapping issues concern especially harmonisation and testing methods of CDW-generated recycling products to increase the market acceptance (strengthening the market) and information gathering to provide necessary information for awareness campaigns. The competences lie with the universities in cooperation with regulators (material testing institutes) and involved industrial sectors. As the industry is often involved in standardisation processes as well, Holcim can also support already existing standardisation activities and initiate recycling activities to gain more practical experiences.

A very sensitive topic is the link of CDW to climate change, because in public and governmental perception this is the most important environmental challenge (even if that is not really far-sighted), but as the funding depends mainly on this aspect at the moment, it will be important to link the two topics. That challenge lies with the GTZ, as well as the proposition on a new PPP on CDW-Management.

### 4.3. Development of Institutional and Legal basis

In most developing countries, there is no clear policy on CDW Management, but urgent action is vital, such as:

- Establishment of specialized departments to deal with CDW issues
• Revision of legislation to support CDW recycling and minimize disposal to landfills, e.g. high taxes on disposal in landfills and heavy fines on fly-tipping
• Introduction and enforcement of stricter safety standards to ensure safe disposal of hazardous and toxic waste
• Revision of building codes, standards and specifications to allow for the use of lower quality products in lower value applications
• Introduction of the concept of producer responsibility, which requires the manufacturer or supplier of goods to take back their products at the end of their useful life
• Introduction of legislation to make it compulsory for government and communal buildings and roads to be constructed with materials of recycled content

Table 3: Results of thematic working group “Development of Institutional and Legal basis”

<table>
<thead>
<tr>
<th>Remarks &amp; issues that have been left out:</th>
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<th>Pro + cons of different approaches in promoting CDW Management</th>
<th>Possible steps for further action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition of demolition waste is missing</td>
<td>Revise EU waste catalogue + waste framework directive</td>
<td>Taxation: difficult tool – may drive to deviation</td>
<td>Make the examples of UK &amp; Holland better understandable</td>
</tr>
<tr>
<td>End of waste criteria</td>
<td>Develop stringent law (tax on landfill and enforcement)</td>
<td>Producer responsibility: definition and responsibility of value chain</td>
<td>Enhance the attitude of engineers and contractors</td>
</tr>
<tr>
<td>Do you have demolition rubble which is not waste?</td>
<td>Increase difficulties to access primary raw material (permitting i.e.)</td>
<td>Corruption and transparency</td>
<td></td>
</tr>
<tr>
<td>Classification (under definition in Europe)</td>
<td>Public tendering (requiring x% of recycling)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control and enforcement</td>
<td>100% reuse of demolition/reusing public infrastructure</td>
<td>Resistance from civil engineers to use recycling material (reason: fear of not achieving standards)</td>
<td></td>
</tr>
<tr>
<td>Creation of transparency to change image</td>
<td>Cooperate with the producers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collection and sorting and crushing</td>
<td>Pressure on companies (producers, ...) as a precondition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definition of landfill criteria</td>
<td>Driving forces for tackling the issue in different contexts have to be analysed</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Find the point where it hurts most</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palestine: special unit</td>
<td>Integrated and gradual approach for legal and institutional framework to develop accordingly</td>
<td></td>
<td>Enhance information/ awareness</td>
</tr>
</tbody>
</table>
Although in many developing countries waste laws are missing or just recently enforced, one of the substantial points in the discussion was the demarcation between waste and product. Apart from the establishment of the legal infrastructure, the definition of terminology and end of waste criteria for CDW has been regarded as crucial. As this is also a continuous discussion in the EU the harmonisation will be very difficult. The waste law has to be stringent and producers’ responsibility has to be included. Also financial instruments are estimated as promising approaches. These concern especially the market development. Because it will affect the building material industry the transparency and cooperation are important elements to increase acceptance and to come up against prejudice. Market forces or instruments like self obligation of the industry can be very successful (e.g. Germany) and control and law can support the acceptance, possibilities of use and quality standards of the generated recycling products.

The GTZ can become active within the range of control and enforcement, whereby an integrated and gradual process is meaningful. Research institutes can support both with the definition of waste criteria and examine whether laws are stringent. It is important to note that missing coordination can lead in the long term to large problems with the application type of CDW-recycling materials, if competitive laws prevent the use.

4.4. Establishment of the requisite infrastructure

Without the necessary infrastructure, no CDW Management System can be introduced. Some essential requirements are:

- Provision of a dense network of transfer stations, where separated fractions of CDW can be disposed of free of charge by anyone
- Introduction of CDW collection systems preferably operated by private enterprises, in order to ensure efficiency and reduce costs
- Installation of CDW recycling plants, where CDW fractions are turned into good quality products for new constructions or other uses
- Establishment of materials testing laboratories to check the quality of recycled products, in order to increase confidence in these products
- Development of a mapping and monitoring system of the locations and availability of waste materials
- Establishment of special CDW networks and associations of stakeholders in the CDW industry
Table 4: Results of thematic working group “Establishment of the requisite infrastructure”

<table>
<thead>
<tr>
<th>Remarks &amp; issues that have been left out:</th>
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<th>Possible steps for further action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Framework:</td>
<td>Compilation of case studies</td>
<td>- General guidelines (incl. case studies) on re-use and recycling of CDW</td>
<td>Creation of platform for exchange of info, opinion, know-how between stakeholders</td>
</tr>
<tr>
<td>- financing mechanism</td>
<td>- Guideline on selective demolition and waste segregation on-site</td>
<td></td>
<td>Collection of know-how on best practices</td>
</tr>
<tr>
<td>- guidelines and technical standards</td>
<td>- Platform for exchange of information, opinions and promotion (network)</td>
<td>- General guidelines (incl. case studies) on re-use and recycling of CDW</td>
<td>Develop market overview to justify business investment</td>
</tr>
<tr>
<td>Environmental impacts of value chain</td>
<td>- Need of guidelines for site proc. And sorting during demolition</td>
<td>- General guidelines (incl. case studies) on re-use and recycling of CDW</td>
<td>Investigation of environmental benefits of CDW- Recycling (i.e. energy saving?)</td>
</tr>
<tr>
<td>- proper siting (location) of treatment facilities</td>
<td>- Quality Management</td>
<td>- Guideline on selective demolition and waste segregation on-site</td>
<td></td>
</tr>
<tr>
<td>- noise</td>
<td>- Need of guidelines for construction works: Quality management (waste segregation)</td>
<td>- standardized monitoring system for emission control</td>
<td></td>
</tr>
<tr>
<td>- dust</td>
<td>- standardized monitoring system for emission control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- transport</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social aspects</td>
<td>Integration in waste management planning/plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- public acceptance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- job creation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work safety/ health</td>
<td>- standardized monitoring system for emission control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- workers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- neighbourhood</td>
<td></td>
<td></td>
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</tbody>
</table>

The most important approach in this area seems to be the development of guidelines for the whole value chain. It has already been obvious in the discussion of the awareness and information topic, that it is important to consider the relevant target groups and issues. Guidelines have to be developed for the general use of CDW recycling material (addresses national and local authorities as well as construction industry), for the construction and demolition of infrastructure (building industry, engineer education), the recycling of CDW (recycling companies) and emission control (monitoring authorities). The contents have to cover technical standards, quality management, environmental aspects, as well as health and safety.
Legal authorities have to be convinced of the necessity of CDW Management and it could be helpful to include it in the integrated solid waste management strategy.

Main approaches for GTZ and universities on this topic are to provide information and exchange of know how on platforms (here again information gathering on best practice is needed) and to communicate the environmental benefits of CDW Management to enable local authorities to convince stakeholders and the neighbourhood. Another important aspect that can be supported by Holcim is the development of market overviews to justify the business investment on the necessary infrastructure.

### 4.5. Strengthening the market

There are numerous means of promoting the use of salvaged and recycled CDW:

- Increasing taxes on landfilling, tax exemptions on use of recycled products, higher taxes and duties on imported raw materials and products, higher taxes on quarrying for virgin materials, etc. are all useful instruments for making recycled products more competitive.
- Organisations and associations need to be established to promote CDW activities.
- Special exchanges for salvaged and recycled goods must be established to facilitate selling and buying such products. This should be supported by entries and advertisements in professional journals and yellow (or green) pages of telephone directories.
- Good practice awards and eco-labelling also have strong effects in promoting the use of salvaged and recycled CDW.
- Public buildings that have been built with salvaged and recycled CDW are the best advertisements of the technology.

<table>
<thead>
<tr>
<th>Remarks &amp; issues that have been left out:</th>
<th>Possible approaches</th>
<th>Pro + cons of different approaches in promoting CDW Management</th>
<th>Possible steps for further action</th>
</tr>
</thead>
</table>
| Economic issue                          | Produce same quality out of CDW as virgin material but for cheaper price | + increase of demand due to lower price  
- additional value (green product, same/higher quality) should result in higher price  
- funding for quality control necessary  
- availability and quality of material not constant (information exchange needed) | Marketing campaign (green building issues) and Promotion (development of a set of exemplary marketing strategies)  
Promotion of green procurement (governmental initiatives)  
Change of terminology (dependant on cultural issues) |
| Amend terminology to standard raw material | Legislation/legal frame |
The main challenges for marked success of recycled products are:
- to guarantee a stable quality and availability (information systems) and
- to convince potential users to buy these products.
These prerequisites require already mentioned approaches, such as quality control systems, information and awareness campaigns as well as a certain legal frame.

It is also again necessary to address different target groups with promotion and marketing campaigns. Planners (engineers) have to overcome their resistance to using recycled material from CDW, landlords and investors (building owner) can be convinced to use these materials by lower price or green image campaigns. The building material industry could develop new business concepts for the future when raw mater-
rial is scarce or more expensive to generate. For demolition and CDW treatment companies improved networking will be important to ensure the availability and quality of their material. Governmental organisations can influence the market with several strategies (regulations, strategic issues, such as taxes, subsidies for recycled material, waste management plans) and building associations should be involved in setting the standards and promotion campaigns. The support of communal authorities should cover infrastructural plans, the regulation of building and demolition activities and the integration of CDW in municipal waste management.

The general opinion in the discussion was that lowering the price of recycled CDW would be the strongest motivation to use the material: However it was also mentioned, that if the quality is the same or higher compared to raw material and with an additional value (green product), the price should be higher. This can only be answered by carrying out a market survey with potential users, under what prerequisites they would buy the material. Another problem was the terminology, which is related to the topic of definition of waste and product, because in many countries, products generated from waste would not have a chance on the market if the origin is known. So it has to be discussed whether CDW-management really should be strongly connected with municipal waste management.

4.6. Overlapping Issues

Altogether the main overlapping issues, which concern all areas in certain ways, are:

- the need of legal frame in terms of standards, terminology
- further research on CDW for education and information gathering
- guidelines to secure quality standards
- information platforms for best practise examples, etc.
- promotion of awareness and positive attitude towards recycled building material

5. Workshop Results Part 2: Next Steps and Agreements on further Activities on CDW Issues

In the second part of the group work, the most interesting approaches for GTZ, Universities and Holcim were discussed separately to develop concrete steps and activities to promote CDW in developing countries. The different approaches are regarded under the aspects

- what would we like to do
- what do we expect/wish from other groups
- what can we offer.

The results are collected in the following tables. As most of the topics have been already mentioned in section 4, further explanation is not necessary.
5.1. Group Results: Our Contribution to enhance CDW Management

Table 6: Results of Group 1 - GTZ

<table>
<thead>
<tr>
<th>What would we like to do?</th>
<th>What do we expect/wish from other groups?</th>
<th>What can we offer?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training material for different stakeholders</td>
<td>Provide harmonised definition =&gt; jointly with all stakeholders</td>
<td>Medium term objective for Palestine</td>
</tr>
<tr>
<td>Promote stakeholder dialogues</td>
<td>Closed confidential workshop with stakeholders – table discussed with Holcim and Management Team</td>
<td></td>
</tr>
<tr>
<td>Define clearly why work with CDW</td>
<td>Incoporate the universities?</td>
<td>Write down, why GTZ works about CDW</td>
</tr>
<tr>
<td>CDW &amp; its link to climate change</td>
<td></td>
<td>Realise a study about CDW + climate impact?</td>
</tr>
<tr>
<td>Propose a new PPP between Holcim &amp; GTZ on CDW</td>
<td>Identify partner for a new PPP Holcim, Other cement industry, Construction industry…</td>
<td>Evaluate possibilities of a new PPP about CDW within GTZ</td>
</tr>
<tr>
<td>Control and Enforcement</td>
<td>Integration of control and enforcement for CDW in existing solid waste projects</td>
<td></td>
</tr>
<tr>
<td>Integrated and gradual approach</td>
<td>Promoting of integrate approach in Palestine with case study/regional workshops</td>
<td></td>
</tr>
<tr>
<td>Creation of platform for knowledge exchange</td>
<td>Cooperation with universities and private sector + additional institutions</td>
<td>Follow up of the study about CDW done within the PPP 2</td>
</tr>
<tr>
<td>Collection of knowledge &amp; best practise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collect information and prepare them that it can be used for information and awareness campaigns</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7: Results of Group 2 - Holcim

<table>
<thead>
<tr>
<th>What would we like to do?</th>
<th>What do we expect/wish from other groups?</th>
<th>What can we offer?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use recycled products</td>
<td>Quality and quantity from the CD industry (sufficient)</td>
<td>Create good examples</td>
</tr>
<tr>
<td>Pilot programmes or examples within company (Holland, Canada)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demonstration projects: Identify criteria -when -were -how to influence decision makers</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Investigate into countries where the need is expanding (Romania)
Clarify where does Holcim fit into the chain?
Create sustainable “green” products

Market analysis
Legislation/Regulation assessments
Help open doors

Marketing

Table 8: Results of Group 3 – Missing Link

<table>
<thead>
<tr>
<th>What would we like to do?</th>
<th>What do we expect/wish from other groups?</th>
<th>What can we offer?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collect data on CDW and derived products in unified format</td>
<td>Supply of information of anonymous data on CDW/derived products by third parties</td>
<td>Existing operational database for leading data</td>
</tr>
<tr>
<td>Pilot project</td>
<td>Cooperate with GTZ in TH under the part of eco-efficiency</td>
<td>National/local networks with public+private sector</td>
</tr>
<tr>
<td>- Demolition work</td>
<td>- Political support</td>
<td>Application of tools</td>
</tr>
<tr>
<td>- Recycling facility</td>
<td>- Tools for evaluating environmental impact</td>
<td></td>
</tr>
<tr>
<td>- Standard for testing</td>
<td>- Tools for evaluating economic benefit</td>
<td></td>
</tr>
<tr>
<td>To convince administration, decision makers to consider CDW-recycling as an attractive alternative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investigate on risks associated with CDW investigate on potential of CDW CDW4CDM</td>
<td>Cooperation to apply for research funds</td>
<td>Environmental impact assessment</td>
</tr>
<tr>
<td>Improve working conditions on demolition sites</td>
<td>Promotion of minimum standards</td>
<td>Definition of minimum standards on work safety</td>
</tr>
</tbody>
</table>

5.2. Final Discussion: Overall Results, next Steps and Agreements

In the final discussion the participants emphasised their point of view regarding the most relevant aspects for further activities.

Holcim has a general interest in the topic CDW, but has got to set priorities and to decide what projects they should focus on. Immediate actions can be carried out. Holcim plans an inventory of exemplary activities on CDW within the company.

The main problem for the GTZ is that CDW has no lobby, so first activities will be to convince people and internal and external decisionmakers of the relevance. It can be done in two ways: small solutions in selected countries or big solutions/cooperation with industry/Holcim.

The two main topics for future agenda (high impact on funding) are climate change (CC) and biodiversity (BD). CDW is only a subtopic and has to be linked with CC and
BD. Immediate actions will have a 2 year perspective and are realistic, so the first step will be to set up small projects. The GTZ will also evaluate the interlink between CC and BD.

D. Mutz mentioned a research fund in Switzerland for several countries, e.g. India, and is preparing a project proposal with partners from private and public sectors. The topic is the research on environmental impact of uncontrolled CDW, risk and opportunities.

An additional pilot project in Thailand will continue on CDW. Thailand focuses on agriculture at the moment, but there is a possibility to link CDW to ecoefficiency and there is also interest in further activities on working conditions (health and safety) and data collection.

Mr. van der Sloot can provide environmental data for the environmental impact of CDW and will collect further information.

Next steps will be to evaluate the possibilities of a new PPP and in 2008, the management team meeting will take place to consider further steps.
Key issues, responsibilities and agreements are summarised in the following table:

Table 9: Key issues, responsibilities and agreements

<table>
<thead>
<tr>
<th>Topic</th>
<th>First Step</th>
<th>Who?</th>
<th>With Whom?</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhance performance</td>
<td>Document Workshop</td>
<td>GTZ Management</td>
<td>Team</td>
<td>End 2007</td>
</tr>
<tr>
<td>Linkage with CDW to Climate Change and Biodiversity</td>
<td>Evaluate possibilities</td>
<td>G. Wehenpohl, GTZ</td>
<td>Anja Wucke, GTZ, K. Übelhör</td>
<td>12/07</td>
</tr>
<tr>
<td>Research on CDW Environmental Impact Risk and Advantages</td>
<td>Discuss with GTZ India/ Holcim: Collect Info</td>
<td>D. Mutz, B. Kueng, Holcim</td>
<td>Management Team, Anja Wucke, GTZ, K. Übelhör</td>
<td>03/08</td>
</tr>
<tr>
<td>Pilot Project on CDW</td>
<td>Discuss proposal in Thailand</td>
<td>Dr. Achara Ussawarujikulchai</td>
<td>G. Wehenpohl, GTZ Holcim, Thailand, Rauschelbach, GTZ Thailand</td>
<td>04/08</td>
</tr>
<tr>
<td>Inventory on CDW activities in Holcim</td>
<td>Gather data</td>
<td>M. Römer, P. McCaffrey</td>
<td>D. Mutz</td>
<td>03/08</td>
</tr>
<tr>
<td>Future PPP</td>
<td>Assess options</td>
<td>G. Wehenpohl, GTZ B. Kueng, Holcim</td>
<td>Zeh-Gasser, GTZ Int. Holcim</td>
<td>01/08 04/08</td>
</tr>
</tbody>
</table>

6. Conclusions and Outlook

The results of the workshop show that CDW is a very complex topic. Although the selected areas under which the topic has been discussed are crucial, it is nevertheless difficult to work on several approaches independently, because some pressing issues concern all areas in certain ways and are necessary to clarify in some ways. These are:
- to clarify why we want to work with CDW (important for lobbying, stakeholder meetings, awareness campaigns)
- to investigate whether CDW is really a problem
- to address the problem of lacking information on amount of CDW, environmental impact, quality, best practice (needed for information/awareness campaigns, marketing strategies, developing of infrastructure)
• to introduce the same information and activities to different target groups (governmental, communal, industry, funding)
• to develop standards for CDW-recycling.

Another problem of CDW is that it is linked with environmental impacts of MSW, but it is not mainly responsible for lacking technologies (e.g. landfills). It is also unclear how much CDW is really disposed of in landfills in developing countries and how the composition of CDW varies due to the different building structures (wood, metal, brick, etc.,...).

The agreed next activities will help to clarify the main questions to form a basis for the promotion and improvement of CDW-management in developing countries.

7. Annex
Speaker presentations (see also on coprocem web-page)
List of participants
Impressions of the workshop by Kiran Mukerji

Acknowledgments
Thanks to Ellen Gerdes for picture material, organisation and moderation of the event, to Dr. Dieter Mutz, Kiran Mukerji, Dr. Achara Ussawarujkulchaisai and Wa’el Safi for the presentations, to Dr. Günther Wehenpohl, Kiran Mukerji and Dr. Dieter Mutz for proofreading the workshop documentation
Promotion of Construction and Demolition Waste (CDW) Management in Developing Countries

Dieter Mutz
University of Applied Sciences Northwestern Switzerland
Coordinator of the PPP

Eschborn
November 14th, 2007

The GTZ-Holcim Public Private Partnership

Background and challenges

- 200 – 400 tons of construction material per person in Europe.
- Present turnover per person and year: 4 - 8 tons
- 60-70% of all generated waste is CDW
- In developing countries CDW management is not given special attention – unsystematic re-use and recycling is predominant
- CDW is not yet recycled with a high resource efficiency
Raw material exploitation

Worldwide trend in urbanization (mega cities) increases demand for raw material

Geogenic and anthropogenic iron stocks in the USA

Resources are limited: Anthropogenic stocks will play a more and more prominent role in resource management
World Cement Production, 1926-2032
(million metric tons, 2005-2032 are projections)

High demand for construction material in emerging economies for urban infrastructure (housing estates roads, water, hospitals, airports, etc)

Use of construction and building material in Vienna

Toxic substances in building material are increasing
Where does all the CDW ends up in other countries?

Mega cities: source for raw material in future

Urban Mines

Transfer of CDW into resources
Thank you for your attention

For more information:  www.coprocem.com
Contact: dieter.mutz@coprocem.com
What are we talking about?

Construction waste – which results from building constructions and renovations:
- Surplus material (more had been supplied than required)
- Damaged or broken material (due to wrong or careless handling and accidents)
- Cut-off pieces and processing waste (e.g. sawdust, metal spoils)
- Dismantled shuttering, used up tools and accessories, packaging
- Garbage generated by people on the site

Demolition waste – which results from:
- Natural disasters (earthquakes, hurricanes, tsunamis)
- Wars, civil conflict, vandalism and other man-made events
- Accidents (impact, explosions, fires, collapse of weak structures)
- Demolition of built structures (buildings, roads, bridges, etc.) for renovation, or complete removal or renewal

Much of this CDW can be avoided either partially or completely.
What are the main problems caused by the lack of CDW Management in developing countries?

- Irreparable environmental damage.
- Serious health hazards of uncontrolled disposal and incineration.
- Reduction of useable space due to rapidly increasing landfills.
- Economic and social retrogression.
- Depleting natural resources.

All these problems are avoidable.

Despite these problems, why are CDW Management Systems not being introduced in developing countries?

- Lack of awareness about the problems associated with the uncontrolled disposal of waste.
- Lack of acceptance that wastes are valuable resources.
- Reluctance of people to deal with waste.
- Ease of disposing waste legally or illegally.
- Lack of a clear CDW management policy.
- Lack of technology, know-how and standards.
- Lack of a market for reusable or recycled CDW.
- Tough competition in the building materials sector.
- Lack of funds.
- Lack of infrastructure.
- Lack of national waste information systems.
- Lack of information on good practices.
- Unstable political situations.
In the Group Discussions today, we would like to clarify

“What is required to promote Construction and Demolition Waste Management in developing countries?”

As there are many aspects to this question, we would like to subdivide it into 5 subject areas (that is 5 groups):

1. Information exchange and awareness campaigns.
2. Research and development of technologies.
3. Development of institutional and legal basis.
4. Establishment of the requisite infrastructure.
5. Strengthening the market.

1. Information exchange and awareness campaigns

The biggest problem is that most people are not aware about CDW issues, or they may be aware, but have no idea where to start tackling the issues. So the best way is for them to learn from others through:

- Public awareness campaigns in the media.
- International seminars and workshops.
- Increased reporting of good practices in other countries.
- Active interaction with stakeholders in governments and industry.

Are there any other means of information exchange and creating awareness? The Group Discussion should clarify.

Further questions are:

- Who should take the lead?
- How can these activities be implemented?
- Where can the funds come from?
- What are the constraints and how could they be overcome?
2. Research and development of technologies

Relatively little research into CDW technologies is taking place in developing countries, so what kind of research is needed?

Some proposals:

- Surveys of the kind and quantities of CDW generated and development of concepts to channel them away from legal and illegal landfills.
- Development of concepts to reduce, reuse and recycle CDW.
- Development of designs of structures to minimize CDW.
- Development of improved recycled products that can compete with new products in terms of quality and costs.

Technical guidance and funds will be needed to conduct such R&D work, calling for:

- Cooperation with foreign research institutes.
- Public Private Partnerships
- Incorporation of CDW activities in development aid projects

3. Development of institutional and legal basis

In most developing countries, there is no clear policy on CDW Management, but urgent action is vital, such as:

- Establishment of specialized departments to deal with CDW issues.
- Revision of legislation to support CDW recycling and minimize disposal to landfills, e.g. high taxes on disposal in landfills and heavy fines on fly-tipping.
- Introduction and enforcement of stricter safety standards to ensure safe disposal of hazardous and toxic waste.
- Revision of building codes, standards and specifications to allow for the use of lower quality products in lower value applications.
- Introduction of the concept of producer responsibility, which requires the manufacturer or supplier of goods to take back their products at the end of their useful life.
- Introduction of legislation to make it compulsory for government and communal buildings and roads to be constructed with materials of recycled content.
4. Establishment of the requisite infrastructure

Without the necessary infrastructure, no CDW Management System can be introduced. Some essential requirements are:

- **Provision of a dense network of transfer stations, where separated fractions of CDW can be disposed of free of charge by anyone.**
- **Introduction of CDW collection systems, preferably operated by private enterprises, in order to ensure efficiency and reduce costs.**
- **Installation of CDW recycling plants, where CDW fractions are turned into good quality products for new constructions or other uses.**
- **Establishment of materials testing laboratories to check the quality of recycled products, in order to increase confidence in these products.**
- **Development of a mapping and monitoring system of the locations and availability of waste materials.**
- **Establishment of special CDW networks and associations of stakeholders in the CDW industry.**

5. Strengthening the market

There are numerous means of promoting the use of salvaged and recycled CDW:

- **Increasing taxes on landfilling, tax exemptions on use of recycled products, higher taxes and duties on imported raw materials and products, higher taxes on quarrying for virgin materials, etc. are all useful instruments for making recycled products more competitive.**

- **Organisations and associations need to be established to promote CDW activities.**

- **Special exchanges for salvaged and recycled goods must be established to facilitate selling and buying such products.** This should be supported by entries and advertisements in professional journals and yellow (or green) pages of telephone directories.

- **Good practice awards and eco-labelling also have strong effects in promoting the use of salvaged and recycled CDW.**

- **Public buildings that have been built with salvaged and recycled CDW are the best advertisements of the technology.**
Group Discussions

We hope that the Group Discussions today will:
• identify issues that have been left out in this presentation;
• point out the problems of promoting CDW Management in developing and emerging countries;
• highlight the pros and cons of different approaches in promoting CDW Management; and
• outline possible steps for further action.

Thank You
MANAGEMENT OF CONSTRUCTION & DEMOLITION WASTE
Experiences from the Palestinian Territories

OBJECTIVES

- Presentation of the gained experience in the Palestinian Territory
- Exchange of information & experience
SOCIO-POLITICAL FRAMEWORK (1)

- The Palestinian Territories (PT) are considered a multi-conflict zone
- The Palestinian Authority is by all means a “fragile state”
- The PT enjoy no territorial integrity in a geographical, legal or physical sense
- The population growth rate is enormous (around 3.5% in the West Bank and 4% in the Gaza Strip)
- Unemployment rate above 50% (2000: 20%)
- Today estimated 58% live under poverty line (2000: 20%)

SOCIO-POLITICAL FRAMEWORK (2)

Compared to the neighboring Arab countries, the PT possess:

- A vibrant civil society
- A relative functioning formal democratic system (with deficits regarding the internal appliance of democratic mechanisms)
- A high freedom of expression, and
- A high level of education (skilled worker, however, is of short supply)
SECTOR ANALYSES

National Level:
- Weak legislative framework
- Absence of national solid waste strategy
- No environmental monitoring procedures in place

Local Level:
- Uncontrolled dumping of C&DW
- Lack of capacity and professional competence

STUDY AREA

The Gaza Strip:

- Area: 365 km²
- Length: 40 km
- Width 6-12 km
- 5 Governorates
- Population: 1,400,000
- Population Density: 3,800 cap/km²
INIATIVES SO FAR

- Concept Report on Recycling of C&DW (GTZ, June 2004)
- Feasibility Study of Recycling of C&DW (GTZ, July 2004)
- Italian crusher donated to Rafah Municipality
- UNIDO Project: Cleaning of The West Bank and Gaza Strip (€ 2.5 Million)
- Italian Study (October 2005)
- Recycling and Reuse of C&DW in Palestine
- UNDP Project: Cleaning of the DW of the former Israeli settlements USD 25 Million

REUSE/RECYCLING PRACTICES

- Filling/leveling of low areas: about 11,500 m³ in 2 areas
- More than 180,000.00 m² of agricultural roads were constructed by Ministry of Agriculture, layer of 25.0cm (Islamic Bank funded project)
- More than 310,000 m³ of C&DW were used so far in construction of Gaza Fishery Harbor
- Covering material in Gaza Landfill (layer 10-20 cm)
- Reuse of aggregate produced by crushing old/broken concrete hollow blocks to produce new hollow blocks (individual initiatives)
- More than 6500 Ton as sub-base and base course in 2007
RECOMMENDED USE

- Natural (fresh) material price:
  - Filling material: USD2/Ton
  - Sub-base material USD2/Ton
  - Base course 8.5 USD/Ton
  - Gravel USD11/Ton
- Recycled Aggregate:
  - Estimated production cost=USD 4.4 as of July 2004,
    USD 3.51/Ton in May 2005
  - Proposed selling price of base course=USD 6.7
- Actual current production price=USD 2.3/Ton
- Actual current selling price= USD5/Ton (as sub-base & bottom layer base course)

CONCLUSIONS

- There is a good potential market for the recycled C&DW, but needs to be developed
- Clear specifications need to be developed
- QC/QA is needed to stabilize the quality
- More awareness at the decision making and consumers levels is needed
- Relevant regulations and mechanisms to enforce these regulations are needed
## List of participants

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>First Name</th>
<th>Organisation</th>
<th>Contact (eMail address)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Degré</td>
<td>Jean-Pierre</td>
<td>Holcim</td>
<td><a href="mailto:jeanpierre.degre@holcim.com">jeanpierre.degre@holcim.com</a></td>
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<tr>
<td>2</td>
<td>Dirr</td>
<td>Martin</td>
<td>GTZ</td>
<td><a href="mailto:Martin.Dirr@gtz.de">Martin.Dirr@gtz.de</a></td>
</tr>
<tr>
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<td>Faupel</td>
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</table>
Impressions of the Workshop by Kiran Mukerji
**Agenda 13.11.2007**

1. 00pm  | Registration & lunch
2. 30pm  | Registration & lunch
3. 00pm  | Welcome dinner
4. 00pm  | Welcome dinner
5. 30pm  | Welcome dinner
6. 30pm  | Welcome dinner
7. 45pm  | Welcome dinner
8. 45pm  | Welcome dinner
9. 45pm  | Welcome dinner
10. 00pm | Welcome dinner

**Agenda 14.11.2007**

1. 00am  | Registration & lunch
2. 30am  | Registration & lunch
3. 00am  | Welcome dinner
4. 00am  | Welcome dinner
5. 30am  | Welcome dinner
6. 30am  | Welcome dinner
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8. 45am  | Welcome dinner
9. 45am  | Welcome dinner
10. 00am | Welcome dinner

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Group of people standing around a flip chart with the agenda written on it. Another group of people standing on a sidewalk near a building labeled "Weck-Hammarskjöld-Weg."
Agenda 11.11.2008

8.30am Ten Halle 6172
3.10pm Opening of Workshop
- Welcome address
- GWU on Development Context
- Presentation of GWU
- All 11am Coffee break
- Groupwork
- 12.30pm Lunch break
- 1.30pm Results: next steps
- 3.45pm Coffee break
- 5.00pm End of workshop

Goals of Workshop
- Gather information on CIVI management in various regions
- Discuss the problems faced by CIVI agents in developing countries
- Identify key drivers for the promotion of CIVI in developing countries
- Agree on steps to be taken