Practical Demonstrator 6
Refurbishment of Deutsche Bank's Head Office & New Construction Schwabinger Tor

IDEA
The main idea is to establish – through ecological as well as economic and social improvements within a logistical system that can be directly influenced by bauseve – an industrial network around selected construction projects in Germany such as the refurbishment of Deutsche Bank's Head Office.

RESULTS

- Reduction of GHG emissions: 38%
- Reuse and recycling of waste: 85%
- Reduction of freshwater utilisation: 100%

PARTNERS

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About ZeroWIN

Project Motivation
Waste prevention has been assigned the highest priority under European waste management law. However, the initiatives which have been taken so far have not reduced the regular increase in total waste arisings across Europe.

Goals
The ZeroWIN project develops innovative approaches and effective strategies for the prevention of waste in industrial networks based on industrial symbiosis. Expected results are a reduction of at least 30% of greenhouse gas emissions, 70% of overall re-use/recycling of waste and 75% of fresh water utilisation.

Consortium
The ZeroWIN consortium has 30 partners from 11 countries (AT, DE, ES, FR, HU, IE, PL, PT, RO, UK, TW), dominated by industry – 6 large companies (one of which is the electronics cluster in the Basque region) and 10 SMEs.

Project Facts
Coordination: SAT
Consortium: 30 partners from 11 countries
Duration: May 1, 2009 – April 30, 2014
Budget: 9,5 Mio. €

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1. Introduction

Practical Demonstrator 6 – based on a refurbishment project and a new construction project in Germany – is mainly focusing on "efficient construction logistics" of construction and demolition projects which are the first step of enabling new network opportunities in construction sector. The responsible project partner bauseve GmbH is aiming to implement an optimized logistical supply chain of material delivery and waste management on site, e.g. through a high number and quality of separated waste on site for both projects.

In particular, the practical demonstrator focuses on the improvement of logistical processes (material supply and disposal) to achieve a better interaction of the different bodies and actions on site. The selection of building materials and products is not considered in this practical demonstrator, as bauseve acted to facilitate the cooperation of industrial companies and main actors (owner, architects, general planner and contractors, subcontractors, logistic service providers, etc.). Thus, these two examples are only downstream related as the choice of construction type, site location, building materials, components and product are taken for granted and will not be included in the assessment in work package 7.

This optimization process shall be applied to all project phases from planning to the point of completion for

- Refurbishment of Deutsche Bank Head Office, Frankfurt, Germany and
- New construction project - Schwabinger Tor, Munich, Germany.

The objective of this practical demonstrator is to show how an optimized logistic approach of both delivery and disposal can cause an economical, but especially ecological efficient structure of an industrial network around the two selected construction projects in Germany. The sites itself started in 2008 (project I in Frankfurt am Main) and in spring 2012 (project II in Munich).

2. Implementation

Five Prevention Practices - From the company to the network level

Process design vs. network design

In order to reach the goals of the ZeroWIN project, the general and core approach of practical demonstrator 6 lies in the implementation of innovative actions already in the design of the logistical process on site regarding the material delivery to and on site as well as the waste management processes. The action itself – (1) selecting downstream companies using residues from construction...
process, (2) residues separation already on site, (3) optimizing transportation of building materials to and residuals from installation point on site, (4) Just-In-Time delivery – have their focus on the improvement of environmental performance as an effect of implementing and optimizing industrial networks with respect to achieve the reduction targets of the ZeroWIN call.

Input substitution vs. primary resources substitution

None, as practical demonstrator 6 is focusing on the logistical processes of material and waste management on site and not on the production processes of the building itself. Nevertheless, especially in project I "Refurbishment of Deutsche Bank Head Office, Frankfurt, Germany" materials that have a reduced impact on the environment compared to traditional materials were built in. Here, the building owner took great care to contribute to a sustainable refurbishment and new construction within his refurbishment project. That especially included the supply and use of products and materials manufactured using recycled materials or using renewable energy sources during manufacturing. Manufacturers that supply sustainable versions of high impact products should be brought into the network to provide the input material for this project.

Plant improvement vs. network infrastructure improvement

The change in process design and thus, also in network design is the foundation of site improvements through efficient construction logistics e.g. by using storage and equipment or the unloading zone on site as efficient as possible. This also includes the efficient use of containers for collecting and separating by-products on site and the transportation of this material to network partners, such as recycler, refurrisher or manufacturer. All this requires not just the exchange of information between construction partners on site but especially between all network partners around a construction site as manufacturer, construction contractor, logistic service provider, waste management company, recycler, manufacturer, etc. In the practical demonstrator the improvements of network infrastructure are especially reached through improvements on the downstream site already in the early stage of planning of the projects – by involving waste management issues for manufacturers and construction companies on site as well as for all waste streams with their disposal option, e.g. Which work is responsible for which waste-material and in which quantity and quality? Who will be the customer for the waste/material? Is there regionally an economically and ecologically justified possibility of material recycling instead of incineration and landfill?

Good housekeeping vs. cooperative network responsibility

See explanations to "plant improvement vs. network infrastructure improvement".

Reuse, recovery & recycling vs. exchange of resources

The logistical processes – especially on the downstream site – are designed for reaching a higher reuse and also recycling quote of material, rather than incineration and disposal. This is caused by the fact that already on site and in the floors directly at the installation point bauserver is encouraging the contractors to collect and separate the waste into its different fractions. Also the contractors are encouraged to do so by using a logistic plan and handbook as a guideline to fulfill the work always in consideration of the logistical processes. For most of the fractions it is possible to pre-analyse the material flow from the construction site to downstream companies, either in the same or in a different industry that are re-using the material or recycling the material for another purpose of use.

Five Resource Productivity Themes - From the company to the network level

Effective resource utilization and materials efficiency

Practical Demonstrator 6 focuses on the improvement of logistical processes (material supply and disposal) to achieve a better interaction of the different bodies and actions on construction site. Within the downstream site the focus lies on the optimization of logistics of disposal with respect to an efficient use of resources on-site as
storages, lifts and containers for the different waste fractions and high recycling and re-use levels. Furthermore, within the upstream site (logistics of delivery during construction) the focus lies on the optimization of logistics of delivery through Just-In-Time delivery with respect to an efficient organization of material transports to site and an efficient use of resources on-site, too, as the use of storages, forklifts and lifts.

**Reduction of process waste and enhancement of by-product values**

The model of an efficient construction logistics reduces waste for incineration and disposal by enhancing all construction companies on site to separate and collect their waste as clean as possible with the right quantity and quality. In doing so, the collected material can be used as a by-product with required quality. For instance, in project "Refurbishment of Deutsche Bank Head Office in Frankfurt (Main)" waste fractions as marble, false floor or furniture were collected and directly re-used.

**Reduction of water use and impacts**

The reduction of water use and waste water will be implemented in practical demonstrator 6 by focusing on the efficient and optimal collection and separation of the total amount of waste into its different fractions already on site. Thus, one of the expected and positive impacts will be decreasing water consumption by using the residues directly from site as clean and separated material for production processes, in order to save water use for raw material extraction and manufacturing.

**Reduction of energy consumption and greenhouse gas emission**

The reduction of energy consumption and greenhouse gas emissions will be implemented in practical demonstrator 6 by focusing on the transportation processes to site, on site and from site. For instance, the strategically process-oriented logistic coordination of a just-in-time supply chain management is based on the optimization and regulation of all transports. This includes the notification of all deliveries to construction site either manually or via online-registration-form (OLAV) in order to balance the transports over the day. It also incorporates the coordination of space and time for unloading and lift capacities as well as the precise use of forklifts supporting the unloading and horizontal transports. According to these optimized processes of supply logistic the capacity of horizontal and vertical transports can be increased and greenhouse gas emissions substantially can be decreased.

**Improvement of control of minor elements and toxic materials**

None, as practical demonstrator 6 is focusing on the logistical processes of material and waste management on site and not on the production processes of the building itself and its materials. Thus, an improvement of control of minor elements and toxic materials can be just reached indirectly. For instance, by improvements within the waste management of residues on site: by collecting and separating the residues already on site with special focus on the clean separation of dangerous substances the risk of contaminated materials that leave the site and infect the environment are reduced.

3. **Assessment**

To find promising measures for waste as secondary resource for the production of basic construction materials on the one hand and the use of waste flows from demolition as secondary resources have been the core tasks of the construction and demolition studies of which practical demonstrator 6 is a part of.

Nearly all targets could be reached by the construction and demolition case studies. Especially the reuse and recycling rate was the first achieved goal by all case studies. Proper waste management strategies on and off-site enable the success on this indicator.

Most challenging was the reduction of fresh water utilisation. Direct on-site water consumption has negligible influence on the life cycle water consumption. Thus, improvements can only be achieved through material exchange or very thorough selection of products.
EOL (end-of-life) related case studies could achieve the goal of reduced fresh water utilisation due to the avoided primary production caused by recycling and reuse.

Finally the most promising measures for the improvement of C&D projects in terms of greenhouse gas emissions and reduced fresh water utilisation are:

- **Reuse**: Reuse avoids waste as well as the production of new product. Thus, reuse is the best option to significantly reduce the environmental burden of a building.

- **Metals have the highest environmental burden**: Separate collection on-site is the best solution for high recycling rates.

- **Aluminium recycling**: Common C&D waste sorting plants have a low sorting efficiency of aluminium. This must be changed as aluminium has the highest environmental burden of all investigated metals.

- **Timber and paper recycling**: Timber shall be recycled instead of thermally treated. Recycling leads to storage of biogenic CO$_2$.

- **Transport efficiency**: Volume reduction on-site has to be investigated in the future to reduce the transport impacts.

The research leading to these results has received funding from the European Community’s Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 226752.