

## CONSTRUCTION WASTE MANAGEMENT PROCESS IN LATVIA: PROBLEMS AND POSSIBLE SOLUTIONS

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### ABSTRACT

*Overall in Latvia every year there are 600,000 to 700,000 tonnes of waste, about half of this amount is considered to be biodegradable municipal waste. The municipal solid waste management in their administrative areas is the responsibility of municipalities. Approximately 77% of Latvian household waste is disposed of in landfills or dumps, and every year the amount of waste disposed increases. Besides, the amount of hazardous waste is increasing and hazardous waste in the most part consists of metal production waste. Currently, hazardous waste is temporarily stored in a specially equipped commercial and waste storage sites. However, hazardous waste collection and disposal is improved, as well as the amount of recycled packaging.*

*Also, the construction process creates a large amount of waste. The construction waste is referred to as waste from construction, renovation and demolition, as well as debris and damaged materials resulting from the construction process, or materials used in the construction site temporarily. Usually the construction waste from residential buildings contains concrete, wood, metal, plaster panels, oil, chemicals and roof trim materials. Construction waste can contain environment and human health hazardous substances. It can cause soil contamination if improperly disposed. Precipitation may result in contaminated groundwater.*

*These processes have defined the topicality of this article; the aim of the article is to analyze construction waste management processes, identify problems and possible solutions. This paper addresses problems related to construction waste separation, storage, transportation and disposal and the problems associated with waste management in Latvian context of sustainable construction.*

**Key words:** construction waste, management, legislation

### INTRODUCTION

Waste did not cause problems while the number of population of the Earth was small – to compare, the current population of the world exceeds six billions, but the number of population did not exceed two billions only in 1900-s; there was no deficit of raw materials, the environment was minimally polluted, there was a lot of free areas, the materials used were biologically decomposing or inert natural products (wood, clay, wool, linen, leather, etc.) which, when coming into contact with the environment, in due time vanished without a trace.

Nowadays, the situation has cardinally changed. The population of the Earth exceeds 6 billions, the stock of non-renewable natural resources (oil, gas, coal) are not everlasting. But the main thing is that synthetic materials (plastics, synthetic fiber, various chemicals, composite materials, etc.) have entered our lives extensively, but such are not common in the environment and in the majority of cases they do not decompose biologically. When such waste gets into the environment, it is being polluted because nature is not able to assimilate such waste.

### CLASSIFICATION OF WASTE

Classification of waste is based on the consideration of its properties, composition and origin. It may be deemed that various types of waste are individual elements forming the total waste flow.

According to the waste properties, it may be divided into household, hazardous and inert waste. The above division is required to regulate the waste collection, burying or recycling requirements (Environment..., 2010). Classification of waste is based on consideration of its properties, composition and origin (see in Fig. 1).

Waste may be divided:

1. As to its origin:
  - a) Industrial;
  - b) Specific;
  - c) Household;
  - d) Mining.
2. As to its properties and impact:
  - a) Hazardous;
  - b) Inert.
3. As to the place of waste formation:
  - a. Industrial;
  - b. Agricultural;
  - c. Energetic;
  - d. Household;
  - e. Service.

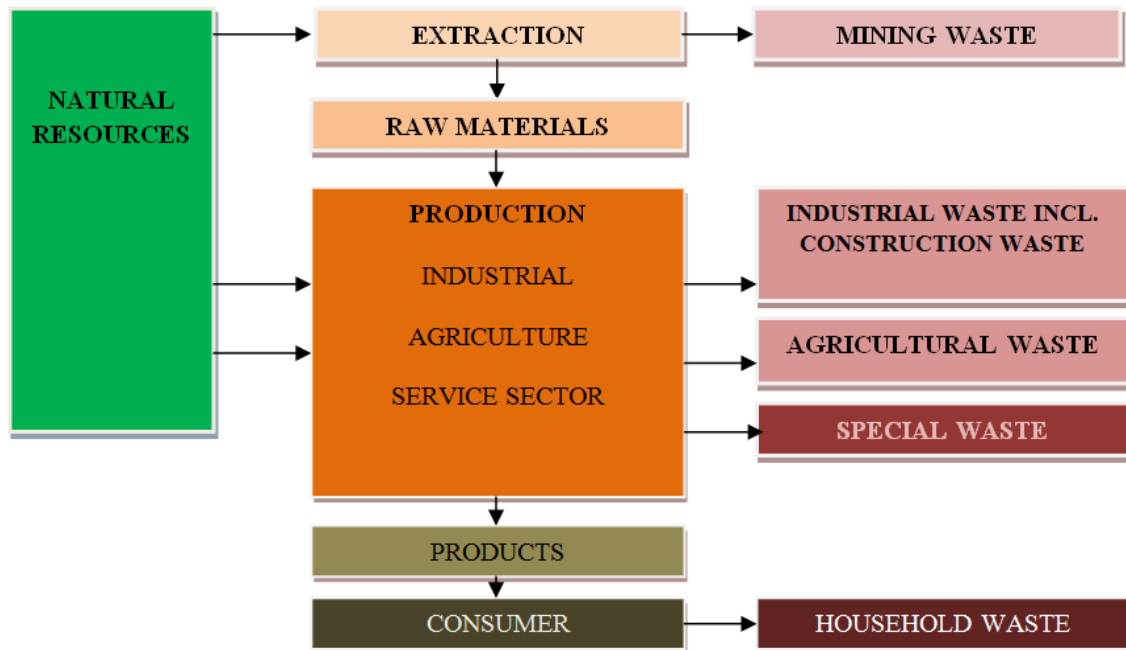


Figure 2. Waste flow

## SUSTAINABLE WASTE MANAGEMENT

Sustainable waste management envisages minimizing the volume of waste produced as well as using the resources more efficiently and rationally, by recognizing that the waste of one industry serves as raw material in another industry. The main principles of sustainable waste management:

1. Self-sufficiency and proximity principle;
2. Principle “The polluter pays”;
3. Principle of the producer’s responsibility;
4. Good waste management practice principle.

It should be noted that during the period of operation of the previous Waste Management State Plan sufficient support from the EU Structural Funds was not available for the development of the waste recycling infrastructure. The Latvian Investment and Development Agency has granted support for investment in the development of tiny and small merchants in the especially supported territories and according to the Waste Management State Plan 2013-2020 environmental impact assessment strategic evaluation, the environmental overview for the above EU support was received by 4 projects in the waste recycling sector, one of which is the Construction Demolition Waste Recycling Service Development in LLC Jaunlaicenes kokogles.

Upon developing landfill sites meeting the requirements of legal acts in the country the preconditions were created to close and recover the waste dumping grounds not meeting the requirements of the law. By attracting the funds of the European Union in the financial planning period

for 2007 – 2013, by the end of 2011 there were 30 household landfill sites with an area of ~51 ha recovered, 7 of those landfill sites with an area of 18.185 ha in 2011.

Waste management issues have been included into the strategy “Europe 2020” (Strategy...).

The strategy “Europe 2020” nominates three priorities mutually enforcing each other:

- *Smart growth* – development of knowledge- and innovation-based economy.
- *Sustainable growth* – more effective promotion of the economy in terms of resources, less harmful for the environment and more competitive.
- *Integrating growth* - promotion of such an economy that has a high level of employment and that ensures social and territorial cohesion.

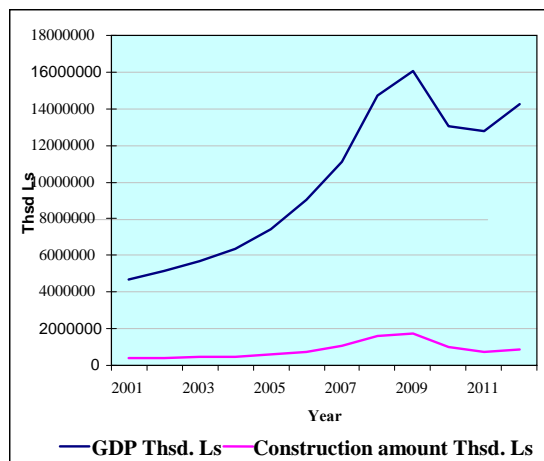
According to Section 4 of the Waste Management Law, waste management cannot adversely affect the environment, including:

- 1) creating risks for waters, air, soil as well as plants and animals;
- 2) creating disturbing noises or odors;
- 3) adversely affecting landscapes and specially protected nature territories;
- 4) polluting and littering the environment.

Especially large volumes of waste were generated in 2008 in two fields of activity, namely in construction (NACE Section F), as a result of which 859 million tons of waste were generated (32.9 % of the total waste volume) and in the extraction industry and quarry processing (NACE Section B) which generated 727 million tons of waste (27.8 % of the total volume). A major part of waste generated in these sectors was mineral waste or soil

(excavated ground, road construction waste, demolition debris, dredging ground, useless rocks, fractions, etc.). This is an explanation for the comparatively large specific weight of mineral waste and soil (63 % of the total waste volume generated) in the total volume of waste (Regulation (EU)...).

GDP and construction amounts in Latvia from 2000 - 2012 see in Figure 2.



**Figure 2.** GDP and construction amounts in Latvia from 2000 – 2012 (Created by the authors according to the data of CSB)

Waste management purposes are included in the following national planning documents: Sustainable Development Strategy of Latvia to 2030 (approved by the LR Saeima on 10 June 2010), Latvian National Development Plan 2007-2013 (Regulations of the Cabinet of Ministers No. 564 “Regulations Regarding the Latvian National Development Plan 2007-2013” of 4 July 2006), Latvian Strategic Development Plan 2010-2013 (approved by the ordinance of the Cabinet of Ministers No. 203 of 9 April 2010) as well as the Basic Guidelines for Environmental Policy 2009-2015 (approved by the ordinance of the Cabinet of Ministers No. 517 of 31 July 2009).

## CONSTRUCTION AND BUILDING DEMOLITION WASTE

The construction waste category included road construction and building demolition waste:

- 1) concrete and reinforced concrete constructions, concrete, bricks, tiles, roof tiles, ceramics, timber, glass, plastic and gypsum materials, insulating materials;
- 2) construction material containing asbestos;
- 3) cement, calcareous and gypsum materials as well as waste from production of items made of such;
- 4) street cracking waste – hard waste (cement together with binders, bitumen) that occurs when

cracking or renewing the street cover; extracted ground – soil excavated during construction, artificial dykes or excavated ground that cannot be used in the same place any more, rocks and bed deepening sludge,

5) old heating system elements, pipes, radiators, sanitary technical appliances, rug-type floor covers, linoleum, fabric or paper tapestry, plastic or wooden laths, dismantled doors and window blocks; all of them should be removed together with other debris.

It is a mistaken attempt to burn the old floor covers, tapestry or plastic finishing elements in stoves and furnaces during refurbishment because these materials produce major heat when burned and in the event of imprudent activity it may damage the stoves or even cause fire. Many finishing materials, when burned in stoves, may distribute hazardous chemical substances thereby imposing threat to human health.

If the debris is a fine fraction clinker or crushed old plastering and it is envisaged to transport such to the container from the upper floors of the building, it is useful to perform such work by means of a debris transportation pipe; this helps avoiding littering the premises of common use (Construction...).

Pursuant to the legal acts regulating construction, when the building is renovated, reconstructed or demolished the construction materials are recycled, if possible. All debris that is qualified as hazardous waste is buried according to the requirements set forth for burying hazardous waste. Legal acts relating to the divided collection of waste, preparation for repeated use, recycling and material regeneration include the construction and building for demolition waste management purposes discussed in the plan and the methods for assessing the attainment of the goals. The rate for burying 1 ton of construction and building demolition waste has gradually increased since 2009, reaching 15 LVL per ton in 2012. Burying the construction and building demolition waste has decreased, but the volume of such waste and the volume of its recycling has increased. The total volume of construction waste collected in 2010 is 153 thousand tons. The volume of construction waste is being collected in a sorted manner or as piece-waste. Approximately 140,000 tons of the collected construction and building demolition waste have been recycled in 2010, but approximately 13,000 tons of the collected waste have been buried.

One should individually discuss the waste containing asbestos that is buried in the asbestos waste site Dūmiņi. By the end of 2010 there were approximately 4,000 tons of construction waste containing asbestos buried on the site. The possibility for burying construction waste containing asbestos is envisaged in several household waste management sites as well. It is set forth that in the future all hazardous waste will be

buried in the same site (Zebrene). When the construction waste management sector is generally evaluated with respect to attaining the regeneration goals, one may allege that the requirements have already been met and in the future the main attention should be paid to controlling the collection and transportation stages. Importing construction waste from other countries of the European Union is allowed only for regeneration purposes. No construction and building demolition waste is brought into Latvia from other countries for regeneration.

### DEBRIS UTILISATION

The occurrence of debris is inevitable during any, even small, refurbishment or construction process. Each builder has to consider that the issues related to debris collection, storage, transportation and utilization will be integral and quite important parts of the construction process, the solving of which should be started in good time, at the project documentation coordination and construction permit issuance stage, so already prior to start of real works.



Figure 3. Occurrence of debris (Collection...)

The best solution is entering into an agreement with waste transporters. Even when comparatively small apartment refurbishment works are performed, one shall experience the occurrence of debris in such volumes which do not provide the opportunity to dispose of them in the usual way by dumping them into a household waste container.

It is important to know that dumping any debris into household waste containers is prohibited because the physical and chemical characteristics of the construction and refurbishment process remains and litter are essentially different from the household waste and it requires separate sorting, processing and utilization of debris.

Each repairer or builder in Latvia is bound by such construction waste management regulations as issued by the local authority in the jurisdiction of

which the refurbished or newly built object is located. It is set forth in the law that the owner of the construction waste is the legal entity or the individual in the territory of which the construction works take place, therefore the sanction for violations in the construction object may be applied to both, the builder performing the works and the customer under the assignment of which the works are performed. In this respect no discounts are allowed either to individuals or companies, but the municipal police are monitoring the situation in the territory by applying sanctions quite often for even minor violations.

In urban territories, where the works are performed in quite restricted areas, it is especially important to abide with the prohibition of placing construction waste and construction materials outside the territory where the construction works take place. The regulations impose a duty to the builder (not later than after the completion of construction works) to deliver all construction waste directly to the construction waste processing site. Quite often the persons residing next to the construction object are subject to a lengthy accumulation and storage of debris next to the place of construction because litter is dragged around the neighborhood by means of stray animals or homeless persons. The best solution for the performance of refurbishment works or the private builder is entering into an agreement with the construction waste carrier regarding the regular removal of construction waste for recycling.

### THE PROCEDURE IN WHICH CONSTRUCTION WASTE IS MANAGED

In construction works of a larger volume (if the occurrence of construction waste is envisaged in the construction project), upon the receipt of the construction permit the customer must, within five days after the commencement of works, enter into an agreement with the construction waste carrier regarding the removal of construction waste for recycling. Quite often the customer delegates this task to the builder performing the works. Excerpts from the "Construction waste management regulations" of Riga: the "Owner of construction waste – any individual or legal entity generating construction waste by its activity or who is the owner of the construction waste." "Upon accepting the construction for operation and taking into account the envisaged volume of construction waste, starting from 10 m<sup>3</sup>, Riga City Construction Inspectorate shall require the act regarding the total volume of construction waste removed for recycling that has been signed by the construction waste carrier or the construction merchant (if the construction merchant has removed the construction waste) as well as by a representative of the construction waste recycling company." "Tanks, containers and vehicles fitted for the purpose shall

be used for the collection and transportation of construction waste.”

Transportation and recycling of debris is often performed by the same companies who offer to place a specialized debris container in the object. The rent for the idle period of the container is symbolic and is calculated for the presence of the container in the object for a day or more. The main costs are formed by the container transportation and debris utilization charges that are calculated according to the cubic capacity. Containers of 5, 8, 9, 10, 15 and 25 m<sup>3</sup> are offered for rent. Already, at the stage of drafting the construction work cost estimate, the customer should require the builder to include the transportation and utilization of debris in the costs as well as follow up that the volume of debris is calculated in the cost estimate as accurately as possible. Saving funds on account of the debris removing works, including carrying it out from the object and loading into the container, quite often leads to conflict situations with municipal police or neighbors.

#### LIABILITY AND DUTIES OF THE CONSTRUCTION WASTE OWNER

The owner of the construction waste in the territory of which the construction works take place is forbidden to place construction waste and construction materials outside the territory in which the construction works take place. It is his duty, not later than after the completion of construction works, to deliver the construction waste directly to the construction waste recycling companies or to enter into an agreement with the construction waste carrier regarding the removal of construction waste for recycling. When issuing the architectural and planning assignment, the City Council Development Department shall specify therein that the delivery of the construction waste for recycling is mandatory and that the envisaged volume of construction waste (m<sup>3</sup>) must be specified in the construction project.

Upon accepting the construction for operation and taking into account the envisaged volume of construction waste, starting from 10 m<sup>3</sup>, the City Construction Inspectorate shall require the act regarding the total volume of construction waste removed for recycling (Form “Act regarding the volume of construction waste delivered for recycling”, sample 1) that has been signed by the construction waste carrier or the construction merchant (if the construction merchant has removed the construction waste) as well as by a representative of the construction waste recycling company. After the receipt of such acts, the Riga City Construction Inspectorate shall file those with the Environmental Department within five days.

If the occurrence of construction waste is envisaged in the construction project, upon the receipt of the

construction permit the customer must, within five days after commencement of the works, enter into an agreement with the construction waste carrier regarding the removal of construction waste for recycling or receive a permit from the Regional Environmental Authority for the independent removal of the construction waste to the recycler.

When construction and refurbishment works financed from the city budget funds are performed, upon commencing the works the customer must require the contractor to present the agreement regarding the delivery of construction waste for recycling entered into the construction waste recycling company.

#### CONSTRUCTION WASTE COLLECTION

Tanks, containers and vehicles fitted for purpose shall be used for the collection and transportation of construction waste.

It is the duty of the construction waste tank and container owner to maintain these in technical order. The owner or the lessee of the construction waste tanks and containers is responsible for their cleanliness (Collection...).



Figure 4. Available containers - 4 m<sup>3</sup>, 5.5 m<sup>3</sup>, 8.5 m<sup>3</sup>, 15 m<sup>3</sup>, 22 m<sup>3</sup>, 35 m<sup>3</sup>, 40 m<sup>3</sup> (Collection...)



**Figure 5.** Transportation of construction waste  
(Collection...)

### **CONSTRUCTION WASTE SORTING AND ACCEPTING FOR RECYCLING**

To ensure a quality construction waste recycling process, the owner of the construction waste must sort such as follows:

- separate other household waste and hazardous waste, including asbestos;
- concrete and reinforced concrete constructions (larger than 100x70 cm, thickness of up to 30 cm);
- concrete and reinforced concrete constructions (larger than 100x70 cm, thickness from 30 cm to 70 cm);
- concrete and reinforced concrete constructions (larger than 100x70 cm, thickness exceeding 70 cm) as well as all T-shape and double T-shape beams;
- all types of construction waste (smaller than 100x70x30 cm) by sorting them as follows:

Owners and carriers of the construction waste are strictly prohibited to remove and store away construction waste in household landfill sites and the managers of the household landfill sites are prohibited from accepting such. In the construction waste recycling company the delivered construction waste is weighted and the type of construction waste is registered by filling in the form "Construction waste acceptance waybill" delivered by the cargo carrier; two copies of which shall be retained by the carrier. The construction waste recycling company is entitled to handle the construction waste after weighing the waste and accepting it for recycling. The construction waste carrier must deliver the "Construction waste acceptance waybill register" to the Environmental Department monthly, by the 15<sup>th</sup> date of the following month. If the construction waste recycling company refuses to accept the construction waste due to its low quality or any other reason, such shall be confirmed by an entry in

the construction waste acceptance waybill by specifying that it is permitted to take the construction waste to the household landfill site for storing away.

When construction waste is accepted for storing away in the household landfill site, the construction waste acceptance waybill containing the entry by the construction waste recycling company regarding its refusal to accept the construction waste for recycling shall be required. One copy of the construction waste acceptance waybill shall be left with the person accepting such cargo at the landfill site.

If the construction waste delivered to the construction waste recycling company or the household landfill site contains substances hazardous to the environment and human health, the construction waste shall be returned to the supplier to handle, according to the provisions of Part One of Section 14 of the Law of the Republic of Latvia "Waste Management Law".

The excavated ground should be used or removed so that it is not mixed with the construction or other household waste. If possible, it should be used for landscaping the construction site or removed to another object or piece of land by agreeing such a place with the Riga City Council Environmental Department as well as not permitting the destruction of the productive upper soil layer or lowering its quality.

The construction waste recycling company must quarterly, by the 25<sup>th</sup> date of the following month, deliver to the City Council Environmental Department the overview of the volumes of construction waste brought in and recycled, of its suppliers and the types of construction waste.

If during sorting the construction waste prior recycling it is discovered that the construction waste contains other household waste then the construction waste recycling company must deliver such to the household landfill site (Riga City Council...).

### **CHARGE FOR ACCEPTING THE CONSTRUCTION WASTE FOR RECYCLING AND SALE OF THE PRODUCTS**

The supplier of the construction waste pays the construction waste recycling company for accepting the construction waste for recycling. The upper limit of the construction waste acceptance and recycling rates is set forth by the City Council. The construction waste recycling company may determine its own construction waste acceptance and recycling rates, but such cannot be higher than the ones set forth by the resolution of the City Council. The City Council is not responsible for the sale of products of the construction waste recycling companies (Riga City Council...).

## LIABILITY FOR FAILURE TO COMPLY WITH THE REGULATIONS

Complaints about the quality of services provided by the construction waste recycling company as well as about the failure to comply with these regulations should be filed with the City Council Environmental Department. If a violation of these regulations is discovered in the activities of the construction waste recycling company or the construction waste carrier, the City Council Environmental Department is entitled to unilaterally terminate the agreement on the recycling or transportation of the construction waste. For the failure to comply with these regulations, individuals and legal entities may be penalized with the fine set forth in the Latvian Administrative Violations Code. The administrative violation protocol may be drafted by:

- police officers, because the right of the police to control the performance of these regulations is regulated by the Law of the Republic of Latvia "On Police";
- head of the construction inspectorate and the construction inspectors;
- inspectors of the State Environmental Inspectorate (Riga City Council...).

## NATURAL RESOURCES AND WASTE

While the energy efficiency of the building during its use is still the most important aspect in terms of sustainability, the choice of materials used for construction have significant importance for the environmental impact – the primary energy content in the materials themselves (during the process of extraction, processing, transportation and waste management), use of toxic and hazardous substances and use of non-renewable resources. A large portion (40-50%) of the raw materials used in the world is converted annually into materials and products useful for construction.

Moreover, 40% of the total amount of waste generated annually comes from construction and demolition of buildings, followed by waste from renovation works. A major part of such waste may be recycled or used repeatedly, for example, for making roads or railway dams. The choice of materials used for construction has essential importance with respect to the environmental impact as well, especially the use of natural resources and the generation of waste flows (during the construction process as well as at the phase of demolition).

## CONCLUSIONS

Due to its considerable volume, construction waste occupies huge territories of landfill sites. They may also contain substances hazardous for the environment and human health. If improperly

buried, they may cause serious soil pollution. As a result of precipitation, underground waters may be polluted as well. It is necessary to order special containers for collecting construction waste. Construction waste management is governed by the legal acts of each region and the construction waste management regulations. Construction waste, as well as other waste, endangers the environment and the ecosystem. Quite a lot of construction waste is generated as a result of the construction process. It is possible to recycle a large part of the construction waste and to use it repeatedly. According to the Waste Management State Plan 2013-2020 environmental impact assessment strategic evaluation environmental overview:

1. In the field of waste management – in 2013-2014 it is envisaged to introduce a strict accounting system for the transportation of construction waste;
2. In the field of divided waste collection – to set forth in legal acts administrative penalties for the failure to sort waste;
3. In the field of waste preparation for regeneration, waste regeneration and recycling - to set forth quality criteria for the compost/digestate so that it may be used elsewhere in the economy (agriculture, construction, forestry, road construction, etc.);
4. In the field of waste burying – to assess the possibility of setting forth prohibitions/limitations for burying such waste that has the potential for recycling.

According to the Directive 2002/98/EC (Non-hazardous...), to increase to at least 70 % by 31 December 2019, the preparation of non-hazardous debris and building demolition remains for repeated use, recycling and other material regeneration, including filling by using waste as a substitute for other materials.

## PROPOSALS:

1. To set forth in the General Construction Regulations that it is the duty of the customer to ensure that debris is collected.
2. Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC. The Regulation enters into force on 1 July 2013 and the transitional period is ongoing at the moment (Regulation (EU)...).

Principal requirements for the buildings are set forth in Annex I to the Regulation, and there is a new requirement for sustainable use of natural resources (Requirement 7): Sustainable use of natural resources.

The construction works must be designed, built and demolished in such a way that the use of natural

resources is sustainable and in particular ensure the following:

- a) reuse or recyclability of the construction works, their materials and parts after demolition;
- b) durability of the construction works;
- c) use of environmentally compatible raw and secondary materials in the construction works.

The first six requirements are already set forth in Part Three of Section 3 of the Construction Law and in the Latvian Construction Regulation LBN 006-01 "Essential requirements for buildings" (LBN 006-01...); all 7 principal requirements for the constructions will be specified in the new draft Construction Law.

3. It is required to envisage such a system as BAPUS. Otherwise unfair competition occurs – cargos that do not reach recycling, illegal debris management is also present;

4. Promotion of recycling. Stimulating the attraction of EU funds for the purchase of recycling equipment (in proximity to large cities). Support of the EU Structural Funds to slum demolition.

5. The NRT rate for the volume of buried debris should be increased.

6. Sales of recycled materials should be stimulated.

7. Stricter control is required, but it should be evaluated whether setting forth such strict requirements is needed in B category permits – as of 2014 there must be concrete laid everywhere? Is it a requirement to lay concrete on the debris acceptance areas or on the whole area?

90% may be recycled in Latvia. Debris may be recycled to full amount.

8. It may be forecasted that the content of waste will change because construction technologies change and there will be other kinds of construction waste (for example, filled panels will not be made of reinforced concrete any more), thus also other recycling technologies.

Waste containing asbestos is brought into the Brocēni site Dūmiņi minimally because the costs are high (50 LVL/ton) and the distances are large, and storing in other sites is possible.

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