Abstract. Based upon a rough estimation, Europe counts more than 150,000 landfills. Most of them are old and abandoned landfills. Some part of these (more than 700) counted landfills is localized in Latvia, where at the moment we have no experience with possible future use of these territories. The aim of this study was to find out potential ways for reuse and possible future uses of closed landfill territories, the best possible ways to include former landfill sites into natural landscapes. The study results shows, at the moment we have more than 670 closed landfill sites and have no strategies to reuse these territories. This study is aimed to show benefits from reuse and successful external experience that can be accommodated to situation in Latvia.

Key words: closed landfill, reuse, recreation, transformation, efficient land-use.

Introduction

During the time, when Latvia was a part of Soviet Union, there was explosion of manufacturing – there were build great number of factories, extra manufacturing blocs. As the result of fast growing population in urban areas – there were opened extra landfill sites in almost every municipality. As a result of EU restrictions in manufacturing and landfill management, most of these factories and landfills have been closed and properties – contaminated and derelicted. Nowadays, when value of properties in urban areas and peripheries, have increased, we bethink existing planning processes, paying attention to effective land use. These areas should be used in more efficient way to attract investors and to add extra value to the site, city and state.
When we talk about sustainable development, one of the most efficient and successful land use planning is the reuse/multiple use of territory. Latvian experience shows a weak reuse of these brownfield areas, mostly the post – industrial territories are revitalized.

Revitalization and reuse of degraded territories, such as closed and recovered landfills, specially those who are localized in urban area, are important action to avoid from city enlargement, to reduce threat of using new, vacant green territories. [...] in urban areas the re-use of old landfill sites can be considered as privileged. A combination of relative low aftercare costs due to natural self-cleaning processes in the landfill (Natural Attenuation) and high benefits by redevelopment projects of housing, office buildings, industrial area is the most favourable opportunity. (Vossen 2005)

There is not much research done about this topic in Latvia, and we can meet different preconceptions about reuse of these territories. In 2004 single research has been done in Riga by company of city planners “Grupa 93”, it covers mainly post-industrial territories in the city of Riga, besides – due to some unknown reasons – most hazardous, contaminated and sensitive areas are not mentioned.

As land becomes more valuable, reuse of abandoned or derelict land—including former landfills—is becoming more widespread. Landfills provide unique opportunities for reuse, although significant development limitations must be addressed. Almost every community has a landfill, whether closed and capped, abandoned, or operational. Although landfills are usually viewed as liabilities, closed landfills can provide communities with unique reclamation opportunities, as long as special monitoring and design considerations are established and followed, and as long as the public is convinced that reuse will not pose any threats to public health and safety. The unique advantages of landfill reuse include funding and revenue opportunities and potential economic spin-offs.” (Kissida, 2007)

Such evaluation of current situation encouraged carrying out this research and the following research questions:

1. What is the present situation of closed landfills in Latvia?
2. How important is to pay attention to these territories?
3. What is the possible future uses of former landfill sites?

The aim of this research was to find out potential ways for reuse and possible future uses of closed landfill territories.

To achieve the main goal, the main tasks of research were specified:

- For deeper research – to analyze scientific literature about reuse of former landfill sites
To analyze laws in force about landfill sites
To consider the external experience in transformation former landfill sites

Materials and Methods

Data output to meet the objectives of this study were obtained from Central Statistical Bureau of Latvia (CSB), environmental surveys of "Latvian Environment, Geology and Meteorology Centre", as well as from the Ministry of the Environment, interregional cooperation project SUFALNET (funded by INTERREG IIIC) and from developed former landfill sites all around the world (external experiences).

Data analysis methods were used to describe existing situation of closed landfills in Latvia and to identify the main trends how to develop these territories.

To describe existing situation of landfill sites in Latvia and to provide usage alternatives, were used mainly qualitative research methods. The analysis of laws in force, statistical material about closed, capped, abandoned, and operational landfills. There were analyzed strategical development plan of Latvia, Development plan of Riga (as a biggest city of the state), cartographic material – aerial photographies, graphical plans, development projects of different existing and closed landfill sites, photographical material as well as different policy papers on redeveloping former landfill sites (SUFALNET project).

The methods of analysis were used to draw conclusions.

Results and Discussion

Present situation in Latvia

According to the data of CSB, every year 600 – 700 thousands of household waste has been produced, besides 30% of them are produced by commercials and different institutions. From more than 500 landfills, that was identified during the development of paper “Strategy of household waste management in Latvia”(1998), there were identified 252 operational landfills, about 251 closed landfill site and 55 recovered landfills. (Ministry of the Environment, 2005)

According to the “Review of landfill sites in Latvia” (2003.-2008.), total number of operational landfills is decreasing, number of closed landfills are increasing. (Figure 2.) Furthermore - Ministry of the Environment have made the prognosis of future production of household waste 1993. – 2015, and as it is shown in Figure 3. , total amount of household waste has a tendency to increase. More waste we are going to produce, more closed landfills we will find in the future. Nowadays huge attention is paid to the environmentally safety actions in building processes, management and closure. Old and abandoned landfills are going to be closed,
according to the safety requirements, and the new ones, using the latest technologies, are made next to the old landfills or in new places. Those ones who are closed and are derelict, becomes as a “dead zones” of the city or region.

Figure 1


Figure 2

The benefits of landfill redevelopment

Landfills redevelopment shows many similarities with brownfield redevelopment: first the legal and administrative framework ruling the matter is similar; second, much public money is involved and people’s preference needs to be accounted for; third, redevelopment can result in benefits accruing to the local communities if it is well linked and integrated within an urban regeneration programme. The European experience, and also the vast experiences coming from
USA, with brownfield remediation and reuse offer positive examples to address the challenges posed by old landfill redevelopment. Furthermore, the landscape, that has been reclaimed and used as a landfill, need to be repaired and integrated in natural environment – to promote successful land use and avoid from cultivating new green territories.

Figure 3

![Image showing benefits of reusing landfills](image)

**Environmental Benefits**
- reduction of development pressure on greenfields sites
- protection of public health and safety
- protection of groundwater resources
- protection and recycling of soil resources

**Social Benefits**
- renewal of urban cores
- improving the quality of urban life
- elimination of the negative social stigmas associated with the affected communities by revitalizing them
- reduction of the fear of ill

**Economic Benefits**
- attraction of domestic and foreign investment
- restoration of the tax base of government
- increased utilization of and reinvestment in existing municipal services
- development of remediation/decontamination

**Reusing – road to achieve sustainability (Turvani, 2005)**

We may count direct benefits such as the products and services we get thanks to the intervention (outputs of the project) and we may count indirect benefits, such as the positive effects produced on the surrounding area or even on a larger scale (effects of the project).

(Turvani, 2005) See the Figure 4.

From external experiences we can meet examples where as well as developed territories, also neighborhood territories benefit from redevelopment of these territories – mainly it is because of an improvement of social and economical conditions and improvement of infrastructure.

**Why Latvia need to redevelop former landfill sites**

Because of growing urbanization, old or former landfills are now often situated within or near city limits and pressure to redevelop them for recreational use, city parks, natural parks, industrial sites and even house building has increased in recent years’ (Turvani, 2005)

Besides, most of these closes areas are not integrated into natural landscapes.

Urban situation in Latvia holds lot of unsolved problems, for instance urgent lack of recreational and green open spaces in urban areas. The reason is a lack of municipality – owned properties that could be suitable for recreational needs. A reclaimed landfill constructed to the
proper standards provides a site that can help a community affordably meet its recreational needs (Gaylan, 1999)

For example, in the city of Riga there are 3 closed landfill sites - after transformation these properties can be used for recreational or commercial needs, providing new working places and adding a extra value to the property.

Re-use possibilities (external experience)

Re-use of landfill sites means a wide range of redevelopment possibilities. An overview is presented in Table 1.

The choice of type of re-use is depending on the urban or rural spatial planning of the area in which the landfill is situated.

Positive economic impacts for communities living around the site including new employment opportunities, increased property values and catalysts for additional redevelopment activities.(USEPA, 1999)

Moreover, taken from external experience - landfills are reused as a golf courses, huge parking places, afforested areas – as a green lung of urban area, recreational parks, sport facilities – sport fields, sport traces, pool complexes, storage areas, walking trails, zoo, new car temporary storage of new cars (common in U.S), solar energy fields etc.

Conclusions

At the moment, Latvia is on the way to realize examples of sustainable planning. Our minds are mainly on the level of post – industrial thinking. It is hard to accept new way of thinking, besides if it is something absolutely against assumed standards. To make parks and build residential houses on the former landfills seemed to be impossible 10 years ago. Now it is reality, besides worlds’ most developed countries are practicing this efficient land use planning for a long time period.

Conclusions:
1. Present situation in landfills of Latvia, according to the data of "Latvian Environment, Geology and Meteorology Centre", is quite serious – number of closed landfill sites is increasing, society is occupying new vacant green territories.
2. At the moment, there is no strategy in the level of the State – how to re-use closed landfill sites.
3. As a result of landfill redevelopment and land use change, territory can and should be integrated into natural landscape, by planning there afforestation, or planning it for recreational/commercial use.

4. The land reuse of former landfill sites are possible and can have long-term positive impacts on the environment, economic development, and quality of life in a given community and closest neighbourhood territories.

References


6) Sustainable planning of Latvia
