Title of Good practice case study

LANDSCAPING OF VUOSAARI LANDFILL SITE IN HELSINKI, FINLAND

Theme

RAISING PUBLIC AWARENESS ON BIODIVERSITY IN MUNICIPAL AND REGIONAL COOPERATION

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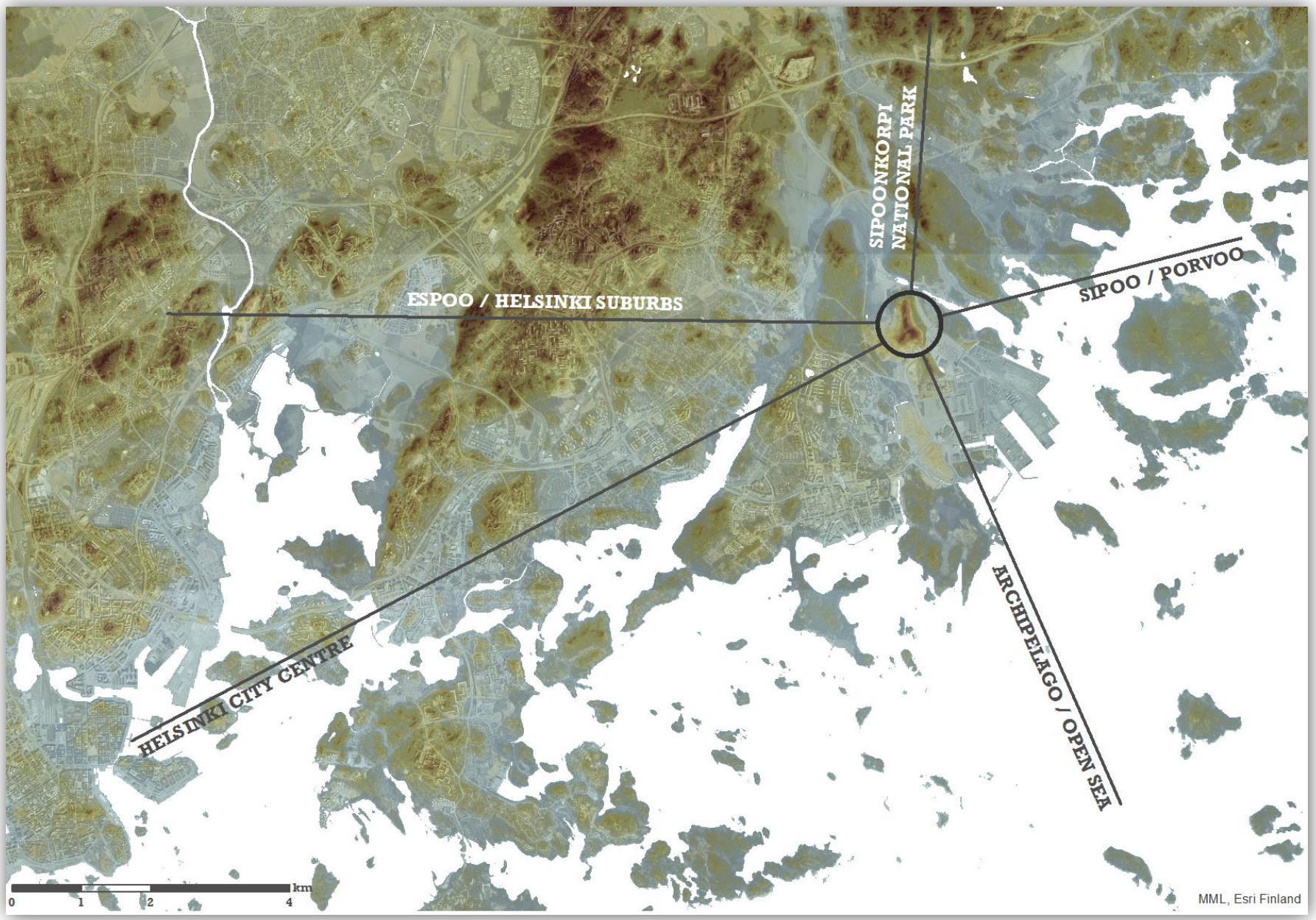

Figure 1. The unforested peak of Vuosaari landfill site provides an excellent outlook to the Helsinki Metropolitan Region (FCG Finnish Consulting Group 2013)

1 INTRODUCTION

Sustainable development of a community is strongly connected with the ability of the community to preserve and promote local environmental values – for example original green infrastructure, habitats, and biodiversity. In the urban environment, this infrastructure often composes of parks with multiple functions and diverse pool of users, and they are hiding the fragments of original habitats. Parks serving the economic, social and environmental purposes and combining the improved capacities to create synergies and to enhance performance and benefits, can be called Hybrid Parks.

Searching for the best available or good practices within the topic of raising public awareness on biodiversity among Hybrid Parks is a broad task and offers many approaches. Good practice, in the context of the INTERREG IVC programme, is defined as an initiative (e.g. methodologies, projects, processes, and techniques) undertaken in one of the programme's thematic priorities, which has already proved successful and which has the potential to be transferred to a different geographic area. Proved successful is where the good practice has already provided tangible and measurable results in achieving a specific objective.

Because of its unique character and promotion of different activities as well as combination of integrated planning approaches, the LANDSCAPING OF VUOSAARI LANDFILL SITE IN HELSINKI, FINLAND was selected as the good practice. The practice is a great example of the contemporary landscape design for sites with transitional function, which can be defined as having a relatively clear starting stage, or function and unclear final function. By steering the functions of transitional period into those that promote the creation of environmentally valuable and flexible ensemble, or Holon if you want, might certainly lead into increased public awareness on the values of the site and surroundings, for example its biodiversity as well as the recreational value of the urban green infrastructure.

The flexibility of the practice, and its at the present hidden stages, apparently leads into discovery of new (and improvement of old) management techniques. Such improved and new knowledge as well as definitions might undoubtedly become extremely valuable benchmarks for adaptation to changes in the living environments on different levels.

The Vuosaari landfill site case demonstrates a process that solves many adverse environmental issues relating to urban land use planning and its implementation.

Landscaping of Vuosaari landfill site as part of Helsinki City urban renewal

The Helsinki City has a need to improve community development to ensure that its services meet the peoples' needs. The principle is to distribute well-being in a balanced way to develop a sense of community in the neighborhoods.

The concept of "Neighborhood Identity" in the strategic spatial planning project "Suburban Renaissance"[1] will be applied to the renovation and regeneration of the existing neighborhoods built mainly in the 1960' and 70's. The aim of the project that started in 2006 is to renovate these areas in a socially sustainable way. Helsinki's existing suburbs are required to improve their attractiveness. This will be done through integrating purposeful land use development with bringing housing and workplace activities closer together. The Suburban Renaissance slowly becomes a part of the upcoming master plan of the Helsinki City.

In land use development, the aesthetic, social, operational, and technical points of view aims to complement one other. It is recognized that public urban spaces should be open to the general public throughout the city. In the suburbs, it is more difficult to perceive the city-landscape because the visual environment consists of elements of different scale, shape, and lines, and the structure of environment resembles less of an urban cityscape. Landscape planning can be used to create and build easily identifiable places and connections (Figure 1) and, on the other hand, to highlight more clearly particular elements such as local biodiversity among typical regional habitats.

2 LOCATION

Finland (in Finnish *Suomi*) is a Nordic country situated in the Fennoscandian region of Northern Europe with approximately 5.4 million inhabitants and area of 340 000 km^2. The capital city is Helsinki.

The Helsinki City is located in the southern part of Finland on the shore of the Gulf of Finland, by the Baltic Sea, at the coastal lowlands of the Uusimaa County. The Helsinki City, with its Swedish name Helsingfors, has a population of 580 000 inhabitants; 1.3 million people live in the Helsinki Metropolitan Region formed by the cities of Helsinki, Espoo, Kauniainen, and Vantaa.

The site is located (Figure 2) in the northern part of the Vuosaari suburb, approximately 20 km towards east of the Helsinki City centre. The suburb of Vuosaari has experienced a fast development since 1990, and nowadays has approximately 36 000[1] inhabitants. The Helsinki City's official scenario estimates that the total population will be 40 000 inhabitants in 2019. With 15.4 km^2 it is the largest suburb of the Helsinki City. More than 13 % of the population has a native language other than Finnish or Swedish. 20 % of the population is younger than 16 years.

The site (coordinates N60.226148 E25.158134) lies in the border area between the hemi-boreal and the southern boreal bioclimatic vegetation zones with moderately oceanic climate that is represented by cool summers and moderate winters with occurrence of very low temperatures (below -30 EC). The yearly temperature average is +5.0 EC, with warmest month June (average +21.7 EC) and coldest month January (average -10.4 EC), and is strongly affected by the Baltic Sea and the Gulf Stream. The yearly average precipitation is 655 mm (snowfall of 72 cm) and the average amount of sunshine hours is 1858 [2].

(a) (c)

(b)

Figure 2. The location of the Vuosaari landfill site in Finland (a), the Helsinki Metropolitan Region (b) and the Vuosaari suburb area (c) (FCG Finnish Consulting Group 2013).

[1] http://www.aluesarjat.fi/

Figure 3. The unforested land of the Vuosaari landfill site presents a unique piece of recreational infrastructure in the Metropolitan area (FCG Finnish Consulting Group 2012).

A large part of the Helsinki City, in fact one third of the total area, consists of various parks and diverse recreational areas. Aside of the traditional public urban parks (oldest dating to the 19th century) there are 3 700 hectares of urban forests. The biggest unfragmented urban forests can be visited in Central Park, Tali, Munkkiniemi, Viikki, Kivikko, Laajasalo and in Vuosaari (Mustavuori, Uutela). These urban forests quite often include parts that are under the nature protection status – Pitkäkoski, Haltia and Mustavuori are good examples of such. However, new development areas keep fragmenting and cropping up on all types of unbuilt land, including mainly forest areas with scarce patches of fields and meadows (Figure 3). Fragmentation, isolation and homogenization are recognized as the main problems regarding maintenance of urban biodiversity. In particular, habitats and ecologically important microhabitat conditions should be retained in as large and contiguous forms as possible. The restoration of the Vuosaari landfill site extended the extensive urban green "finger" infrastructure of the ten kilometers long Helsinki Central Park that stretches from the inner city to the northern border of the Helsinki City.

3 KEY TECHNICAL DETAILS OF VUOSAARI LANDFILL SITE

Status:

Landfill for Hazardous Waste; Landfill for Inert Waste [3]. In the ownership of the Helsinki City.

Area:

The size of the Vuosaari landfill site is in total 60 hectares with its diameter of approximately 750 meters.

Height:

The elevation of the landfill site is reaching from 5 to 65 meters above sea level (Figure 4), which rates it as the second highest point of the Helsinki City after the hill (Malminkartanonhuippu, 90 m above sea level) in the suburb of Malmikartano, which by coincidence has a similar origin.

Stored material and capacity:

The total amount of stored material (storage capacity) is approximately 2 million m^3 (3.4 million tons). Stored material includes:

- municipal waste;
- industrial waste;
- dangerous waste (most probably PAH and VOC, heavy metals, and sulfates).

Currently the landfill intakes:

- waste land / excess soils (15 % broken rocks, 20 % gytija clay, 20% clay, 15% moraine, and 30% surface soil);
- snow;
- contaminated soil (intermediate storage, activity coming to an end).

Gas production:

Approximately 200–350 m^3/year of landfill gases have been recovered since 1991.

Surrounding environment:

Surrounding areas, especially those on the northern and western parts are important recreational semi natural forests with a dense network of outdoor routes. The site itself is passed by a 3.5 km long lighted route that is in the winter maintained as a cross-country skiing track.

Figure 4. The steep south-west slopes highlight the elevation of the hill and help to distinguish different origins and purposes of the site (FCG Finnish Consulting Group 2010).

4 OBJECTIVES OF PRACTICE

The purpose of the practice is to promote social, economic and environmental activities at the Vuosaari landfill site. Landscaping the land reservoir aims to imitate the landscapes and habitats that are typical to the North European nature with a rich and unique biodiversity. During the landscaping process, plants that are typical to the area and earth organisms that promote succession have been transferred to the site (Autio et al. 2005), which has resulted in an attractive place of many functions – a Hybrid Park. The practice is especially leading into promotion of following functions:

- **the original** function of the site – storage of the construction land masses from the port and residential areas;
- storage of the top soil organic layers serving as a **"seed bank"** and providing the first step to the desired effect – sustaining of biodiversity and succession of ecologically sustainable habitats;
- **a deposition** site for the transferred plant species that would otherwise be lost in the construction projects in the region (Figure 11);
- **raise awareness** and knowledge of the regional biodiversity among the public via site's comfortable and versatile recreational use - nature is brought within the reach of area's residents in an increasingly urban environment.

5 DETAILED DESCRIPTION OF PRACTICE

5.1 Origin and timeline

Activities on the site have started in the 1960´s, following with a more extensive storage use period starting from the 1980´s on. The landfill site ownership was transferred to the Helsinki City in 1963 from the company Lohjan Kalkki Oy. Originally, the purpose of the site was to operate as a waste storage site and an inert material landfill. The part for household waste landfill was closed 1988, while the section for inert material is still in use. Environmental permit for the inert material storage (land reservoir) at the landfill was issued in 1996, while a partial landscaping of the site started in 1994. Environmental Impact Assessment (EIA) process was finished during 1998 (steering group: Helsinki City authorities, the Helsingin Energia, the Helsinki City Environment Centre, and the Centre for Economic Development, Transport and the Environment).

The new development period started with the decision to transform the neighboring areas into a main port hub of Helsinki. This hub should, and is replacing two harbors (Kalasatama and Länsisatama-Jätkäsaari), both originally situated in the city centre of Helsinki. After a challenging permitting period, the construction of the hub at Vuosaari started 2003 and was completed 2008.

5.2 Process and cooperation

The cooperation between different stakeholders and interest groups in the planning process has been slowly evolving (Figure 5) since the ownership was transferred to the Helsinki City, and resulted in a colorful mixture of interest groups (Figure 6).

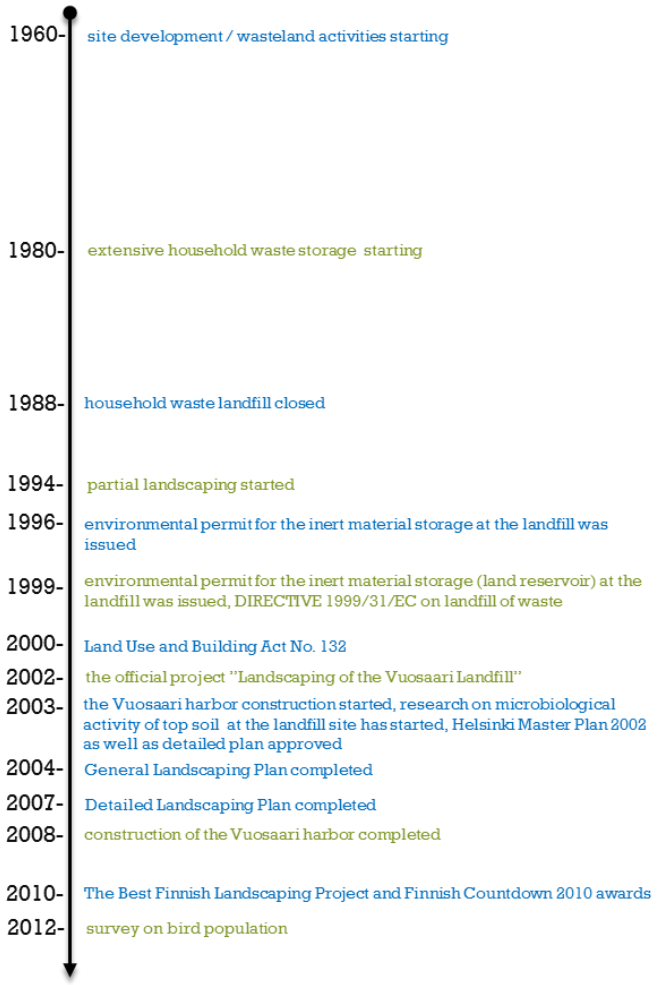

Figure 5. The site evolution timeline (FCG Finnish Consulting Group 2013).

The official project "Landscaping of the Vuosaari landfill site" started in the end of 2002 as a joint project of the Public Works Department of the Helsinki City and the Helsinki Port Authority. The original purpose of the landscaping project was to compensate the recreational space that was lost in the construction of the harbor and new housing in the northern Vuosaari [4]. Another important goal was to create a regional node connecting several outdoor routes with regional importance.

While the Finnish Environmental Institute (SYKE) concluded research on microbiological activity of top soil [5] during 2003–2005 (ordered by the Public Works Department), a General Landscaping Plan (Figures 12 & 13) for the site was completed in December 2004 by the former Suunnittelukeskus Ltd. (nowadays part of the FCG Finnish Consulting Group Ltd). A Detailed Landscaping Plan was finished in December 2007 by FCG Finnish Consulting Group Ltd.

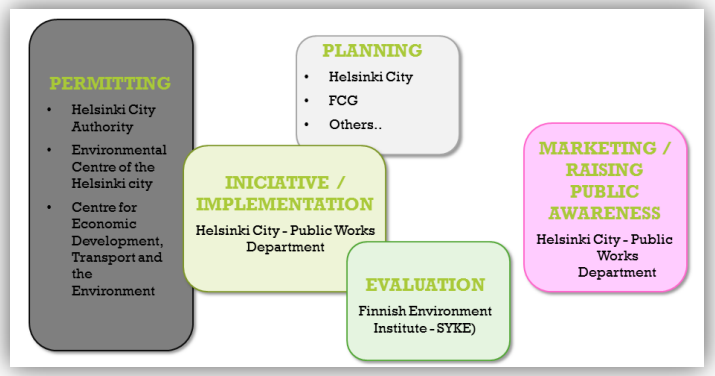

Figure 6. Different stakeholders cooperating in the planning and implementation processes (FCG Finnish Consulting Group 2013).

5.3 Legal framework

The practice is indirectly based in the goals defined in the "Helsinki Action Plan for Sustainability" (approved by the City Council in 2002), specifically in the Goal 2 – Protecting and Fostering Biodiversity in Helsinki (Preserving the biodiversity of Helsinki in accordance

with the principles of the UN agreement on the protection of biological diversity.) One of the seven main objectives in the Helsinki City Local Agenda and its ongoing development program is "Adopting lifecycle consciousness in physical urban planning, procurement practices and construction work".

The spatial planning system in Finland consists of the actual (physical) land use planning system as a core, but also of other development planning mechanisms at the national, regional and local administration levels that have direct spatial implications. The Land Use and Building Act No. 132[2] (came into force 1.1.2000) defines the statutory land use planning system in Finland. It covers also the general building regulation. It is a general act for planning the use of environment at three levels (regional plan, master plan, and detailed plan), but it doesn't cover all forms of the use of environment. The provision that concerns the objectives for the land use planning complements and specifies the main objectives of the Act. It brings out the main issues coupled with two procedural aspects, namely participatory planning and sufficient impact assessment:

"The objective in land use planning is to promote the following through interactive planning and sufficient assessment of impacts:

1) *a safe, healthy, pleasant, socially functional living and working environment which provides for the needs of various population groups, such as children, the elderly and the handicapped;*
2) *economical urban structure and land use;*
3) *protection of the beauty of the built environment and of cultural values;*
4) *biological diversity and other natural values;*
5) *environmental protection and prevention of environmental hazards;*
6) *provident use of natural resources;*
7) *functionality of communities and good building;*
8) *economical urban development;*
9) *favorable business conditions;*
10) *availability of services;*
11) *an appropriate traffic system and, especially, public transport and non-motorized traffic."*

[2] Unofficial translation to English is available on-line: http://www.finlex.fi/fi/laki/kaannokset/1999/en19990132.pdf

Regional Plan [6]

A Regional Plan sets out the general long-term development aims and associated strategies for the region. Careful planning of the land use and the geographical location of communities and activities are essential elements in the provision of high standards of living, functionality of the physical environment, and in sustainable development. The Regional Plan defines the use of areas needed for particular purposes and the principles of urban structure from the point of view of regional development.

When an area requires protection due to its landscape, natural values, built environment, cultural and historical values or special environmental values, the necessary regulations for this purpose may be given in the regional plan. There is a need to recognize natural and recreational values in the rapidly developing region of the Uusimaa County. The Regional Plan provides a framework for sustaining the recreational and green infrastructure (Figure 7), and includes also the Vuosaari landfill site. Among these particular uses the plan focuses on the

promotion of natural biodiversity and the system of ecological corridors.

Figure 7. The zoning of the Regional Plan of Uusimaa County clearly specifies the harbor (red outer line) and the surrounding recreational (dark green, VL) and nature protection (S, SL, sl, and MY) infrastructure.

Master Plan [7]

The Strategic Spatial Plan and the Master Plan form a part of the overall development strategy of the City. The 'From City to City-region' contains policy statements which create the basis for the Helsinki's new spatial vision. The strategic element acts as a broad guide and spatial framework for the Master Plan, which is a more detailed land use specific plan. The Helsinki's Master Plan 2002 (Figure 8) was approved by the City Council on 26.11.2003 and came legally into force for the entire City. The City Council approves the Master Plan as the basis for how the City will manage its development in the future and where new investments will be located. The Master Plan has a long-term perspective, and is prepared without a target year, although it is valid until a decision to change it is made, normally, in every ten years.

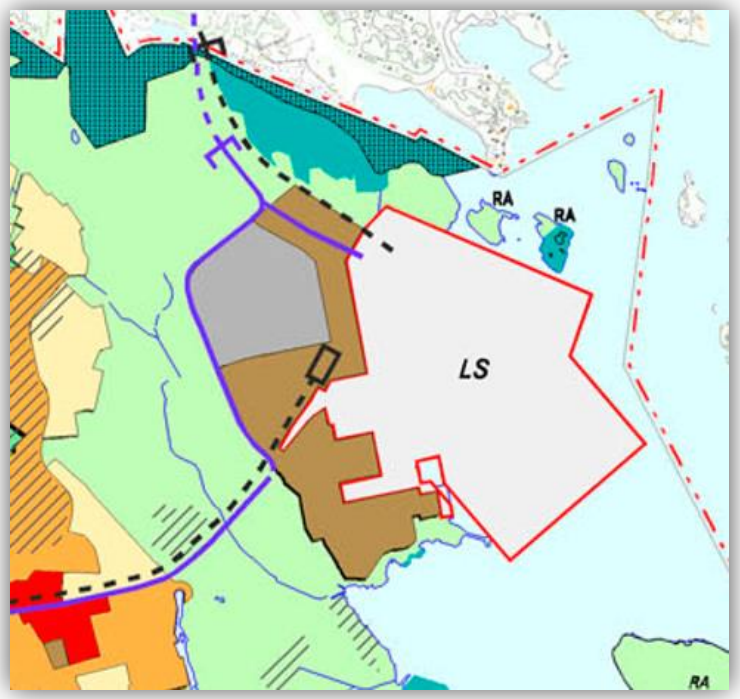

Figure 8. The zoning of the Master Plan of Helsinki City 2002. The landfill site is located in the north-west direction from the harbor area (LS).

The Vuosaari landfill site is affected mainly by the key policies concerning city landscapes and green networks:

1) *"The continuous cityscapes extend beyond the administrative borders.*

2) *The special characteristics of the cityscapes will be emphasized and the areas will be developed as a whole. The characteristics, values and possibilities upon which development will be based will be identified in area profiling.*

3) *Accessibility to the green city network and recreational areas of the city-region will be guaranteed. The preservation of natural diversity and landscape culture will be a key feature of the Plan.*

4) *As the urban structure becomes more compact, greater emphasis than before will be placed on the quality of public outdoor areas. Green areas will be used in a more effective way and provide a clearer outline to the urban structure."*

Detailed Plan [8]

Detailed Plan (Figure 9) was approved by the Helsinki City Council in 1999 and approved by the Finnish Ministry of Environment in 2002. The Vuosaari landfill site is defined in the plan partly as a recreational area (VU/VL), where management should support and secure survival of protected species. Other areas are for special use (energy and storage services, ET) and partly for research and education (EM). The EM zone is further defined as:

- an area that should be restored according to the law;
- management must lead to "open landscape";
- no deep rooting plants should be present;
- outdoor infrastructure must be planned with respect to difficult geotechnical condition;
- on the borders with nature protection zone (SL), buffering vegetation must be introduced.

Surrounding areas are dominated by the nature protection areas (SL), industrial areas (T, TS), services (K, KTY, KTS), traffic (LR, LP, LS, LT), and green protection belts (EV).

According to Land Use and Building Act the built and the natural environment must be preserved and their special values must not be destroyed. The body responsible for drawing up the Detailed Plan of Helsinki City is the City Planning Department. The Public Works Department is responsible for the plan´s implementation, along with several other departments in the technical sector.

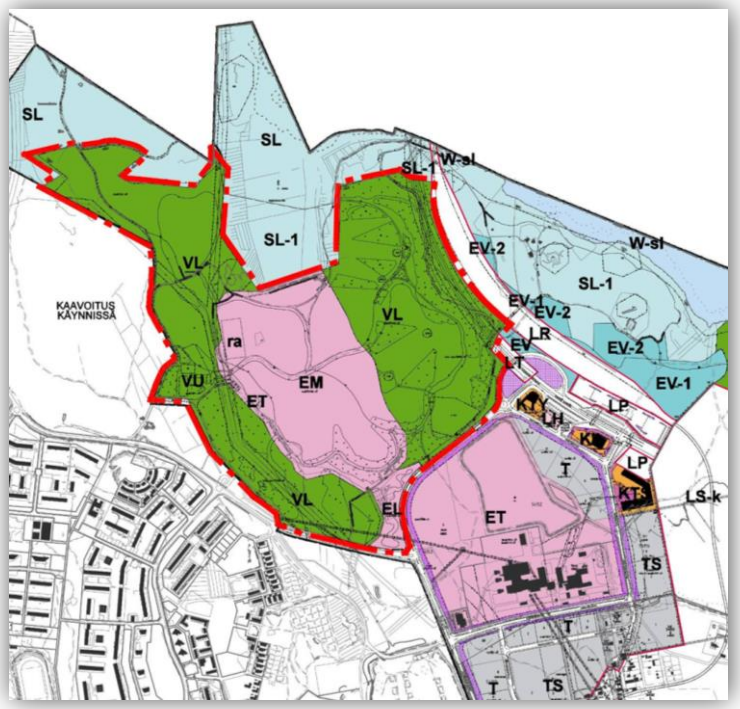

Figure 9. The zoning of the landfill site became a part of the Detailed Plan of Vuosaari Harbor.

5.4 Implementation

Traditionally, the land use planning and the infrastructure planning have occurred as separate processes. Under the traditional model, infrastructure decisions are made based on a pre-determined use (i.e. zonings in a Detailed Plan). However, with sustainability being a key goal, it becomes essential that different aspects of planning are closely linked.

The landscaping of the Vuosaari landfill site has appeared to be an excellent example of "Integrated Planning Approach" as following concepts were applied:

- restorative design;
- ecological design;
- regenerative development;
- conventional design.

Implementation of the landscaping phase is a continuous process. The implementation of the landscaping phase and storage of the top soil on the already enclosed landfill is in accordance with COUNCIL DIRECTIVE 1999/31/EC on landfill of waste EU directive. The directive recommends surface sealing of landfill sites with >1m of top soil. According to the directive the sealing should further contain also a gas drainage layer, an artificial sealing liner, an impermeable mineral layer, and a drainage layer (> 500 mm). In practice, two approaches (Figure 10) were selected to separate the land fill mass from the surface environment. While the thinner layering (570 mm) contained 200 mm of top soil and was designed mainly to establish grass/meadow habitats, the other approach (1070 mm) contained 400 + 300 mm of different top soil quality. This created a layer supporting stands of open shrubland. Both approaches contained layer of Bentonite fabric, a Trisoplast sealing, a drainage layer, and three layers of geotextile.

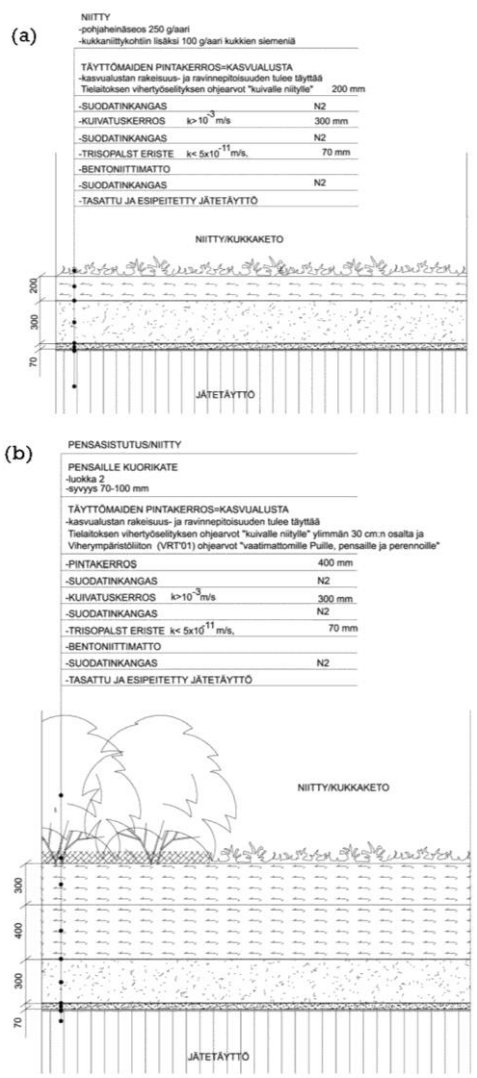

Figure 10. The thin (a) and the thick (b) layering approaches selected to enclose the land fill mass and separate it from the surface environment (FCG Finnish Consulting Group 2004).

During the construction period of the harbor, approximately 80 000 m^3 of inert material (top soil with boulders) from the port site was stored at the Vuosaari landfill site. The goal was to spread the soil fast, within two days after the excavation. In 2003 and 2004, the area that was landscaped by the excavation masses, covered approximately 7 hectares. The areas to store the excess soils were build up in sections of 5-meter layers filled between terraces of broken rock, so that an intermediate layer made of supporting soil (moraine or similar) was placed between layers of poorly supporting soils, such as clays. The area's drainage system consists of terraces and landfills of broken rock functioning as covered drains, open ditches and sedimentation troughs (Autio et al. 2005). At some parts, the surface layer of the landscaped area was comprised of the surface layers of 100-120 year old forest biotopes that would have been built over, as well as upper layers of lakeshore groves.

Figure 11. The Vegetation transfer from the development and construction sites around the Helsinki region to the landfill site (Jukka Toivanen 2012).

The responsible authority for the implementation of the landscaping phase, the construction of infrastructure and the soil economy is the Public Works Department of Helsinki City.

Figure 12. The General Landscaping Plan of Vuosaari landfill site integrating different activities and values (Helsinki City 2004).

- Planned area
- Residential area
- Natura 2000
- Nature protected area
- Delineation of old landfill
- Inert material storage, fenced
- El. powerline
- Cross section

VEGETATITON

- Shrub (existing)
- Forest (to be planted)
- Shrub (to be planted)
- Open space
- Heather meadow
- Ruderal habitats
- Junipers

TRAILS

- Outdoor route, illuminated
- Outdoor route
- Trail
- Historical army route, World War I
- Horse riding route
- Skiing track
- Skiing, illuminated

ACTIVITIES

- Info table
- Resting zone
- Biking trails
- Dog park

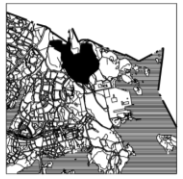

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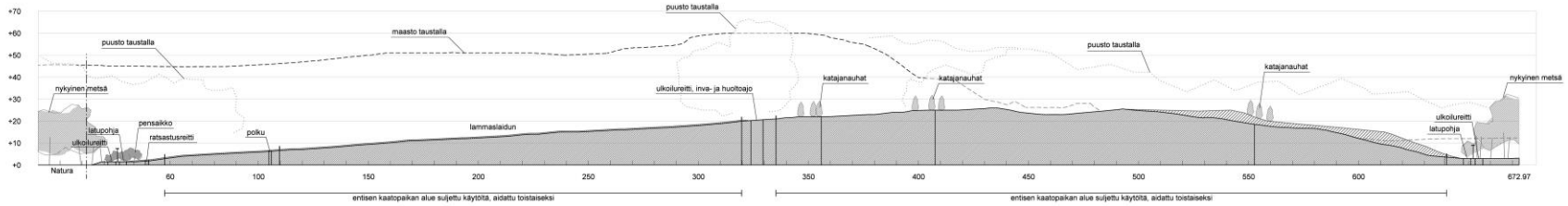
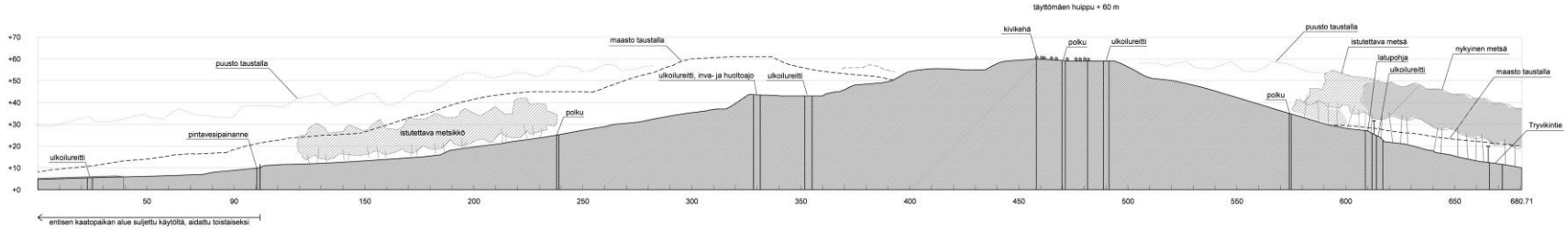
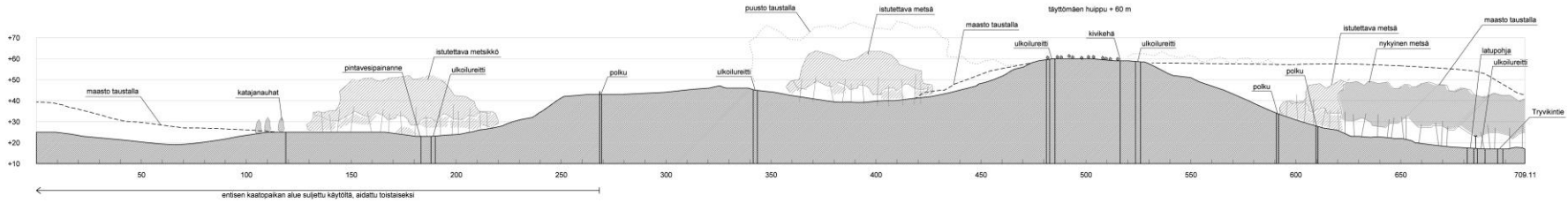
Figure 13. The cross sections of the Vuosaari landfill site (Helsinki City 2004).



Cross section AA 1:1000
Old household waste landfill, towards east



Cross section BB 1:1000
Landfill, towards north-east



Cross section CC 1:1000
Landfill, towards north-west

6 EVALUATION OF PRACTICE

Sustainable land use planning and a carefully thought implementation of strategic decisions can support several environmental aspects and promote biodiversity. The above described pioneering project demonstrates an opportunity for building and landscaping on environmental terms, and saving resources as a result [10]. The target of this practice was to create new environmental planning and implementation methods, with interesting results in easily maintained and diverse environments, which are characteristic for the Finland's natural environment. Several success indicators or aspects of this project are identified to help to evaluate the practice and to demonstrate the results of the practice such as the raised public awareness on biodiversity.

6.1 Environmental aspects

Pastures, alder and ash grows, heather and juniper stands as well as the overheated slopes are typical habitats for the site, and represent the typical regional habitats of the Southern Finland´s archipelago with a remarkable richness of species (Figure 14).

During the landscaping planning process, all together 227 plant and tree species (Table 1) were selected and recommended for the re-vegetation and restoration of the habitats – 114 ruderal and bare land, 45 grassland and meadow, 43 woodland, 12 moist woodland, and 13 other species [11]. The criteria for the selection were – domesticity, significant butterfly community support, beauty, and vitality.

*Table 1. The selected plant species for the re-vegetation and restoration of the habitats at the Vuosaari landfill site (*Keiron Oy 2007*).*

ruderal and bare land species	grassland & meadow	woodland	moist woodland and other
Alliaria petiolata, Allium oleraceum, Allium schoenoprasum, Anchusa officinalis, Anthemis arvensis, Anthemis tinctoria, Anthyllis vulneraria, Arabidopsis thaliana, Armeria maritime, Armoracia rusticana, Artemisia absinthium, Artemisia vulgaris, Barbarea vulgaris, Berteroa incana, Borago officinalis, Brassica rapa, Bromus hordeaceus, Bunias orientalis, Campanula glomerata, Campanula rapunculoides, Capsella bursa-pastoris, Centaurea cyanus, Centaurea jacea, Centaurea phrygia, Conyza Canadensis, Cytisus scoparius, Echium vulgare, Epilobium adenocaulon, Epilobium angustifolium, Epilobium ciliatum, Epilobium hirsutum, Erigeron acer ssp. acer, Erysimum cheiranthoides, Euphorbia esula, Euphorbia helioscopia, Euphorbia peplus, Euphrasia sp., Filago arvensis, Galium boreale, Gnaphalium sylvaticum, Helianthus petiolaris, Hieracium (Vulgata), Hieracium sp., Hieracium umbellatum, Hyssopus officinalis, Impatiens parviflora, Inula helenium, Inula salicina, Isatis tinctoria, Knautia arvensis, Lapsana *communis, Lathyrus pratensis, Leontodon autumnalis, Lepidium campestre, Linaria repens, Linaria vulgaris,Lotus corniculatus , Lysimachia nummularia, Medicago lupulina, Medicago sativa, Melilotus albus, Melilotus officinalis, Myosotis arvensis, Persicaria hydropiper, Persicaria lapathifolia, Persicaria maculosa, Pilosella officinarum, Plantago lanceolata, Polygonum aviculare ssp. aviculare, Potentilla intermedia, Potentilla norvegica, Potentilla recta, Potentilla thuringiaca, Prunella vulgaris, Raphanus raphanistrum, Rhinanthus minor, Rhinanthus serotinus, Rubus idaeus, Rumex aquaticus, Rumex longifolius, Salvia pratensis, Sedum acre, Sedum album, Sedum reflexum, Sedum telephium , Senecio sylvaticus, Senecio viscosus, Senecio vulgaris, Silene latifolia ssp. alba, Silene vulgaris var. vulgaris, Sisymbrium altissimum, Sisymbrium officinale, Solanum dulcamara , Solidago virgaurea, Sonchus arvensis, Sonchus asper, Sonchus oleraceus, Stachys palustris, Succisa pratensis, Symphytum officinale, Symphytum x uplandicum, Tanacetum vulgare, Thlaspi arvense, Thlaspi caerulescens, Trifolium arvense, Trifolium aureum, Trifolium hybridum, Tussilago farfar, Verbascum nigrum, Vicia cracca, Vicia hirsute, Vicia sepium, Vicia tetrasperm, Viola arvensis*	*Achillea millefolium, Achillea ptarmica,, Agrostis capillaris , Agrostis stolonifera, Ajuga pyramidalis, Antennaria dioica, Anthoxanthum odoratum, Campanula persicifolia,, Campanula rotundifolia, Carum carvi, Centaurea scabiosa, Dianthus deltoids, Digitalis purpurea, Festuca ovina, Festuca rubra, Filipendula vulgaris, Fragaria vesca, Galium verum, Geranium columbinum, Geranium molle, Hesperis matronalis, Hypericum maculatum, Juniperus communis, Lamium album, Leucanthemum vulgare, Lychnis viscaria, Myosotis ramosissima, Oenothera biennis, Origanum vulgare, Pimpinella saxifrage, Platanthera bifolia, Polypodium vulgare, Rosa mollis, Rumex acetosa , Rumex acetosella , Satureja vulgaris, Taraxacum sp., Thymus serpyllum, Verbascum Thapsus, Veronica arvensis, Veronica chamaedrys, Veronica officinalis, Viola canina ssp. canina, Viola tricolor, Woodsia ilvensis*	*Alnus glutinosa, Anemone nemorosa, Athyrium filix-femina, Carex digitata, Convallaria majalis, Corydalis solida, Corylus avellana, Daphne mezereum, Dryopteris carthusiana, Dryopteris filix-mas, Gagea lutea, Gagea minima, Geranium sanguineum, Glechoma hederacea, Hepatica nobilis, Humulus lupulus, Impatiens noli-tangere, Lonicera xylosteum, Luzula pilosa, Maianthemum bifolium, Melica nutans, Mentha arvensis, Mercurialis perennis, Milium effusum, Mycelis muralis, Paris quadrifolia, Prunus domestica ssp. insititia, Prunus padus, Ranunculus ficaria, Rhamnus catharticus, Rhamnus frangula, Ribes alpinum, Ribes nigrum, Ribes spicatum, Rosa dumalis, Rubus saxatilis, Salix caprea, Salix pentandra, Salix starkeana, Scilla sibirica, Sorbus intermedia, Stellaria holostea, Viburnum opulus*	*Cirsium helenioides, Filipendula ulmaria, Geranium sylvaticum, Geum rivale, Geum urbanum, Iris pseudacorus, Lythrum salicaria, Salix aurita, Salix cinerea, Salix phylicifolia, Silene dioica* *Acer platanoides, Betula pendula, Betula pubescens, Galeopsis speciosa, Hippophaë rhamnoides, Lonicera caprifolium, Prunus spinosa, Rosa majalis, Rosa villosa, Saponaria officinalis, Satureja acinos, Sorbus aucuparia, Syringa vulgaris*

The Kidney vetch *(Anthyllis vulneraria)* and the Marsh Daisy *(Armeria maritime)* that are rare in Finland can be seen here. In fact, the 10 years' follow up project pointed

390 vascular plant species, and 9 endangered, 16 near threatened, and 38 least concern insect species (for example the Large Copper (*Lycaena dispar)*_[9] and the Wormwood (*Cucullia absinthii).* An overwhelming proportion of all taxons, 75 %, were found in the area that had been landscaped in accordance with the already described techniques. This indicates that the seed bank and the transfer of vegetation yielded promising results and provided public with a possibility to observe rare fauna and flora (Figure 15).

Figure 14. The site's biodiversity of the plant species exposes to the visitors especially during the late spring and early summer seasons (Jukka Toivanen 2012).

The year round observation of birds has been a part of the landscaping project. The bird life of the area consisted of nesting migrants, migrating visitors, and winter guest species with different habitat preferences – woodland, open woodland, and grassland species. The Marsh Warbler (*Acrocephalus palustris)*, the Corn Crake (*Crex crex),* the Red-backed Shrike (*Lanius collurio*), the Common Sandpiper (*Actitis hypoleucos),* the Meadow Pipit (*Anthus pratensis*), the European Wheatear (*Oenanthe oenanthe*), the European Barred Warbler (*Sylvia nisoria*), the Common Rosefinch (*Carpodacus erythrinus*), all evaluated as least concern species, have been observed at the site [12].

Figure 15. The Viper (Vipera berus) and the Old World Swallowtail (Papilio machaon) are attractive species that remind of the site´s biodiversity (Jukka Toivanen 2012).

The success of the project can be also evaluated by the topsoil's microbiological activity. Soil enzyme activity patterns reflect functional structure of the micro biota and provide information on important soil processes. Enzyme activity was measured with ZymProfiler at different sites during 2 years. Enzyme activity measurements revealed that microbial activity continues in the transferred humus layer, and even though some activities start to decline after certain period, the practice is obviously successful also from this point of view.

In addition to the ecological values of the area it is worth to mention the two neighboring NATURA 2000 sites in the vicinity – Mustavuori and Östersundom (FI0100065) [13]. Both sites are representing the boreal groves and the mesotrophic siliceous and calcareous outcrop stands and are also parts of the Nature Protected Areas in Finland. In terms of fauna, the species of the Birds Directive are in abundance; a large number of them nest in the area or rest during the migration.

Efficient utilization of natural resources and rationalization of the use of excess soil mass created as a result of construction a reduction on the volume of excess soil, improved ecological efficiency, and enabled the protection of urban ecology and biodiversity also within the construction sites (Autio et al. 2005).

Table 2. Conducted research and inventories:

research/inventory
Wallenius, K., I. Heiskanen ja M. Niemi. 2004. Maaperän entsyymiaktiivisuuksien seuranta Vuosaaren huippu – hankkeessa [Top soil enzymatic activity follow up research at Vuosaari hill.] Vuosiraportti 2003. 39.
Faunatica Oy. 2004. Vuosaaren täyttömäen kasvillisuuskartoitus 2003 [Vegetation inventory at the Vuosari landfill 2003].
Faunatica Oy. 2005. Vuosaaren maantäyttöalueen hyönteis- ja kasvillisuuskartoitus 2003–2005 [Insect and vegetation inventory at the Vuosaari landfill 2003–2005].
Faunatica Oy. 2005. Helsingin Vuosaaren maantäyttöalueen luontotyyppikartoitus [Mapping of the nature habitats at the Helsinki Vuosaari landfill].
Faunatica Oy. 2005. Helsingin Vuosaaren maantäyttöalueen kovakuoriaiskartoitus [Beetle species inventory at the Helsinki Vuosaari landfill].
Faunatica Oy. 2005. Helsingin Vuosaaren maantäyttöalueen uhanalaisperhosselvitys [Inventory on endangered butterfly species at the Helsinki Vuosaari landfill].
Solonen., T., Luontotutkimus Solonen Oy. 2005. Vuosaaren täyttöalueen linnustoseuranta 2005 [Bird species follow up research at the Vuosaari landfill.]
Keiron Oy. 2012. Linnustoselvitys 2012 [Bird population inventory 2012].
Keiron Oy. 2012. Isokultasiiven seuranta ja päiväperhosten laskenta 2012 Vuosaarenhuipulla [Monitoring of the Large Copper and other butterfly species at the Vuosaari hill].

6.2 Social and economic aspects

During the planning stage, the site has been designated to provide inhabitants with a number of possible activities, while the creation of the Hybrid Park with multiple uses was induced by the nature and history of the site. The highest point of the site provides an excellent view on the Baltic Sea coast with pittoresque archipelago (towards south), the forest of National park Sipoonkorpi (towards north) as well as the downtown of the Helsinki City can be seen (towards west). The traditional view on Finnishness and its relationship with nature is nowadays in contrast with a more modern orientation on Finnish virtues. Still the importance of nature for the nation is a significant social aspect even if the demand for associated services (Figure 16), e.g. marked routes and info tables, is rising.

Figure 16. The outdoor trails and gravel routes are common in the landfill site and its vicinity. The National Cycling Touring Route [14] connecting the Helsinki City and the Porvoo City is passing the site along its northern border (FCG Finnish Consulting Group 2010).

At the moment the landfill area is already an important target for nature lovers, but upon the improvement of the infrastructure, the target group of visitors is expected to grow. At the moment, the practice has resulted in and promoted following social activities:

- Regular excursion destination for high school and university students as well as for planning professionals.

- Destination for nature enthusiasts, who are always seeking for sites with high biodiversity and diverse habitats (Figure 17).

- Popular recreational destination for inhabitants of the Helsinki Metropolitan Region, with availability of unmarked hiking and mountain bike trails and marked skiing tracks.

Figure 17. The observation of the bird communities is a common activity at the top of the hill, since it provides an excellent view on its surroundings – extensive forests on the north and the Baltic Sea coast and the archipelago on south. Spotting one of the 1500 White-tailed Eagles (Haliaeetus albicilla) living in Finland [15] is a common and intensive experience (Jukka Toivanen 2012).

The services in the area are being improved that has an effect on the growth in the amounts of visitors and their profiles. On the other hand, the implementation of the General Landscaping Plan (Figure 13) can be described rather as unsystematic and disorganized, which is probably due to the transitional stage of the area, and hardly predictable geotechnical and environmental circumstances. Also the specific social structure of the Vuosaari suburb profiles it in different direction from the rest of the green areas in the suburbs of Helsinki City – for example via introducing culturally dependent activities and ways of spending free time.

Planned adjacent services, such as sport venues (skiing and horse-riding) as well as a site for local events are expected to increase the overall attractiveness of the place, and generate monetary values for the service providers in the future. The improved infrastructure is expected to attract part of the 36 000 inhabitants living in the Vuosaari suburb as well as new visitors from areas further away.

The landscaping project is also justifiable when the municipal economy is considered. In the construction business the transport and storage of the excess soil masses (Figure 18) are expensive and often create extra costs. By the operations of the Vuosaari landfill site, these costs were minimized during the construction of the Vuosaari harbor area as well as nowadays, when it minimizes the municipal costs of inert material storage.

Figure 18. The storage of excessive material, snow and contaminated soil (on the picture) at the site creates important part of its economic revenues (FCG Finnish Consulting Group 2010).

6.3 Raising public awareness on biodiversity

Raising public awareness can be understood as marketing, which is often seen as a driver of ever growing consumerism and unsustainable use of resources. Choosing proper marketing strategy can also provide positive results in biodiversity and habitat conservation. Following indirect marketing approaches to raise public awareness on biodiversity can be seen as those, which succeeded in providing the public with information on the Vuosaari landfill site project. The increased awareness was mainly realized via Public Relations, and backed up by a Non-Governmental Organization and with exceptional success in Special Events like several competitions and presentation on different exhibitions. Social Media Optimization is also used to market the Vuosaari landfill site project, and refers to the use of a number of social media outlets and communities to generate publicity to increase the awareness of the site.

PUBLIC RELATIONS:

Helsinki Neighborhoods Association (Helka ry) [16]

The non-governmental organization Helka was founded in 1964. Helka's values include openness, fairness, equality, community building, and sustainable development. Its mission is to activate and bring together residents and local actors in the Helsinki City area. Central task of the group is to convey information and to enhance dialogue between the Helsinki City and its residents. With the ongoing support from Helsinki City Government, Helka has established a city wide network of neighborhood web pages. It aims to strengthen diverse opportunities for local participation and interaction in Helsinki. The Vuosaari landfill site was included in the Northern and Central Vuosaari–Town wandering routes.

The Best Finnish Landscaping Project 2010 (Suomen Paras Maisemahanke 2010)

The Best Finnish Landscaping Project is an annual competition supported by the Finnish Ministry of Environment, The Finnish Association for Nature Conservation (FANC), and the VR Group (broad-based Finnish transport company). The practice was awarded as one of the winners.

Finnish Countdown 2010

The Vuosaari landfill site project was announced the winner of the Finnish Countdown 2010 competition given by the Finnish IUCN. The IUCN (International Union for Conservation of Nature [17]) is the world´s first global environmental organization and a leading authority on the environment and sustainable development. The central mission of the IUCN is the conservation of biodiversity.

SPECIAL EVENTS:

Man-made Environment (Uutta Pohjoismaista Maisema-arkkitehtuuria)

The practice was presented on the Man-made Environment 2011 exhibition supported by the Museum of Finnish

Architecture [18]. One of the exhibitions' goals was to discuss the landscapes' values and their importance to inhabitants, while another was to present hybrid solutions for planning of urban environments.

Expo 2010 Shanghai

The practice was presented (1.6.-15.8.2010) as a part of the New Nordic Landscapes installation at the Nordic Lighthouse. Through projects from the Nordic countries, the EXPO exhibition New Nordic Landscapes demonstrated how landscape architecture is about so much more than making things look pretty. Landscape architecture can supply sustainable solutions, promote health, and create better living conditions for people in both cities and rural regions. Some of the exhibition highlights contained "Biodiversity in an urban context" and "Interaction between infrastructure and landscape, process urbanism".

SOCIAL MEDIA OPTIMIZATION:

Vuosaarenhuippu blog [19]

The blog regularly updated and written by Jukka Toivonen from the Department of Public Works of Helsinki City provides an overview of up to date information on the site's present state.

Green Hearts Project - Vihreät Sylit Hanke [20]

The Department of Public Works of Helsinki City has launched a project to promote urban parks as destinations for local inhabitants. The project provides interactive routes with the downloadable audio describing the particular spot.

7 LESSONS LEARNT FROM PRACTICE

The sustainability in land use planning and in strategic decision making can lead to strengthening of the nature's position in the society, especially if the Integrated Planning Approach in landscaping can be applied in practice. Participatory municipal planning approach and cooperation of different stakeholders during the implementation process can result in active protection and support of biodiversity in the urban environments. On the other hand the relatively complex chain of planning and implementation processes might sometimes lead in the discrepancies between idea/plan and final result. These differences can be observed also at the Vuosaari landfill site. While the recreational infrastructure at the moment doesn't correspond with the Landscaping Plan, possible impacts of the exact Landscaping Plan's implementation on biodiversity values might be discussed.

Overall, the practice resulted in an important biodiversity sustaining and promoting site in the Helsinki Metropolitan Area with its interregional impacts proved by several excursions from cities and universities around the Finland, and success of special events. The practice successfully provides environmental and social (recreation) functions, while part of it is still providing economical function (storage of inert material). Cooperation between authorities and stakeholders, and the amount of conducted inventories and research certainly increased the value of the final results. Also, the local approach and a passion of an individual are important factors contributing to the quality of the project.

A project with such ecological and recreational qualities certainly embeds capital that can be utilized. The conversion of such capital into monetary values will become easier after the planned infrastructure will be realized. Adjacent businesses, such as sport venues or the site for local events are expected to benefit from the overall attractiveness of the place.

To improve the publicity of the place, it is necessary to develop a clear brand (Figure 19) including all activities of the site. It will also help to secure effective marketing of the practice's values and to spread the lessons learnt during the project.

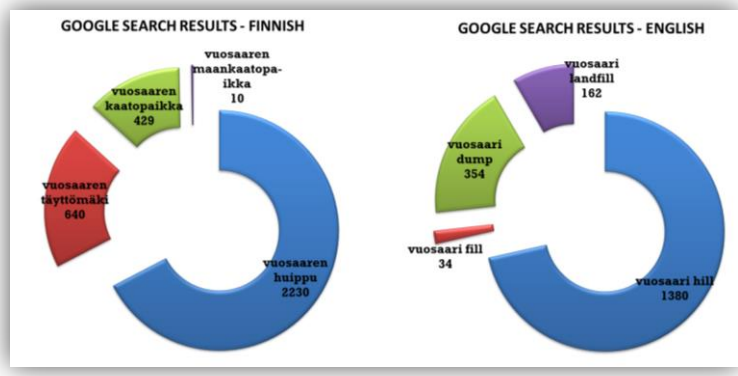


Figure 19. The clarity of the brand (name) of the landfill site was reviewed. Clearly the most common name used for the site was "Vuosaaren huippu" in Finnish and "Vuosaari hill" in English (FCG Finnish Consulting Group 2013).

8 SUMMARY

PROJECT INFORMATION		
INDEX	1026R4	
PROJECT ACRONYM	Hybrid Parks	
PRIORITY	Environment and risk prevention	
PROGRAMME SUB-THEME	Cultural heritage and landscape	
GOOD PRACTICE INFORMATION		
Title of the practice	Raising public awareness on biodiversity in municipal and regional cooperation	
Topic of the practice	Landscaping of Vuosaari landfill site in Helsinki, Finland	
Location of the practice	**Country**	Finland
	NUTS 1	Mainland Finland (FI1)
	NUTS 2	South Finland (FI18)
	City	Helsinki
Start date of the practice	**Start**	2002
Detailed description of the practice		
The Vuosaari landfill site is situated in the capital city of Finland, Helsinki, in the Vuosaari suburb that is situated in the eastern side of the Helsinki City, some 20 kilometres from the city centre. The suburb has grown rapidly, and has now app. 36 000 residents, in the Helsinki City lives all together app. 580 000 residents. The Helsinki Metropolitan Region has some 1.3 million people. The Helsinki City has mainly been in charge of the transformative spatial planning and of the actual landscaping activities of the Vuosaari landfill site. It has been the owner of the site since 1963, when the common landfill activities were started. The Vuosaari landfill site area is in total 60 hectares and now the second highest point of the City. The site has mainly worked as a household waste and as an inert material landfill site, but after the ending of the household waste storage activities in the end of the 80's, and by a construction of a new massive harbor area Vuosaari from 2003 next to the site, it has been transformed into an area of more multiple and versatile use. The inert material section is still in use. The new use of the landfill site consolidated the recreational areas that were lost because of the new harbor and the new coming residential areas nearby. In addition to the programmatic suburb development, the strategic target was also to connect the many regionally important recreation routes there, and to extend the already large Central Park green corridor structure of the City further. The transformation of the activities were planned in the Regional Plan (especially taking notice of the recreation and nature protection areas surrounding the harbor), in the Master Plan supported by regional development strategies (in general combining the city landscapes and green networks), and in the Detailed Plan (combining the recreational use, protection of species, energy and storage services, and research and education). A participatory municipal planning approach was applied, and there was cooperation between the different stakeholders like the Helsinki Port Authority during the implementation phase. The General (2004) and the Detailed Landscaping Plan (2007) by the FCG Ltd, served as the base for the actual landscaping activities and the zoning of different uses, but haven't been manifested as such. Two different technical approaches were used to separate the land fill masses from the surface environments. The landscaping of the surface is a continuous project, and the surface layer environment is changing all the time, because different landmasses and surface biotopes are transferred to the area from different places of the City.		
Evidence of success		
The landfill site is now a storage for construction land masses from the harbor and other construction areas in the City, a storage of the top soil organism layers serving as a seed bank, a deposition site for transferred plant species that would		

otherwise be lost, and a place for versatile recreational use. The re-vegetation and restoration of regional habitats (pastures, alder and ash grows, heather and juniper stands, and overheated slopes) have been successful. The 10 years' follow up project has also proven that the seed bank activity and the transfer of vegetation have been succeeded, and a rich variety of rare flora and fauna can be found. The topsoil's microbiological activity has also remained pretty good. The site gives to people opportunities to build a closer relationship with the nature in the vicinity of diverse urban landscapes (the archipelago, nature protection areas, and the City infrastructure). The place is an attractive and a popular nature target for students, professionals, and nature enthusiasts like bird watchers. Recreational use is multiple like hiking, mountain biking, horse riding, and skiing. Providing different associated services like marked routes, and new sites for local events, the overall attractiveness and awareness of the site are expected to increase. Activities are partly supported by different NGOs, and also the Department of Public Works of Helsinki City provides social media activities and unloadable data. Transportation and storage of extensive landmasses are expensive. The Vuosaari landfill site minimized for its part the construction costs of the Vuosaari harbor, and functions still partly as a municipal inert material, snow, and contaminated soil storage. The practice has been recognised nationally and also internationally for its promotion of landscaping, sustainable development, man-made environment, and new landscapes. It was for example chosen as the best Finnish Landscaping Project 2010.

Contact details to obtain further information on the practice

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Photo and figure credits:

- Jukka Toivonen
  Figures: 11, 14, 15, 17, last page

- FCG Design and Engineering Ltd.
  Figures: front page, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 16, 18, 19

Bibliography:

[1] Suburban Renaissance - Esikaupunkien Renessanssi
Department of Public Works, Helsinki,
http://www.esikaupunki.hel.fi/

[2] Finnish Meteorological Institute
Ilmatieteen laitos – Sää ja ilmasto – Ilmastotilastot – Ilman lämpötila
on-line 24.4.2013
http://en.ilmatieteenlaitos.fi/normal-period-1981-2010

[3] Council Directive 99/31/EC
Directive of 26 April 1999 on the landfill of waste,
on-line 24.4.2013
http://ec.europa.eu/environment/waste/landfill_index.htm

[4] Wallenius, K., I. Heiskanen ja M. Niemi. 2004. Maaperän entsyymiaktiivisuuksien seuranta Vuosaaren huippu – hankkeessa. Vuosiraportti 2003. 39 p

[5] Heikkonen, M. 2008. Vuosaaren satama ja ympäristö. Vuosaaren sataman rakennusprojekti, VUOSA.181p

[6] Regional Plan "Uudenmaan maakuntakaava"
on-Line 12.4.2013:
http://kartta.uudenmaanliitto.fi/maakuntakaavat/index.html

[7] Master Plan "Yleiskaava 2002"
on-line 12.4.2013:
http://www.hel.fi/hki/Ksv/fi/Yleissuunnittelu/Yleiskaava_2002

[8] Detailed Plan "Helsingin ajantasa-asemakaava"
on-line 12.4.2013:
http://ptp.hel.fi/hanke/

[9] Pimenoff, S., 2004. Kooste uhanalaisen isokultasiiven lähtötiedoista ja luonnos seurannasta ja hoidosta keskustelun pohjaksi, Luontotieto Keiron Oy.

[10] Autio, A., Haapaniemi, K., Joki-Pesola, M., Laulumaa, P., 2005. The landscaping of Vuosaari landfill in Helsinki, Finland, in compliance with the principles of sustainable development. CABERNET 2005: The International Conference on Managing Urban Land.

[11] Keiron Oy, 2007. Vuosaaren huipun suunnittelu – kasvilajiehdotukset.

[12] Keiron Oy. 2012. Lintuselvitys. 2012 [Survey on Bird populations 2012].

[13] Uudenmaan ympäristökeskus. Helsingin Natura-alueet 15.7.2009.
on-line 14.6.2013:
http://www.ymparisto.fi/default.asp?contentid=54426&lan=FI

[14] Helsinki Metropolitan Cycling and Outdoor Map
on-line 14.6.2013:
http://ulkoilukartta.fi/#

[15] Valkama, Jari, Vepsäläinen, Ville & Lehikoinen, Aleksi 2011: Finnish Breeding Bird Atlas - Suomen III Lintuatlas. – Luonnontieteellinen keskusmuseo ja ympäristöministeriö. ISBN 978-952-10-6918-5.
on-line 14.6.2013:
http://atlas3.lintuatlas.fi/results/species/white-tailed%20eagle

[16] Helsinki Neighbourhoods Association
http://www.vuonet.fi/kaupunkipolut/Pohjois-%20ja%20Keski-Vuosaari.html, http://www.vuosaari.fi

[17] IUCN, International Union for Conservation of Nature
http://www.iucn.org

[18] Museum of Finnish Architecture.2011.MFA Magazine 1 / 2011
on-line 24.4.2013
http://issuu.com/arkkitehtuurimuseo_mfa/docs/mfa-lehti_1_2011

[19] Vuosaarenhuippu blog
on-line 14.6.2013:
http://vuosaarenhuippu.blogspot.fi/

[20] Green Hearts Project - Vihreät Sylit Hanke
on-line 24.4.2013
http://www.vihreatsylit.fi/?page_id=1515