

# Urban Sustainability in Vuores a New Housing Development in Tampere

Pertti TAMMINEN, Finland

**Key words:** Housing Development, Sustainability, Eco-efficiency

## SUMMARY

Vuores is a new urban quarter, which is being developed in Tampere by the early 2020s. Tampere and its surroundings with 370 000 inhabitants is the second largest urban region in Finland. The population in the Tampere Central Region is expected to grow by 115,000 residents by 2040. The planning of Vuores forms part of the preparation for this growth. The total population of Vuores will be about 14 000. The construction phase of the area started 2010 and the population in the beginning of 2017 is 3000.

Eco-efficiency is the most important starting point for the development. Energy supply, energy-efficient buildings, a sustainable transport system, material-efficiency, and reduction of greenhouse gas emissions are essential parts of the urban development. In Vuores, traffic system emphasises public transport, walking and cycling. The multiphase stormwater management system is the most extensive and diverse in Finland. The automatic waste collection system is based on a Finnish innovation. The waste inlets have separate feeding pipes for biowaste, paper, cardboard, and mixed waste, all of which are transported underground by negative pressure to the collection station. The pneumatic waste collection system significantly lowers the need for energy and reduces emissions compared to the traditional collection method.

A modern wooden town will be built in Isokuusi, which is one of the housing areas within the Vuores neighbourhood. In Isokuusi wooden residential blocks of flats, wooden business and service buildings, and wooden small houses will form a unified architectural entity. Once completed, the area will be one of Finland's largest modern wooden urban environments.

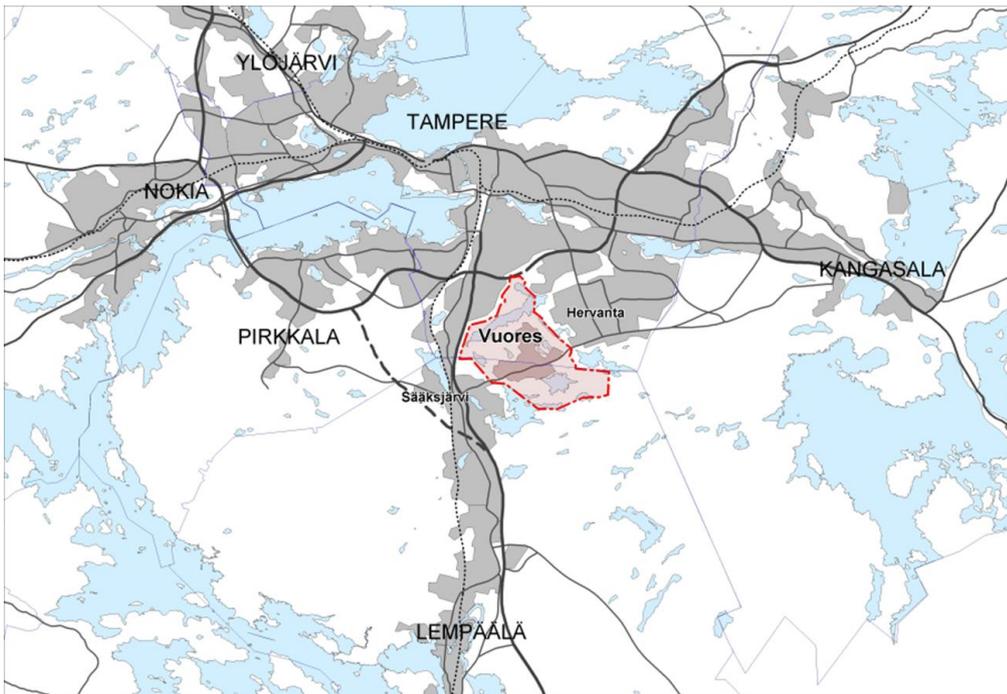
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## 1. INTRODUCTION

The City of Tampere has in its City Strategy committed itself to the Aalborg Charter for Sustainable Development. Urban structure and environment are strategic goals, with an emphasis on unified urban structure and combating climate change. The objectives include efficient public transport, diverse and high-quality living environments, efficient energy consumption, and increasing use of renewable energy sources.

The population in the Tampere Central Region is expected to grow by 115,000 residents by 2040. Most of this growth will take place within the City of Tampere. Vuores is part of the response to this development. In terms of housing production in the entire city area, Vuores will offer opportunities for various forms of housing in the coming 10-15 years. Vuores provides an alternative for families with children in particular, who seek a suitable housing environment in the City of Tampere or in the neighbouring municipalities a reasonable distance away from services and the city centre. The planning of Vuores started in 2000 and the construction in 2008. In the beginning of 2015 the population of the area was 1300, so construction of the district has only begun. By completion around 2025 the district will have 14,000 residents.



**Figure 1: Vuores in urban framework**

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## Vuores Vision

The City Board has based planning and implementation of the Vuores area on the following vision: “A Small Town in the Midst Nature: Vuores is a combination of high-quality housing and urban greenery. The smooth flow of everyday life is combined with sustainable housing and transportation. The area offers innovative construction and housing solutions and utilizes cutting-edge technology. The diversity of the area, a strong sense of unity, and natural intergenerational interaction create excellent conditions for active and sociable lifestyles.”



**Figure 2: Vuores centre, oblique (2016)**



**Figure 3, 4, 5, 6: Versatile housing production in Vuores (2016)**

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## Ecocity project

Vuores has participated in various projects on ways to implement ecological construction and planning. The ECOCITY project, implemented between 2002 and 2005, was a significant background analysis supporting the preparation of the principles used in the planning of the Vuores area. The project was implemented as part of the EU's fifth Framework Programme under the Thematic Priority of "Strategic approaches and methodologies in urban planning towards sustainable urban transport". The aim of the project was to sustainably unite urban planning and transport planning.



Figure 7: Criteria and Issues of Urban Planning (ECOCITY 2008)

## 2. OBJECTIVES

### 2.1 Eco-efficiency as the main goal of planning and implementation

The aim of eco-efficient planning and construction is to build a high-quality urban environment with all the necessary services with fewer natural resources. Raw materials, construction materials, energy, and technology are used correctly and with maximum efficiency.

The goal is to create an eco-effective "small town", which is active throughout the day and will provide high-quality services and a variety of residential options as well as attractive workplace areas for business and trade. The natural environment and ecology are essential parts of the area's identity. Environmentally valuable areas will be protected.

### 2.2 Urban structure as a starting point for sustainable solutions

The most significant basic solutions relating to an eco-efficient community are based on the urban structure designed during the land-use planning processes. Planning can create good conditions for an efficient public transport system, bicycle and pedestrian traffic, and eco-efficient energy management. Together Vuoreksen puistokatu boulevard and Särkijärvi Bridge form the backbone of

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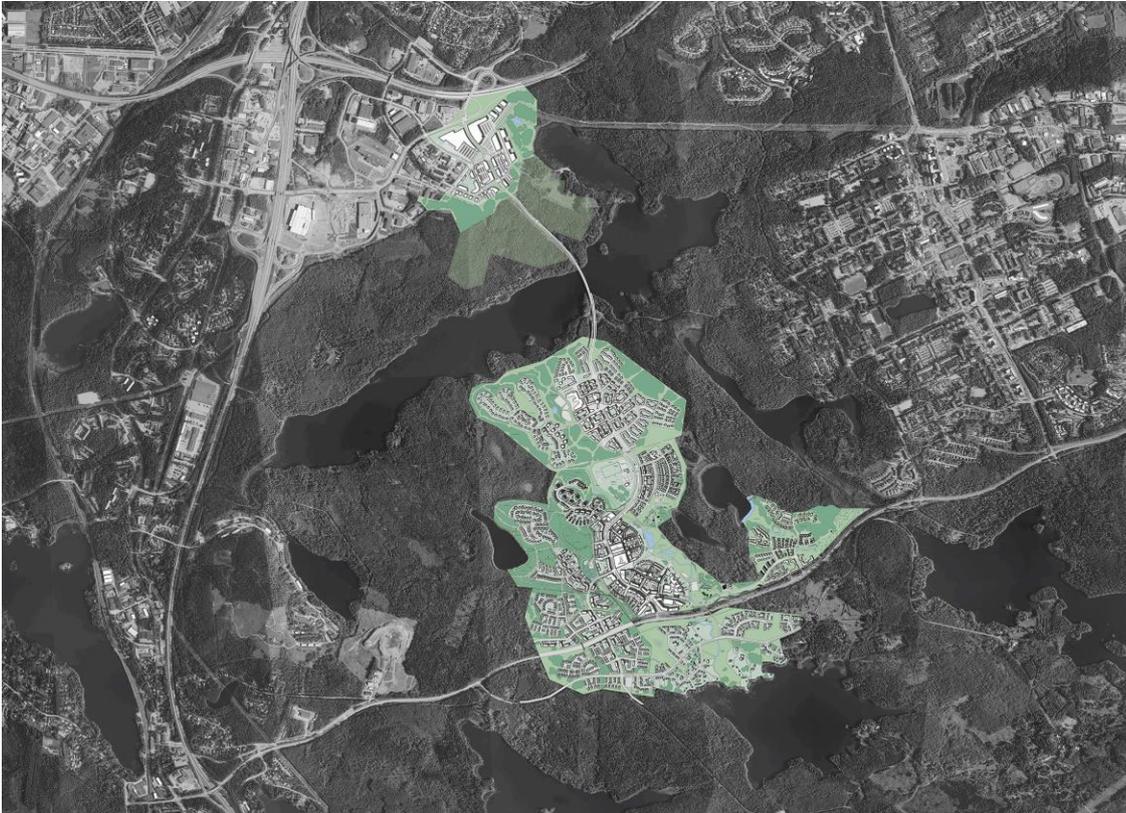
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the entire Vuores district, which supports the urban structure of the entire area. The boulevard connects Vuores to the existing urban structure, and the route facilitates efficient public transport and good pedestrian and motor vehicle connections to Tampere's city centre. The trunk connections of the heating network for the entire district were also implemented during the construction of the boulevard.



**Figure 8: Masterplan, Vuores Urban Structure**

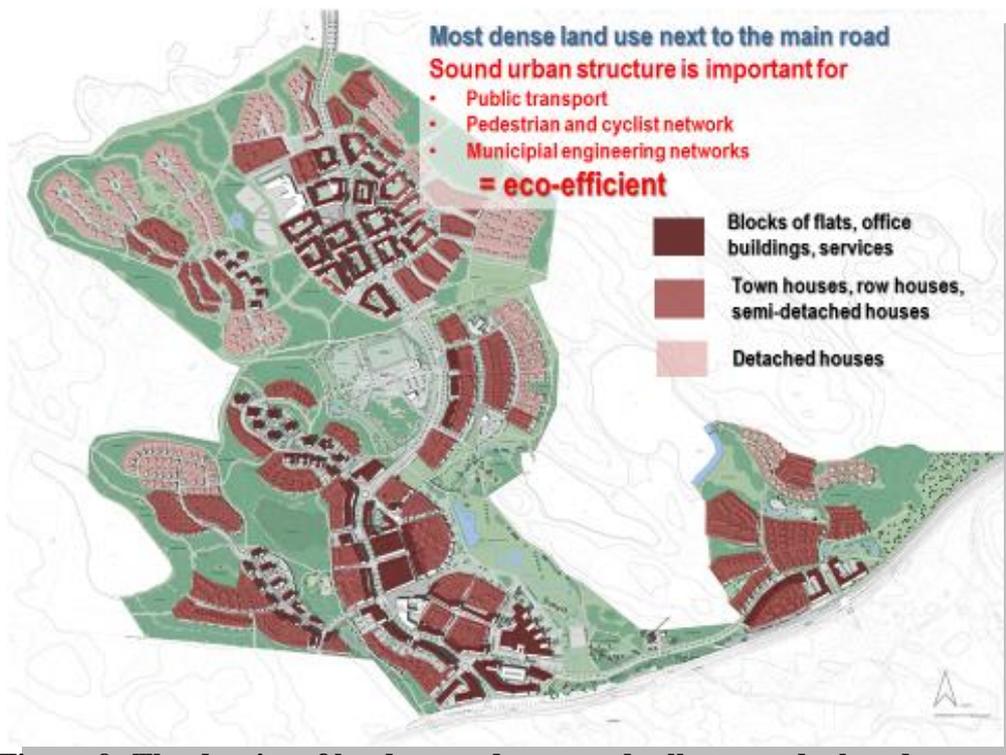
A mixed land use structure is another important goal of urban structural planning. In the Vuores Centre in particular, the goal is to mix housing, services, workplaces, and activities to create activity and stimuli around the clock. A dense, functionally mixed structure means that services and activities are easily accessible, which encourages more cycling and walking. The location of workplaces within the urban structure also helps reduce the amount of commuter traffic.

### **3. ECO-EFFICIENT SOLUTIONS**

#### **3.1 Urban structure**

The planning principle in Vuores was to locate the most dense land use along the Vuoreksen puistikatu boulevard, which serves public transport and allows efficient use of the district heating system. The density of land use reduces gradually towards the edges of the urban structure: blocks of flats along the boulevard are surrounded by terraced house and semi-detached house zones. The

least efficient detached houses are at the edge of the community structure. In this way, the urban structure is not unnecessarily decentralized.



**Figure 9: The density of land use reduces gradually towards the edges**

Vuoresaukio Square will become the core of the Vuores centre. There will be a business centre with a super market, other commercial services, parish premises, and daycare centre. The Vuores church and parish centre will be constructed opposite to the business centre on the other side of the square. The third service cluster in the Vuores centre will be the school centre, which will also include a daycare centre and sports, auditorium, and assembly premises.

### **3.2 Natural environment and constructed green areas as part of the park and garden network**

The aim throughout the various planning and implementation phases is to preserve the valuable nature areas in Vuores together with their diverse fauna and flora, and to maintain the environment in its present excellent state. The ecological and operative connections of the park and garden network will be secured.

The proximity of nature and the natural heritage of the area are integral to the Vuores vision. Before construction began, the Vuores area had a rich natural heritage. The aim in planning has been to preserve and secure the functionality and quality of the various elements of the natural environment. The challenge is to preserve the values set out in the initial assessments prepared on the natural environment, park and garden network, and green areas.

According to the planning guidelines, special attention will be paid to maintaining the special features of the landscape and the diverse natural heritage. Construction will blend with the landscape, and environmental impact will be controlled with careful consideration to the capacity of the surrounding environment. Areas to be preserved in their natural state will be secured with protective zones, and by maintaining the existing ecologic corridors and securing moisture equilibrium.

### 3.3 Sustainable transport solutions

The vision of the traffic system in Vuores is to minimize the carbon footprint of its residents. The objective is to minimize the need for moving from place to place by favouring a mixed and dense community structure, in which jobs, services, and activities are located near the residents. Measures relating to community and traffic planning set an example that facilitates, encourages, and commits residents to a more environmentally sustainable way of life.

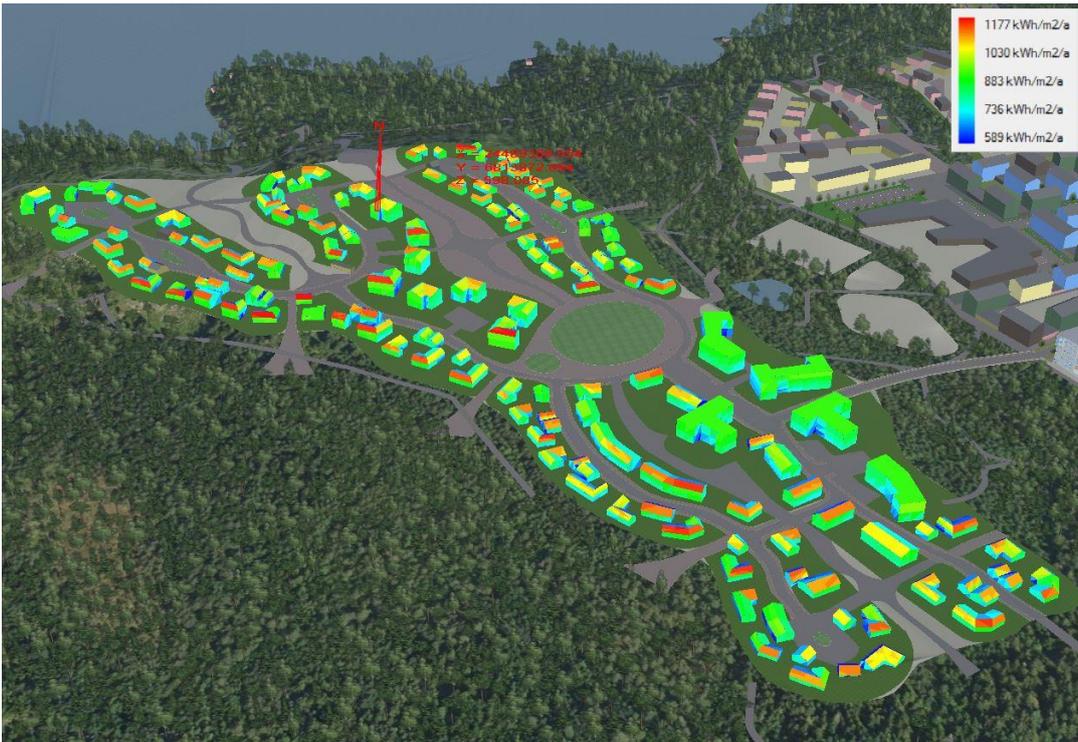


**Figure 10 and 11: Vuoreksen Puistokatu boulevard is the backbone of Vuores land use and public transport**

Planning ensures that Vuores is accessible to all modes of transport, and that walking, cycling, and public transport are more widely used than in other parts of the inner city area. Around 70% of the residents will live within 300 metres from the boulevard, which means that bus stops are a reasonable walking distance away and public transport a competitive alternative for private cars. Vuores makes it feasible to live without a car.

### 3.4 Renewable energy production and district heating

Improving the energy efficiency of buildings will significantly affect the requirements for the energy system. District heating, which is the traditional solution used in new construction in Finland, will only cover the most densely built areas. However, the electricity consumption of the buildings and living will increase due to advances in building technology and household electronics. Therefore, opportunities for building- and area-specific production of renewable energy should be analysed during the city planning process.



**Figure 12: Annual solar energy potential calculation in site planning process**

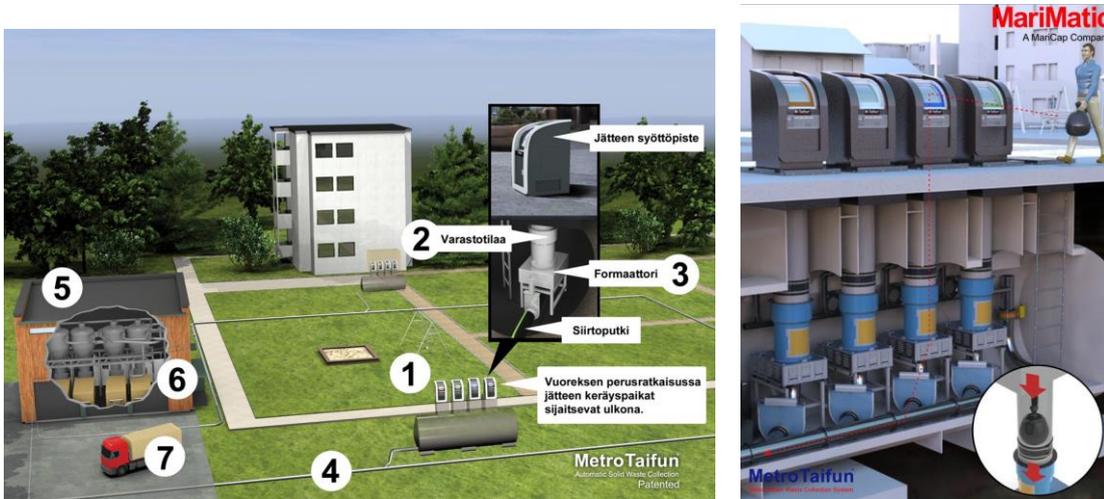
District heating is generated as a side-product in electricity production. The commonest heating solution in apartment blocks and terraced houses in residential areas, district heating is the most eco-efficient form of heating in the efficiently constructed areas in Tampere. The eco-efficiency of district heating in Tampere will improve in future as the availability and practicality of renewable fuels increases. The proportion of renewable energy will exceed 50% by 2025. At the same time, CO<sub>2</sub> emissions will be reduced by around 65% by 2025 from the level in 1990.

In Vuores, district heating will be used wherever possible. Outside of the district heating network, other heating systems will be assessed and considered in planning the areas. One aim is to analyse, facilitate, and enhance the use of renewable energy in the buildings.

### 3.5 Automatic waste collection system

The automatic waste collection system in Vuores is based on a Finnish innovation. The system is used to collect the daily generated waste that is sorted by households and operators into four categories – biowaste, mixed waste, paper, and cardboard. The waste is taken to a collection point, which has a feeding pipe for each waste type. In the feeding pipe, the waste drops into a 300-litre storage tank that is automatically emptied once full. When emptying begins, the waste bags are transferred mechanically to the emptying pipe. Tanks are emptied one waste type at a time along the pipe network to the collection centre by negative pressure.

The waste is dropped into a compressor that compresses and transfers each waste type into their specific container. The containers are then collected and transported to appropriate further processing. Once completed, the Vuores district will generate roughly one container of mixed waste a day. When waste is not collected separately from each plot, emissions are reduced and the safety of residents is significantly improved. The automatic waste collection system uses only one-fifth of the energy used by waste collection trucks.



**Figure 13: MariMatic system layout**

### 3.6 Vuores Central Park, storm water management

The multiphase storm water management system in the Vuores centre and the Vuores Central Park is the most extensive and diverse in Finland. The technical structures of the system have been elegantly integrated with the overall artistic design of the park. Special features of the park include environmental art and natural storm water management. The park connects the built environment and the natural world together, creating innovative and urban greenery in the centre of Vuores.



**Figures 14 and 15: Vuores Central Park is still under construction**

The central features of the Vuores central park plan include artistic shaping of the terrain and varied water elements that include pool structures, natural streams, and flood meadows. The park's scenic

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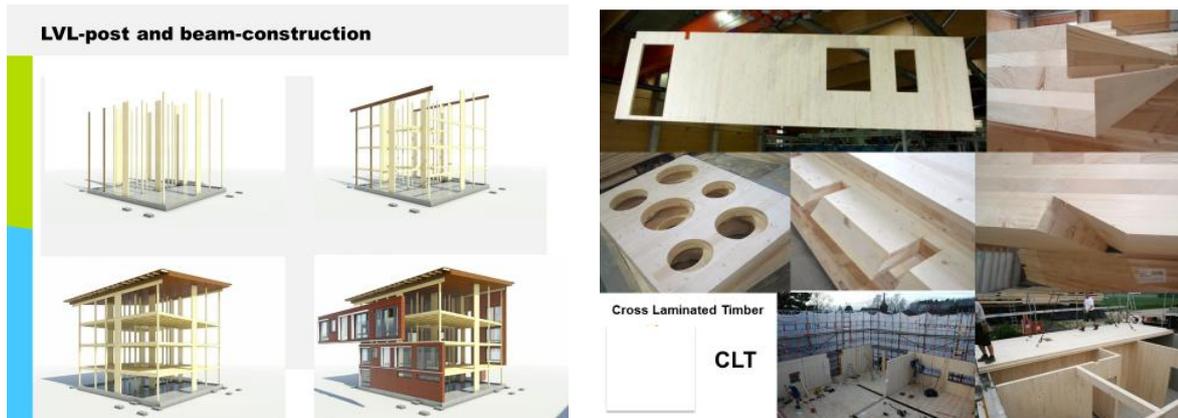
meadow is emphasized by various activity points and aesthetic elements. The large water pool is sure to become an inviting focal point. Art squares along the pedestrian routes bring variation to the environment.

Storm water management system will be built so that the normal flow coming from the higher areas within the district will pass through the central pool and the stream without increasing the surface level. Excess water from heavy rainfall will be retained in the pool and flood meadows. The size of the flood areas and the water depth will vary, but the maximum surface level variation will be 20-30 cm and the flood meadows will be emptied within 24 hours. During dry periods, the flood areas will be scenic meadows.

In addition to the storm water system, storm water will be retained in the plots of the Vuores centre with underground excavations that are filled with coarse rock material. Storm water will flow from building tops to storm water sewers into a lower ground plantation area between the buildings and the park. From here the water will be filtered through several layers of soil before entering the park's water elements.

#### 4. WOOD CONSTRUCTION IS ECO-EFFICIENT

Isokuusi is one of the housing areas within the Vuores neighbourhood. A modern wooden town will be built here, where wooden residential blocks of flats, wooden business and service buildings, and wooden small houses will form a unified architectural entity. Once completed, the area will be one of Finland's largest modern wooden urban environments.



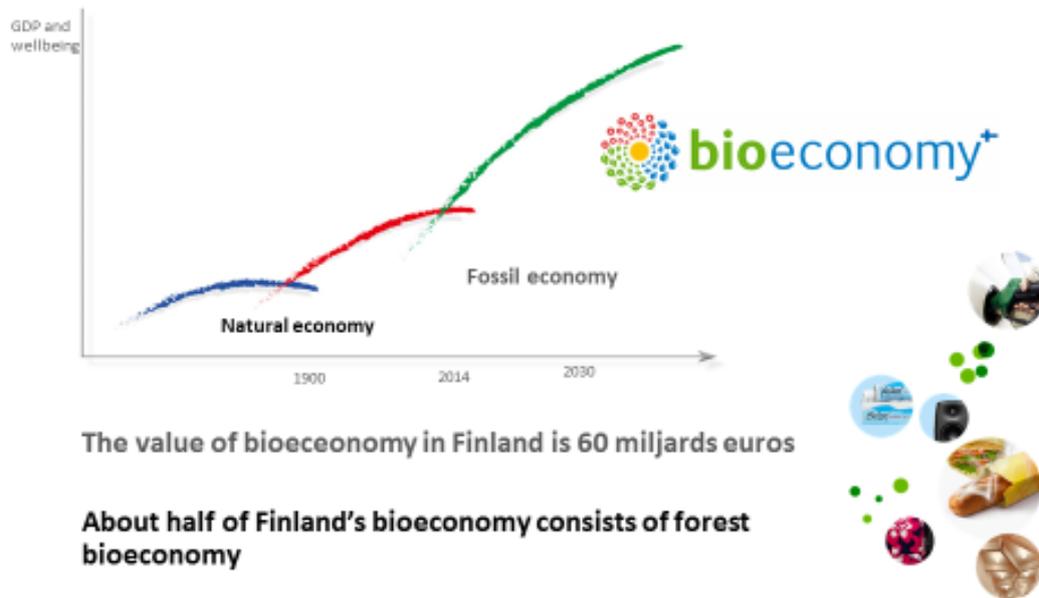
**Figures 16 and 17: Industrial alternatives for the construction of wooden buildings**

Wood is the only building material which use is constantly increasing. By using wood, the consumption of non-renewable materials can be reduced and/or completely avoided. This is particularly significant in construction, where very large quantities of materials are used and replacement of other materials with wood is comparatively easy. (Puuinfo, 2017)

Ecologically, the use of wood in construction could be considerably increased. The supply of wood will not run out if it is used for building. The annual growth of forests in Finland and the rest of

Europe exceeds consumption. In Finland, the rate of carbon bound in forests increases every day by the same amount that the construction wood industry uses in a year. The volume of timber needed to build a six-storey apartment block grows in Finnish forests in 30 seconds. (Puuinfo, 2017)

## Bioeconomy: The next economic wave



### Figures 18: Building in wood is part of Bioeconomy

In buildings with wooden elements, the carbon stored in the wood is stored in structures that are long-term carbon storages. Carbon can remain bound in such structures for hundreds of years.

The manufacture of wooden products generates comparatively few CO<sub>2</sub> emissions. The amount of CO<sub>2</sub> stored in wood is much higher than the emissions caused by the manufacture of wood products. When wood products are converted to energy at the end of their life, the amount of CO<sub>2</sub> they release into the atmosphere is equal to the amount that was stored in the wood during growth. (Puuinfo, 2017)



**Figure 19: CO<sub>2</sub> emissions in EU countries must be reduced**

The use of wood also reduces CO<sub>2</sub> emissions, as wood products replace products whose manufacture causes CO<sub>2</sub> emissions. When replacing other products with wood, the effect of reducing CO<sub>2</sub> emissions is often greater than the mere carbon-storing effect of the wood. This is because of wood's lightness and the fact that it often replaces materials that are considerably heavier and cause more emissions. (Puuinfo, 2017)

## 5. CONCLUSIONS

Land use planning is essential to the successful implementation of an eco-efficient community or city district. Zoning and other land use planning enable the creation of a urban structure with smooth and efficient public transport and energy systems. Environmentally and economically efficient implementation of other urban structure networks also requires well-planned land use. Land use solutions must be based on traffic planning, with priority given to bicycle and pedestrian traffic and public transport. Zoning and surveys conducted as part of the planning process help ensure that residential and commercial buildings make good use of renewable energy.

In the planning of green and recreational areas, it is important to create a comprehensive green network for the area that interlinks the various sections of the district with the surrounding pristine areas. The green network will support and complement the pedestrian connections, which will be

implemented as part of the street network. Park and recreational areas will also be important for maintaining water balance and storm water processing. In park planning, the use of water elements is a natural scenic attraction.

The option of choosing a sustainable lifestyle is a central element in creating an eco-efficient urban quarter. The aim is to make it easier for residents to make choices that are better for the environment. Merely providing information on ecological choices is not enough to change people's behaviour. Consumption patterns are determined by habits, routines, and social norms and behaviour that are considered common-sense and acceptable. The availability of sustainable options and their ease of use also influence our choices. If e.g. public transport seems a lot more troublesome than using a private car, informing residents of the benefits of public transport is futile. The best way to encourage people to make more sustainable choices is to modify their environment; this is more effective than trying to directly change individual attitudes.

Wood is the only building material that is constantly increasing in volume. By using wood, the consumption of non-renewable materials can be reduced and/or completely avoided. In buildings with wooden elements, the carbon stored in the wood is stored in structures that are long-term carbon storages. Well-built and well-planned wooden buildings are beautiful and pleasant. The ecological properties of wood together with it being a renewable natural resource must be considered as a strength. On a longer time-span and as the non-renewable natural resources become scarcer, wood will have a genuine competitive advantage over other materials, and will increase proportionally in price.

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## **BIOGRAPHICAL NOTES**

Pertti Tamminen was born in 1950 and graduated from the Department of Surveying at the Helsinki University of Technology in 1975. He started working for the Tampere Branch Office of Plancenter Ltd. as a Planner and Project Manager in town and land use planning in 1976. In 1985, Mr. Tamminen was appointed the Head of the Branch Office. In addition to managing the unit he has worked in a wide range of community planning projects in the municipal and private sectors.

Pertti Tamminen has since 2002 been the project director of the Vuores project within the City of Tampere's Economic and Urban Development unit. Vuores is a new city district in Tampere. Planning began in 2000 and construction will continue until the early 2020s. Upon completion the district will have 6,000 dwellings and over 14,000 residents. The starting points for the planning and implementation of the Vuores district include ecology and closeness of the natural world, which

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are creatively combined with high technology, modern architecture, and a small-town cityscape and urban structure.

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