# Reduction of Plastics Use in Housing Development: Case Metsäkissa

Final Report 23 April 2021

VERONA GROWTH PREMICO Lujatalo Oy Kuntarahoitus ara Ympäristöministeriö Miljöministeriet Ministry of the Environment

# The project aims to offer answers to these questions

PREMICO

How should the client indicate its objective of reducing the use of plastics in its call for tenders while ensuring that its requirements are also fulfilled at the planning and execution stage of the building project?

Lujatalo Oy

What aspects should the project's main contractor take into account in keeping the project as low-plastic as possible?

What kinds of obstacles/bottlenecks might the contractor encounter that prevent it from meeting the targets?

Kuntarahoitus ara

What kind of matters should financiers pay attention to when deciding on granting funding to a project?

Ympäristöministeriö
Miljöministeriet
Ministry of the Environment

What is the current state of sorting of plastics and how can it be improved?

Based on the case study, what kind of matters and aspects should be brought forward in the whole property and construction sector?

LOOP

# Case Metsäkissa: Final Report

**The full-length final report is available in Word format:**

# Problem: The construction industry is one of the biggest users of plastics

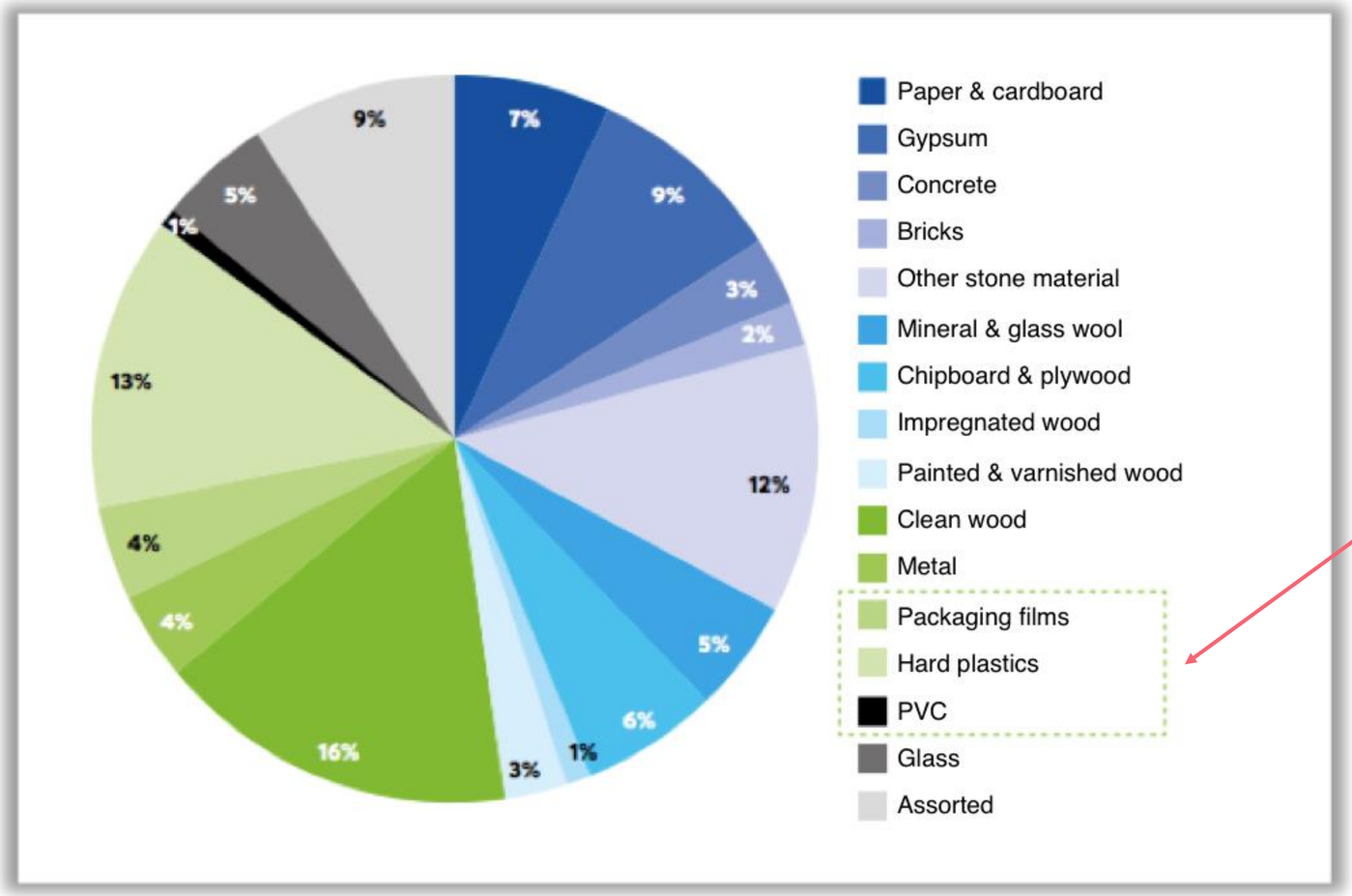
Share of all plastics in use

**Construction industry 20%**

**Packaging industry 40%**

**Other applications: 40%**

Construction waste segments




- On average, plastics make up approximately 18% of all construction waste.
- PE-LD materials, i.e. mostly packaging plastics, form the largest segment.

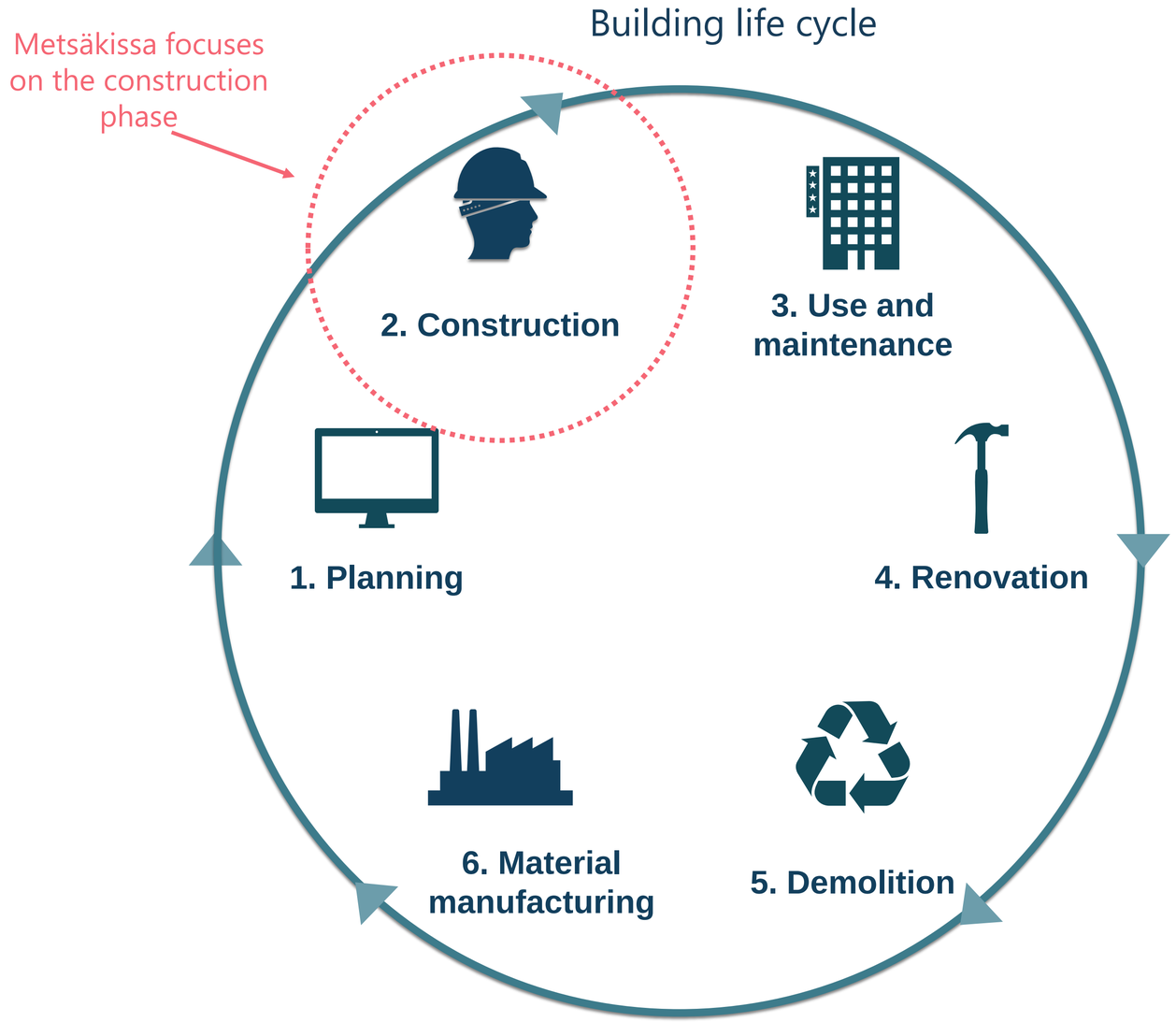
Source: Liikanen, M., Helppi, O., Havukainen, J., & Horttanainen, M. (2018). Rakennusjätteen koostumustutkimus–Etelä-Karjala.

# The Asunto Oy Metsäkissa pilot focuses on the reduction of plastics use at construction sites.

**The project's goal has been to collect data and increase understanding of the current situation and the construction site's impact on the reduction of plastics waste.**

**Concrete measures taken at the Metsäkissa construction site**

1. **Target sorting rate: 70%**
2. **Instruction, training and supervision of construction site workers**
3. **Separate collection and collection instruments**
4. **Extensive material flow chart**
5. **Monitoring and documentation of the amount and types of plastic used and collected at the site**
6. **Phase-specific planning including recycling**



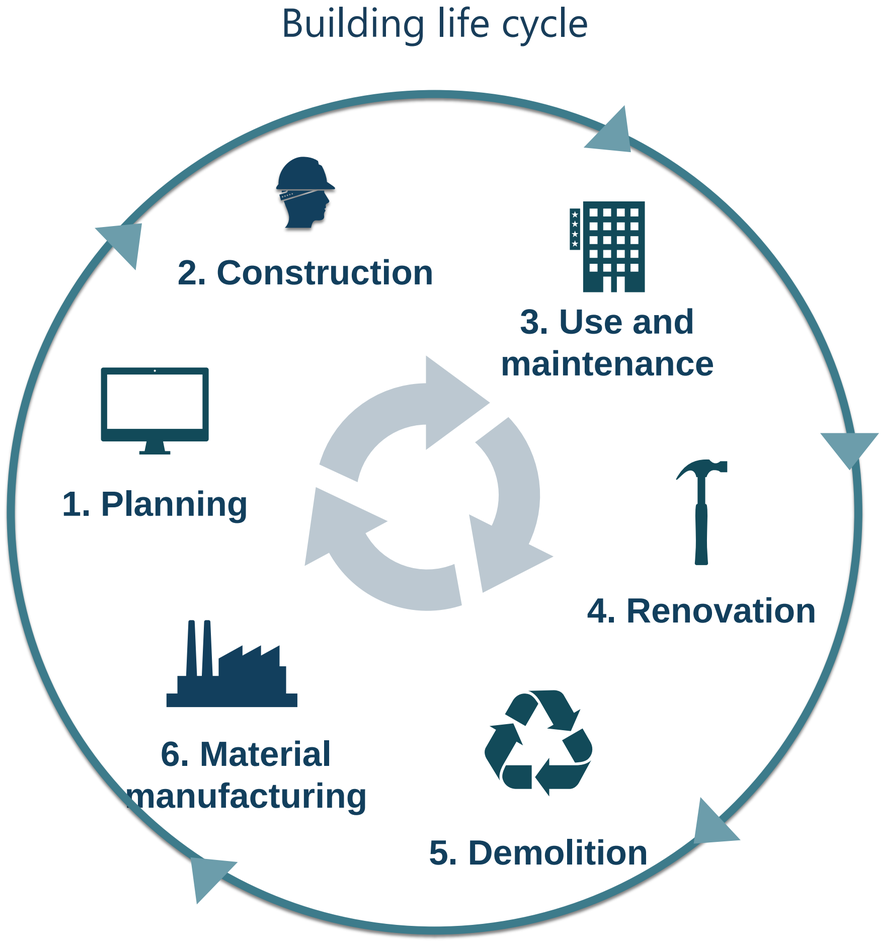
# Tools to impact the use and reduction of plastics within the project's ecosystem

**At the construction stage, measures concern mainly recycling. Other building project phases influence the use of plastics more.**

**Measures to promote the low plastic principle throughout the building's life cycle include:**
- **laws, norms**
- **product standards**
- **financing criteria**
- **incentives**
- **material markings and traceability**

**Research and development**
- **data**
- **indicators**
- **innovative cooperation**
- **substitute products**

**Tools to impact the use and reduction of plastics in the context of the building project:**
- **project plan**
- **planning guidance**
- **project master plan**
- **subcontractor instructions**
- **selecting the right suppliers**
- **waste management planning**



# Definition of ‘low plastic’

A more specific definition is needed for ‘low plastic’. All the parties involved must understand the meaning of the concept and agree on the measures to be taken.

*Low plastic objectives*

1. *Avoid unnecessary use of plastics*
2. *Use plastics as a building material only when the its properties are exceed  the properties of other materials and/or it is the best option in terms of total emissions.*
3. *Strive to replace plastic products with plastic products with a lower environmental load or other better alternatives.*
4. *Maximise plastics recycling.*

- Approaching optimisation from the perspective of the carbon footprint. Abandoning all plastics altogether is not necessarily the best option.

The issue should not be discussed on the basis of material types. Instead, we should focus on the environmental load of materials in use and substitute materials.

Around 5% of construction plastics end up in circulation. This rate will increase significantly and the life cycle of plastic products will become longer in the future.

It is good to strive for minimal use of virgin materials, however, plastics play a key role in the construction industry. Careful and good use of materials could be set as a low plastic goal.

Reduce, refuse, recycle and replace.

# Concrete measures taken to increase the recycling rate of plastics at the pilot construction site

1

## TARGET SORTING RATE: 70%

Now, at the end of the construction phase, the sorting rate is over 75%.

2

## INSTRUCTION, TRAINING AND SUPERVISION OF CONSTRUCTION SITE WORKERS

Mostly good results; cultural barriers have caused some issues regarding recycling.

3

## EXTENSIVE MATERIAL FLOW CHART

Active observance. A wide variety of materials has been collected. The current collection method of expanded polystyrene is not ideal.

4

## SEPARATE COLLECTION AND COLLECTION INSTRUMENTS

The current method is not ideal for the separate collection of clear and coloured packaging plastics.

5

## MONITORING AND DOCUMENTATION OF THE AMOUNT AND TYPES OF PLASTIC USED AND COLLECTED AT THE SITE

The monitoring of the amount of plastics waste has been quite successful, but the documentation of plastic types has been lacking due to insufficient supplier data.

6

## PHASE-SPECIFIC PLANNING INCLUDING RECYCLING

Mostly good results in terms of recycling but there is still room for improvement.

# Summary of results achieved through the measures piloted

## KEY FIGURES OF RECYCLING

### SORTING RATE

The original target sorting rate of 70% has been exceeded. It is currently around **75%.**

On average, the sorting rate at construction sites varies between 50% and 60%.

### RECYCLING RATE

The current realised recycling rate is **49%.** On average, the recycling rate at construction sites is around 35%.

Wood waste is the main factor behind the difference between the sorting rate and the recycling rate. It is recovered as energy.

## SEPARATE COLLECTION OF PLASTICS

### SEPARATELY COLLECTED PLASTIC TYPES

**Packaging plastics** have been collected using a waste press and **polystyrene** in flexible intermediate bulk containers.

However, packaging plastics have also ended up in combustible waste. Polystyrene collection has involved some issues.

### AMOUNT OF SEPARATELY COLLECTED PLASTICS

The total amount of plastics collected at the site:

- Packaging plastics: 2,470 kg

## AMOUNT OF WASTE

### TOTAL AMOUNT OF WASTE

The construction site's target waste amount was 6.5 kg/rm3 (built area). The current figure falls a little below **8 kg/rm3**.

### AMOUNT OF CONSTRUCTION WASTE

The amount of construction waste made up **24%** of all the waste generated at the construction site (control site: 38%). This result was achieved with the measures taken and comprehensive separate collection.

## COSTS

### TOTAL COSTS

The construction site's realised waste management costs have not been significantly high or low in comparison to an average project.

### MAIN CHANGES

The costs from **construction waste** were reduced significantly in comparison to the control site.

The **shipping and skip hire costs increased significantly** in comparison to the control site as a result of extensive separate collection.

# Property and construction sector needs highlighted by the study

## 1 DATA COLLECTION

More data is needed at all levels in order to understand the use of plastics and material streams.

## 2 CONCRETE INDICATORS

Almost all of the value chain operators expressed the need for standard criteria or indicators.

## 3 INCLUSION IN ‘LOW-CARBON’

Several interviewees stated that plastics should be included in the concept of ‘low-carbon’.

## 4 RULES AND REGULATIONS

Several value chain operators expressed the demand for more specific and focused rules and regulations to promote the reduced use of plastics.

## 5 CIRCULAR ECONOMY MODELS

Greater efforts are needed to find buyers and new applications for recovered and recycled raw materials as well as make operators favour recycled plastics.

## 6 NEW INCENTIVES

The interviewees mentioned the establishment of incentives to compensate for additional costs and work incurred by operators as a result of a circular economy. Incentives would impact operators’ attitude towards recycling.

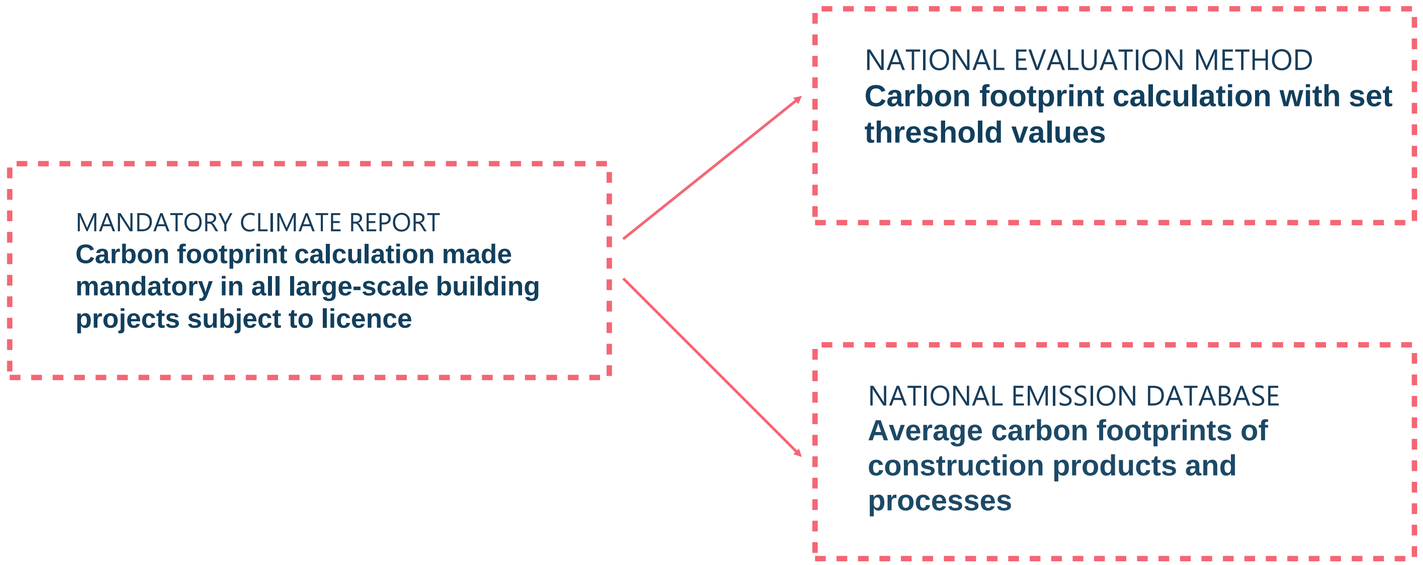
## 7 TAKING PLASTICS INTO ACCOUNT IN PLANNING

The environmental impacts of plastics and any substitute materials should be assessed at the construction planning phase.

## 8 COOPERATION WITH MATERIAL SUPPLIERS AND MANUFACTURERS

Developers and contractors should influence their suppliers’ packaging material choices more.

# The Land Use and Building Act reform might introduce concrete tools to promote solutions to these needs.




**These tools promote the development of solutions to the needs raised by the interviewees**

- **Data collection and development of concrete indicators – The emission database contains product-specific average data which can be utilised by different operators in the industry.**
- **Low-plastic included in low-carbon – The reduced use of plastics is seen as part of the low carbon principle. Decisions are made with the aggregated impacts in mind instead of partial optimisation.**
- **Establishment of incentives – Setting objectives on the basis of data.**

# Documents and agreements influencing the use of plastics

## PROJECT'S EARLY STAGES

### TENDER DOCUMENTS

Criteria on the recycling of plastics and carbon footprint optimisation

### PLANNING GUIDELINES

Future criteria concerning the use of plastics and recommended use of materials bearing a smaller environmental load

### PROJECT PLAN

More specific plans for the reduction of plastics use and establishment of a circular economy

## RULES, REGULATIONS AND INFORMATION

### LAND USE AND BUILDING ACT

E.g. the climate emission report and the material content declaration are potential tools for the development of other indicators.

### GREEN DEAL

An upcoming voluntary agreement system that includes a module on the procurement of plastics. This module discusses plastics' replaceability.

### MINISTRY GUIDELINES

More specific guidelines and tools to promote the recycling of plastics

## MATERIALS INDUSTRY

### PLASTIC STANDARDS

The standards on the use of plastics in construction prevent the use of recycled materials in several applications. The plastics industry has influence over these standards.

### CERTIFICATION OF RECYCLED PLASTICS

The use of recycled plastics for many applications is hindered by the poor traceability of raw materials.

## CONSTRUCTION SITE

### SUPPLIER CONTRACTS

Suppliers should be required to provide data on the life-cycle carbon footprint of their products and use packaging materials with a smaller environmental load.

### WASTE REPORTS

Waste reporting standards for contractors to make comparing projects easier

LO OP

# What next?
# Concrete ideas to promote the reduced use of plastics


## TOOL FOR PLANNERS

A tool to help planners make decisions from the viewpoint of plastics use (under development at Premico). Ideally, the tool would include a low-carbon calculation feature that would determine the impact of each decision.

## TRAINING FOR PLANNERS

Planners are provided training on the reduction of plastics use and their impact on the cause.

## UNDERSTANDING PLASTIC STREAMS

Analysis of plastic streams at several sites to gain a better understanding of the current situation. Cooperation between a plastics industry operator, contractor and recycler.

## DETERMINATION OF THE USE OF SINGLE-USE PLASTICS IN THE CONSTRUCTION INDUSTRY

A pilot project should be organised to determine how much and where single-use plastics are used in the construction industry.

## BENCHMARK FOR CARBON EMISSIONS

A carbon emission level should be determined reflecting the current building project/example project. Future building projects would be compared to this level. The target values are updated as more data is obtained and projects are developed.

## SUPPLIER–CONTRACTOR (& DESIGNER) PILOT

A pilot project in which a contractor and their supplier review the packaging materials in use and test new practices in order to

1) reduce the amount of packaging materials
2) improve the recyclability of materials
3) identify types of packaging for which recycled materials would be suitable

# What next?
# Concrete ideas to promote the reduced use of plastics


ENTERPRISE NETWORKS BUILDING RECYCLING CHAINS

Enterprise networks are necessary for the development of circular economy models. Different waste components should have their own recycling chains.

OPTIMISATION OF LOGISTICS

Cooperation with waste management operators to find ways to reduce the shipping and recovery costs. Recycling shouldn't be more costly than energy recovery or production of virgin material.

INFORMATION PACKAGE FOR BUILDERS

An information package on the use of plastics and recycling given at construction supervision briefings.

MARKET FOR RECYCLED PLASTICS

Establishment of a traceable recycled plastics market by developing the traceability and certification of plastics.

INNOVATION AND PILOTING OF INCENTIVES

Monetary incentives' impact on the use of plastics. Potential recipients:

- Financier & contractor
- Contractor & construction site
- Client & planner

EXTRA POINTS FOR TENDERERS

Extra points for contractors that use recycled materials and/or have planned a recycling path.

CLOSED LOOP AND NEW APPLICATIONS FOR RECYCLED PLASTICS

Cooperation with operators who develop new applications for recycled plastics and/or new low-plastic products for the construction industry.

SUBSTITUTE MATERIALS

Investment in the development of substitutes for difficult-to-recycle materials (polyurethane, PVC) and raising awareness of such materials.

TRAINING FOR PLANNERS

Planners are provided training on substitute products that have the same properties as virgin plastic products.

# Overview of pilot results and interviewed parties' ideas for the promotion of the reduced use of plastics

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# Client

How should the client indicate its objective of reducing the use of plastics in its call for tenders while ensuring that its requirements are also fulfilled at the planning and execution stage of the building project?

Suggested improvements:

- In the future, all construction sites must reach the sorting rate of 70%.
- Contractors must use a material flow chart that is as comprehensive as possible.
- Inclusion of measures/goals for reducing the carbon footprint in tender documentation
- Recommendation and/or required use of substitute products with a lighter environmental load
- Addition of measures, indicators and instructions related to the carbon footprint and the sorting rate to the planning guidelines.

# Main contractor

- What aspects should the project’s main contractor take into account in keeping the project as low-plastic as possible?
- What kinds of obstacles/bottlenecks might the contractor encounter that prevent it from meeting the targets?

Suggested improvements:

- Requiring subcontractors to also recycle and collect waste according to the extensive flow chart
- At the planning phase, efforts should be made to reduce the amount of waste generated at the construction site.
- In future, the reduced use and recycling of plastics should be considered at the procurement phase.
- Closer cooperation with suppliers, material suppliers and the manufacturing industry in order to discover alternative packaging materials
- Requiring suppliers to use packaging materials that are easier to recycle (e.g. logos and labels decrease recyclability)
- Understanding and review of cost-related challenges arising from separate collection and their communication to stakeholders in order to find solutions
- More thorough review of recycling logistics and collection with the waste management operator. Requiring maximum utilisation of the sorting rate.
- Development of collection instruments and processes that correspond with the construction site’s processes together with the waste management operator

# Main contractor

The main contractor’s steps towards successful waste sorting

1. **Inclusion of equipment and resources in the waste management plan**
   - double-chamber press (also separate bags)
   - recycling cages for plastics (all floors)
   - all skips should be placed in the same location, if possible
2. **Efficient, phase-specific sorting of waste**
   - Packaging plastics (interior finish)
   - Cardboard (interior finish)
   - Steel and metal sheets (from the start)
   - Concrete (from the start)
   - Plasterboards (partition work)
   - Wood waste (from the start)
   - Pallet (from the start)
   - Expandable polystyrene (from the start)
3. **Training for cleaners**
   - Adequate human resources (cleaners and site supervisor in charge of recycling)
   - Waste management briefing organised by the waste management operator; the cleaners and the site supervisor must participate
4. **All the construction site workers are briefed about the sorting goals and measures**
   - Contractor meetings
   - Information display in the social facilities
   - Skips bearing waste type labels
   - Plastic collection containers bearing sorting instructions
5. **Monitoring and intervention**
   - The site supervisor in charge of recycling plays a key role.

# Financier

What kind of matters should the financier pay attention to when deciding on granting funding to a project?

Suggested improvements:

- Establishment of shared indicators for plastics based on the carbon footprint and the data from the emission database introduced by the Land Use and Building Act reform or benchmark sites
- Preparation of more specific planning guidelines and inclusion of carbon footprint indicators in energy certification
- Introduction of mandatory climate reporting and recommendation of substitute products with a smaller environmental load based on data obtained from previous projects
- In addition to energy efficiency requirements, the financing criteria should include requirements related to the carbon footprint.
- Planning permission process: inclusion of energy certification monitoring in the certification
- Determination and review of the cost level of resources allocated to recycling in order to ensure the target sorting rate
- Acknowledgement and rating of environmental life-cycle costs in cost accounting
- Inclusion of the recycling rate in the green financing criteria

# Summary: Matters concerning the whole property and construction sector

## DATA AND INDICATORS

- Standard indicators and practices for financiers, clients, contractors and suppliers
- Inclusion of plastics in carbon footprint calculation
- The mandatory climate report and emission database introduced by the Land Use and Building Act reform could lay the foundations for new indicators and threshold values.
- Better understanding of plastic streams
- A plastics identification and tracking system

## POLICY INSTRUMENTS

- More specific criteria, guidelines and recommendations for the use of plastics should be included in project plans and planning guidelines.
- Authorities and legislators should establish economic incentives to encourage operators to recycle and use recycled materials.
- Plastics industry: plastics standards should enable the use of recovered secondary raw materials in long-term applications.

## CONSTRUCTION SITES

- The sorting rate of 75% can be reached by employing phase-specific plans, guidelines and separate collection.
- In order to discover and introduce substitutes to packaging plastics, more cooperation with other value chain operators is needed.
- Demand for economic incentives to encourage recycling; careful sorting and recycling increase a construction site’s costs significantly
- Collection instruments and processes should be developed together with waste management operators to ensure they respond to the construction site’s needs.

# Summary


- **In this project, the reduced use of plastics was examined in the construction site conditions of Premico and Lujatalo's building project Metsäkissa. In addition, several construction industry players were interviewed about the current state of plastics use in the industry. The goal was to answer the following questions:**
  - *How can financiers, clients and developers impact the use of plastics?*
  - *What is the current state of sorting of plastics and how can it be improved?*
  - *Based on the case study, what kind of matters and aspects should be brought forward in the whole property and construction sector?*

- **The construction sites tools to promote the reduced use of plastics: target sorting rate 70%, better training, extensive material flow chart, equipment for separate collection, documentation of amounts and types of plastic generated, and phase-specific planning including recycling.**

- **Both the sorting rate and recycling rate have increased significantly thanks to these measures. The amount of construction waste generated has been lower than at the control construction site. Enthusiastic recycling has increased the shipping and skip hire costs but decreased waste-related costs. The total costs of the construction site have not been not significantly high or low.**

- **The interviewed construction industry players expressed clear needs related to the use of plastics and circular economy. Collection of data is essential to the development of concrete indicators. Plastics should be included in the concept of low carbon. Different operators must cooperate more closely in order to implement circular economy models successfully. Rules and regulations as well as incentives were expected to accelerate the move towards a circular economy. The use and reduction of plastics should be considered at the planning phase. The interviewees wished for more cooperation with material manufacturers and suppliers. The Land Use and Building Act reform might introduce concrete tools to find solutions to these needs.**

- Improvements suggested by the parties involved in the building project:
  - Client: **Requiring contractors to meet target sorting rates and use an extensive material flow chart, inclusion of measures/goals for reducing the carbon footprint in tender documents, recommendation and/or required use of substitute products, and addition of measures, indicators and instructions related to the carbon footprint and the recycling rate to the planning guidelines**
  - Main contractor: **Taking the issue into account at the planning and procurement stage, requiring subcontractors to recycle and recover plastics, development of alternative and more recyclable packaging materials together with other operators, and cooperation with waste management operators in order to maximise recycling and minimise costs**
  - **Financier**: **Preparation of more specific planning guidelines and inclusion of carbon footprint indicators in energy certification, inclusion of the carbon footprint in financing criteria, inclusion of energy certification monitoring in the certification (planning permission process), introduction of mandatory climate reporting and recommendation of substitute products with a smaller environmental load based on data obtained from previous projects, establishment of shared indicators for plastics in relation to the carbon footprint, and acknowledgement and rating of environmental life-cycle costs in cost accounting.**

# Next steps

PROJECT OVERVIEW

## Plastic Reduction Plan 2.0, Keelkorvenkuja 7, Espoo

**The project utilizes the experiences gained from Plastic Road Map 1.0. The 2.0 project focuses heavily on project planning guidance and material sourcing.**

Plastic Reduction Plan 2.0, Keelkorvenkuja 7, Espoo project is continuing and expanding research into plastic reduction, based on the information gained from the previous Plastic Reduction Plan 1.0, Metsäkissa, Vantaa.

In Metsäkissa, the project thoroughly investigated the sorting, recycling and reduction of plastic from the construction site point of view.

Since the construction site doesn't have a significant role in the selection of building materials and material sourcing, project 2.0 will be focusing heavily on the possibilities of project planning and material sourcing guidance. The aim is to gain a concrete understanding of the current practices, and based on the knowledge gained, create instructions for project planning and material sourcing regarding the use and recycling of plastics. The aim is not to remove all plastic from construction. At present, that would not even be possible, since there is no substitute for all products. However, the use of plastic can be rationalized and reduced, and recycled plastics can be favoured.

*Plastic Reduction Plan 2.0, Keelkorvenkuja 7, Espoo*
a project, in which two residential buildings will be built next to Olari and the central park in Espoo, both located on the same plot. There are a total of 4301.5 asqm and 78 dwellings. The construction project is intended to be carried out with an ARA interest subsidy loan.

# Thank you!

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