

CIRCULAR KONGSVINGER REGION

PHASE 3 & 4



KONGSVINGERREGIONEN
Norges grønne hjerte



Project Team

Circle Economy

Annerieke Douma (Lead Cities team), Jordi Pascual (Project Manager), Noah Baars (City Analyst), Yasmina Lembachar (Lead of Digital Communications), Nicolas Raspail (Design lead), Alexandru Grigoras (Visual designer) and Gayle Tjong-Kim-Sang (Visual designer)

Circular Norway

Sofie Pindsle (Project Manager), Leif I. Nordhus (CEO), Ellen Anette Høvik (Communication Manager) and Alexander F. Christiansen (Project Manager)

Kongsvinger Region

Eva Snare (Business Development Manager), Anne Huse (Regional Council of the Kongsvinger region), and Knut Hvithammer (Mayor Sør-Odal municipality. Head of Regional Council of the Kongsvinger region)

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EXECUTIVE SUMMARY

The Circular Economy as a means to an end

This report shows that stakeholders of the built environment in the Kongsvinger region can reap the benefits of the circular economy and make use of it to reduce pressure on the environment, create new jobs, and uncover circular business models that create economic value.

The Circle Region (or City) scan - a collaborative innovation process

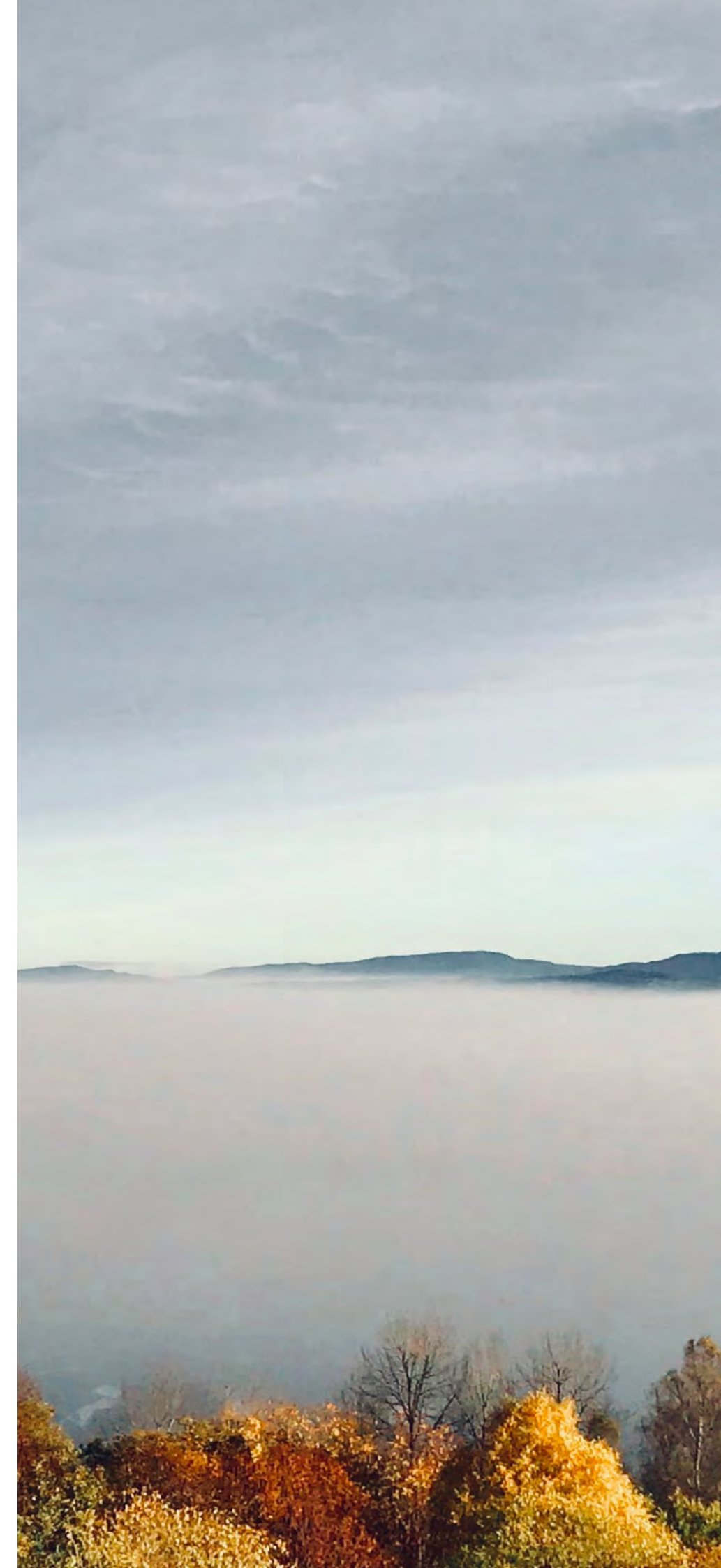
The Circle Region scan of Kongsvinger is designed to be a multistakeholder journey. The scan process consists of four phases: 1) Socio-economic analysis; 2) Material flows analysis and building stock analysis; 3) Circular Strategies; 4) Action plans. The results of phase 3 and 4 lay before you, focusing on the circular strategies, and action plans for pilot projects that can boost the transition towards a circular built environment value chain.

The Built Environment Value Chain

It is important to look at the built environment value chain as a cluster of different sectors interacting between each other. Observed as a value chain, the built environment is one of the biggest contributors in the creation of jobs, gross value added and production of GHG emissions. Therefore, focusing on the built environment value chain in the transition towards a circular region has the potential to generate a great effect in the region's environmental, economic and employment impact.

Three strategies have been developed into action plans for pilot projects:

- 1 Strategy 1: Increase use of secondary materials**
Pilot project: Regional construction network and digital marketplace (Market perspective)
Furniture is a product that has a high turnover in the six municipalities in the Kongsvinger region. By developing a network and digital marketplace, sharing and refurbishment of furniture can be facilitated. This will save the region costs, emissions and create jobs. This marketplace can however go beyond furniture and also be used for construction materials.
- 2 Strategy 2: Shortening the supply chain**
Pilot project: Demolition waste as a resource (Material perspective)
The municipality of Sør-Odal has identified a building about to be demolished that has the potential to provide construction materials for new building projects. This pilot focuses on capturing the value of materials that are stocked in buildings and giving them a second life through reuse, refurbishment and recycling.
- 3 Strategy 3: Circular education**
Pilot project: Circular procurement training (Educational perspective)
Industrial and technological innovations by themselves cannot drive the systemic changes needed to achieve the transformation of the current linear system. The role of education through skills and knowledge development is key. This pilot project focuses on developing the right skills and knowledge in a circular tender team of the municipality. The stakeholders involved in this pilot project will select and shadow the process of six linear tenders (one for each municipality), with the intention to work in parallel to define the process in a circular manner. The identified tenders will range a diversity of topics, such as furniture or building materials.



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INTRODUCTION

The built environment value chain puts a significant pressure on our resources. Approximately 40% of global materials are used for construction. In the EU the current construction and demolition waste (CDW) accounts for approximately 25-30% of the total waste generated and consists of numerous materials, such as concrete, bricks, ceramics, wood, glass, metals, plastics, or excavated soil, many of which can be recycled.¹ Moreover, the built environment value chain has a key role in the global efforts to limit global temperature rise as set out in the Paris agreement and will have to drastically reduce its CO₂ emissions in the coming years.^{2,3}

Transforming the built environment from a linear to a circular value chain creates huge opportunities to lower its impact and create a sustainable and resilient sector.⁴ We need to accelerate this transition, and the Kongsvinger region is leading the way.

A collaborative journey

The Circle Region (or City) Scan is designed to reveal where opportunities lie for the circular economy in the built environment of the Kongsvinger region and will help develop practical and scalable pilot projects at the region level. The process of executing the scan and its success depend highly on a collaborative and multi-stakeholder approach. We have guided local stakeholders from the municipalities and the business community through a common narrative and facilitate connections and collaboration where possible as we were moving toward solutions and projects. The role of the Kongsvinger region local stakeholders has been essential to ensure the impact and systemic transformation the Scan aims to have.

Four project phases

The Circle Region Scan encompasses four sequential phases which form a guided process to develop and select the best circular economy strategies and pilot projects for the Kongsvinger region built environment value chain.

This document presents the methodology, results and conclusions of Phases 3 and 4 of the Circle Region Scan of the Kongsvinger region. Phase 3 started in March 2020 and finished in June 2020, and Phase 4 started in June 2020 and finished in November 2020.

The information contained in the present report is intended to outline the action plans that can support local stakeholders to implement the circular pilot projects defined through phases 3 and 4 and support the region built environment value chain in its transition towards a circular economy.



Phase 1

Understanding the built environment value chain in the region, which maps the relevant stakeholders, current construction practices, relevant policies and existing circular initiatives in the value chain.

Phase 2

A Material Stocks and Flows Analysis, which provides insight into material stocks and flows in the built environment value chain. This enables us to identify major key challenges in the current system and to pinpoint circular opportunities that can address them.

Phase 3

Circular strategies definition, which develops the circular opportunities identified in phase 2 into an integrated approach for a circular built environment in the region with concrete circular strategies.

Phase 4

Pilot projects action plan, which translates the selected circular strategies into tangible pilot projects together with local changemakers, including the definition of necessary next steps to execute the pilot projects in the short, medium and long term. This framework for action aims to secure successful circular implementation on the ground.

OVERVIEW OF PHASES 3 & 4 IN KONGSVINGER



Phase 3 Circular strategies

Selection of circular strategies | phase 3

To select and develop circular strategies that are the most relevant to the region, we used the circular opportunities identified in phase 2 in order to refine them into circular strategies together with local actors in the region. We interviewed local stakeholders and hosted two events, on the 5th and 7th of May 2020, where we invited local businesses with the objective of gathering insights on the strategies and discern where the private sector could best support. Through the insights gathered by the interviews, the discussions with local businesses, and a literature review of international best practices, a set of circular strategies was defined as having the most potential to bring impact and systemic transformation to the Kongsvinger region built environmental value chain. The description of the strategies and the different directions that were explored are included in this report.

On the 18th of June 2020, the circular strategies were presented in the third workshop to local and national stakeholders representing the local business community and the six municipalities which are part of this project. During the workshop, participants brainstormed on pilot project ideas for each strategy that could be implemented on a regional level. A final vote was held to decide which single pilot project for each circular strategy held the greatest transformative potential for the Kongsvinger region, and should be taken into Phase 4 to further develop action plans.



Phase 4 Pilot project action plan

Creating pilot action plans | phase 4

Phase 4 of the Scan began following the workshop on 18th of June, and focused on developing the identified pilot project ideas into actionable pilot projects. In order to develop action plans for each of the pilot projects, the team held interviews with relevant stakeholders. The objectives of the interviews were to identify a local stakeholder to lead, co-create and further develop each pilot project for the specific context of the Kongsvinger region. A final workshop was held on the 10th of November 2020, where the pilot projects and their action plans were presented to local and national stakeholders. The objective was to receive final feedback and officially start the development and implementation of the pilot projects by the local stakeholders.

The detail of the pilot project action plans is included in this report as follows:

1. An **overview** of the pilot project

- A **vision** that lays out the ideal circular state that we are aiming to achieve, and the ways in which the project can contribute to the development of the circular economy in the Kongsvinger region.
- A description of the **project scope** and how it contributes to the vision, reflecting the input given by the local stakeholders in the last workshop.
- A short description of the **business case** proposing how the project could be set up among the stakeholders of the private and public sector and how revenue could be created.
- A handful of **Key Performance Indicators** (KPIs) are proposed so that the impact of the project in relation to the region's circular economy vision can be evaluated.
- **Best practice examples** of relevant projects in other cities are included to provide both inspiration and blueprints for previously successful projects in each domain.
- **Scale up** process. An overview of potential next steps to increase the impact of the described pilot project.

2. The **business model is visualised** in a single, easy-to-read diagram mapping out all relevant stakeholders in the value chain. For every stakeholder, the activities, benefits and revenues, and investments and costs are presented, such that each stakeholder can clearly understand their role within the overall system. Specific organisations are named as possible partners in Kongsvinger.

3. A proposed **action plan** sketches out the steps needed to get the project started and how it could scale over time. The action plan also acts as a simple roadmap linking the small-scale beginnings of a pilot project that can contribute to the larger Kongsvinger circular vision.

A scenic landscape photograph showing a calm lake in the middle ground, with distant mountains on the horizon. The foreground is filled with trees in autumn colors, including yellows, oranges, and greens. The sky is overcast with soft, grey clouds.

3&4

Strategy 1: Increase use
of secondary materials

In an ideal circular city, all materials in the built environment are maintained at their highest value for as long as possible, and products are designed to maximise energy efficiency and recovery of materials after their lifecycle.

Currently, approximately 80% of the total material consumed for construction activities in the region consist of minerals and chemicals and another 2.75% of metals.⁵ Although these percentages are lower than in other European cities where minerals and chemicals represent around 96%,⁶ it is still a significant part of the total.

There is little data on the percentage of re-use within the built environment. Tek-17, is a piece of legislation aimed to clarify and simplify the building requirements and rules.⁷ However it has also been described as hampering the uptake of re-use as it seems that the requirements for materials reusability make the reuse practice difficult.⁸ However, the region has plenty of materials locked in the building stock which could be used in future constructions in the region. Local organisations can support in capturing the resources locked in the stock to lower the pressure on raw materials extraction.

There is a great opportunity to facilitate the increased use of secondary materials for new constructions in the region. The different municipalities can play a key role in driving change but the private sector also plays a key role in bridging the gap. By increasing the use of secondary materials, there is an opportunity to reduce the consumption of raw and non-renewable materials, reduce the value chain's materials footprint, as well as stimulate local innovation to enable the matchmaking of resources.

IDENTIFIED DIRECTIONS

Circular procurement & tendering

Scaling up the use of secondary materials can be achieved by integrating circular criteria in standard terms of reference. Circular criteria should become the core of procurement (both public and private sector). It should not be limited to 'green' procurement but should set the standard for all types of procurement.¹

The Kongsvinger region can drive market demand and stimulate innovation through circular based tendering and procurement. These criteria could demand a minimum proportion of secondary materials in the project, or that the building is modular, or designed to be deconstructed.

Digital marketplace for secondary materials

An online marketplace for secondary materials provides an open-access platform to facilitate the growth of the secondary materials market within the region by matching supplies of residual material streams to the demand. This increased accessibility and information about secondary materials can increase its overall use in construction projects and cascade them through different functions within the economy for as long as possible.



Vision

The Kongsvinger Region has set the ambition to create a network for reuse by creating a digital marketplace. The marketplace will be available to all municipalities in the region to share materials and furniture across the region. The aim is that through the marketplace the region can reduce their consumption of new materials while reducing their environmental footprint.

After consulting with employees in the municipalities it became evident that furniture is a product that has a high turnover in the municipality. By creating a network and digital marketplace, sharing and refurbishment of furniture can be facilitated. This can save the region costs, emissions and create jobs. A similar marketplace has been established in Asker Kommune who has been successful in facilitating refurbishment and redesign through work training programs. The project has had a considerable environmental impact, saved large amounts of money and awakened a love for secondhand in employees in the municipality.

Project scope

Create a digital marketplace, identify furniture to be included and set up a network for sharing. The creation of the marketplace and identification of furniture will set the pace of the project. There also needs to be a system in place for refurbishment and redesign. The pilot project regional construction network and digital marketplace uses the following circular economy key elements: use waste as a resource, preserve and extend what is already made, rethink the business model, incorporate digital technology and collaborate to create joint value.

Business case

As the name marketplace suggests there are different financial flows for the stakeholders involved. The three key players can be described as

A) Supplier: The municipality representative putting furniture on the marketplace to offer. It is a prerequisite that the supplier (in this case the municipality) dedicates resources to manage the furniture stock.

B) Marketplace: The marketplace offering and supplying the different types of furniture and other materials.

C) End user: The organisation or person purchasing from the marketplace and giving the furniture another life.

The suppliers can have a reimbursement for their furniture. The marketplace will make a margin on the service that they provide. The end user will pay. Depending on the product and materials this could entail a more competitive price. When the marketplace reaches a certain scale, it can be a profitable endeavor. At the start however it may be required to have some sponsors and founders, to support and start off the marketplace.

Key performance indicators

- +** **Total number and value of products and components in existing buildings:** indicator is critical to establishing an inventory of products within the region, such that potential clients have knowledge on what products could potentially be made available for use in the future.
- +** **Total number and value of products and components collected on the platform per year / total number and value of products and components collected on the platform / total number and value of products and components wasted per year:** This indicator helps measure the amount of products and components diverted from traditional waste management channels.
- +** **Total number and value of products and components reused in new constructions or existing buildings over the platform per year:** This indicator measures the amount of products and components directly sold for reuse purposes in the region.
- +** **Total reduction in CO₂ emissions associated with reuse of products:** This indicator can give an estimation of the climate mitigation associated with waste diversion from low-value treatment activities.
- +** **Total number of transactions made through the platform per year:** This indicator measures the total number of reuse interactions among users.
- +** **Annual number of visitors to the platform:** This indicator is vital to help gauge engagement to and suitability of the platform. However, this indicator should be understood in relation to the above, as visits without active engagement does not imply increased rates of reuse.

BEST PRACTICE EXAMPLES

The Austin Materials Marketplace:⁹ This example joins an international network of materials marketplace projects across the globe, including the Ohio and Tennessee materials Marketplace, US materials Marketplace, and the Turkey materials marketplace. Hundreds of companies - large and small -, community organizations, academic institutions and government entities are engaged.

Excess Materials Exchange (the Netherlands):¹⁰ This is a digital marketplace where companies can exchange any excess or waste materials and products. The platform also incorporates "material matching" features that help connect businesses to each other. The goal is to establish robust and long term material linkages between various industries to close material cycles.

HarvestMAP / Oogstkaart (Austria & the Netherlands):¹¹ This is an online marketplace for second hand construction materials from small quantities to continuous flows of (industrial) leftovers. HarvestMAP allows companies or individuals to make an inventory of their supply of materials, components or even buildings.

Asker municipality:¹² This example comes from Norway, where Asker municipality has been the country pioneer in using a digital marketplace to foster reuse furniture among different departments within the Administration.

Circular Agent

Raise awareness for the need to use secondary materials and/or furniture, lobbying, set up collaborations.

- ✓ Create new knowledge, skills, and jobs.
- 📅 Time and labour investments (e.g. one full time representative for ongoing coordination and lobbying efforts).
- 📄 E.g. Anne Huse

Local Repair and Social Entrepreneurs

Collaborate with the municipality in redesigning and refurbishing the materials. For example specialised in refurbishing office furniture.

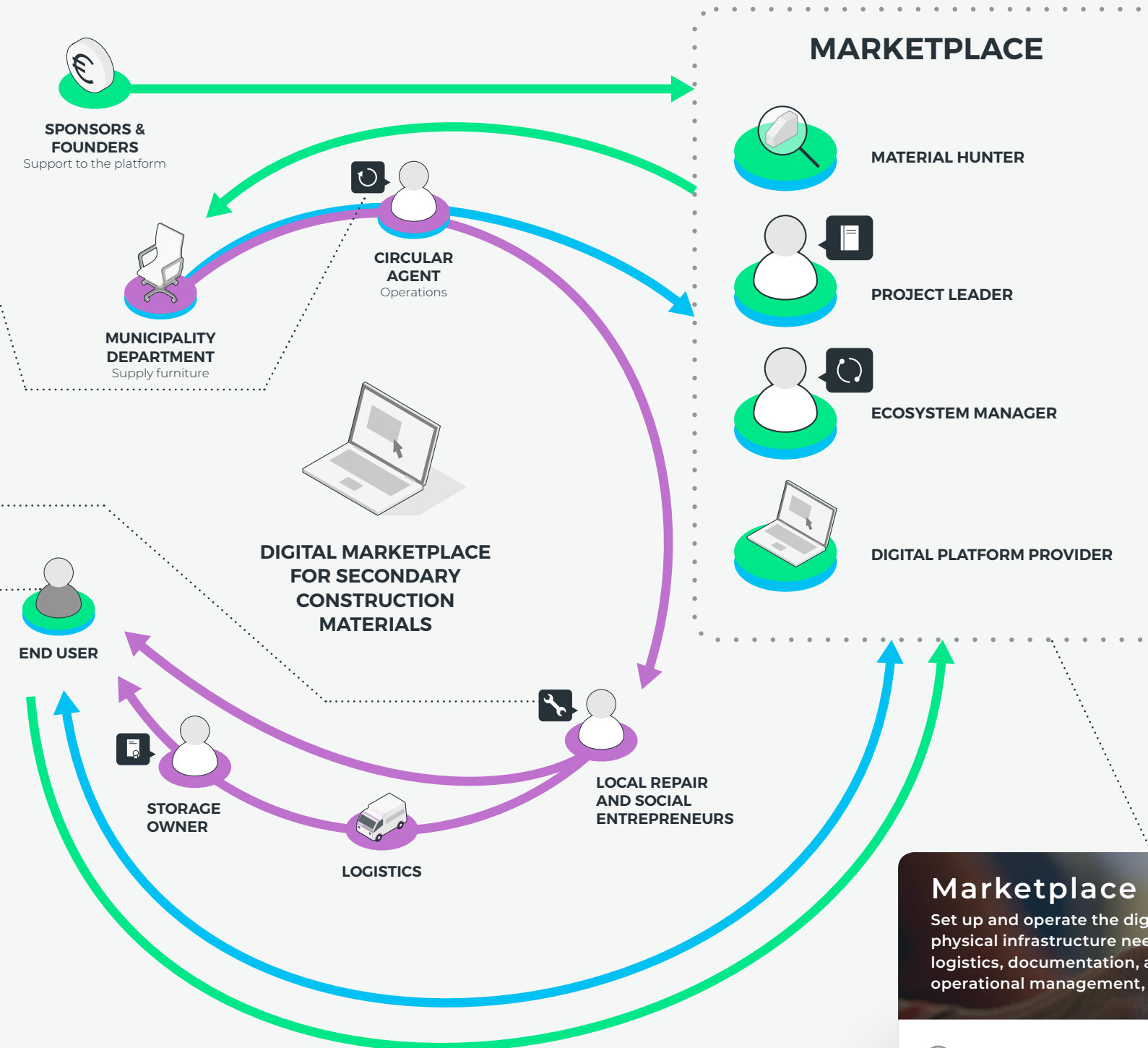
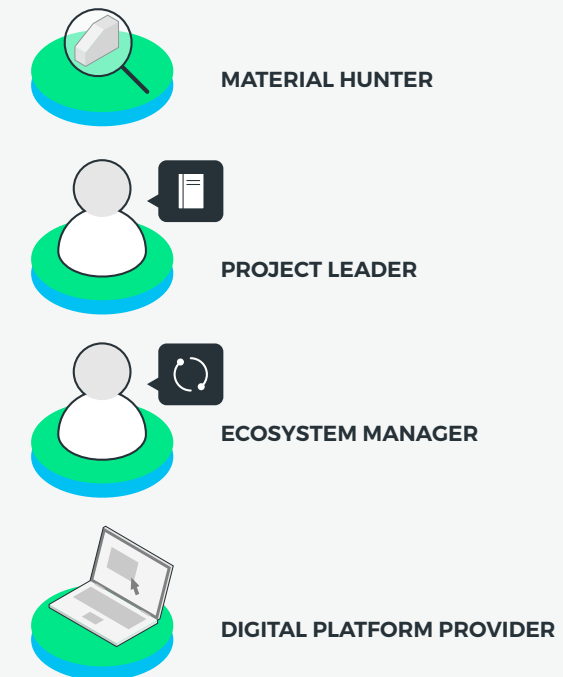
- ✓ Additional revenue stream
- 📅 Investment of logistics between the storage and supplier and user.
- 📄 E.g. Glomma Industries. GIR

Users Marketplace

Providers and end-users of the marketplace. These are all the actors that supply and demand the products and materials provided.

- ✓ Price benefits, reduced environmental impact and storytelling value.
- 📅 Time and either pay or receive money for materials.
- 📄 E.g. municipal employees, semi-public organisations

MARKETPLACE



Marketplace

Set up and operate the digital platform, coordinate physical infrastructure needs (ie. material storage, logistics, documentation, assessment of value), operational management, sales, and support services.

- ✓ Revenue from material sales and support services.
- 📅 Financial investments for the development and operation of the platform, labour, hard and software for platform.
- 📄 E.g. loopfront

1 Decide on responsible legal entity

This is the kick off for the development of the digital marketplace. The start of a committed core working group to lead this initiative. A choice needs to be made on who will be responsible for implementing the pilot project. That could be one of the six municipalities or a to be created legal entity for the network.

Stakeholders: Municipality department, circular agent, marketplace

Outcome of this activity

- ☒ Agreement on legal entity

2 Refine the Scoping

The scope should be limited to a few sites first and then slowly and steadily be broadened.

Stakeholders: Municipality department, circular agent, marketplace

Outcome of this activity

- ☒ Defined scope

3 Apply for funding

To give the marketplace a kickstart sponsor and foundation money are essential to get the marketplace off the ground.

Stakeholders: Municipality department, circular agent, marketplace

Outcome of this activity

- ☒ Several funding proposals
- ☒ Funding for the project secured

4 Set up of digital marketplace

Start of the project and development of the right infrastructure; front and backend, for the marketplace.

Stakeholders: Municipality department, circular agent, marketplace

Outcomes of this activity

- ☒ Agreement on planning for the next steps
- ☒ Set-up of the first version of the digital marketplace

5 Create the network across the region

Introduce different municipal administrations in the region to opportunities in the marketplace. This initiative could have its impact and value beyond the Kongsvinger region.

Stakeholders: Municipality departments, marketplace, transport and logistics

Outcomes of this activity

- ☒ A growing community that is enthusiastic about the marketplace

6 Identification and mapping of furniture

Go through inventory in municipalities to find furniture that can be put into the marketplace. The more materials that will be registered the more traction. One way of registering the furniture is by using a QR code.

Stakeholders: Municipality department, students supporting the pilot project and circular agent

Outcomes of this activity

- ☒ Inventory mapping and overview of available furniture

7 Find local repair companies and social entrepreneurs and storage for the furniture

Find local repair shops and social entrepreneurs that want to support the initiative by redesigning the furniture and a place for temporary storage.

Stakeholders: Municipality department, circular agent, marketplace, local repair and social entrepreneurs and storage.

Outcomes of this activity

- ☒ Local repair companies and social entrepreneurs commit to help
- ☒ A dry and cool place to safeguard the quality of the furniture for its next life phase.

8 Get the political will to change procurement policy of furniture

Lobby to make it part of the standard procedure to first check the availability of furniture in the marketplace before buying brand new items. An innovation manager could communicate the results to different politicians.

Stakeholders: Circular agents and municipality departments

Outcomes of this activity

- ☒ Making the marketplace part of the way of working

9 Sorting, collection (of furniture) and transport / storage

Making sure only the highest quality of furniture or other materials are offered on the marketplace.

Stakeholders: Logistics and storage, marketplace and circular agent

Outcomes of this activity

- ☒ Selection of furniture and materials suited for re-design and refurbishment

10 Start re-designing of furniture

During this step the local repair companies and social entrepreneurs can optimize the furniture/materials.

Stakeholders: Local repair and social entrepreneurs

Outcomes of this activity

- ☒ Optimized furniture and materials, ready for a next life

11 Use furniture

Spread awareness across to show opportunities through redesign and refurbishment

Stakeholders: end users, circular agents and other (municipal) potential end users

Outcomes of this activity

- ☒ Potential positive environmental, social and economic benefit
- ☒ Increase awareness of benefits of redesign and refurbishment

12 Final evaluation

This pilot should develop through continuous learning of the results. The pilot project should be evaluated based on the pre-established KPI's.

Stakeholders: All

Outcomes of this activity

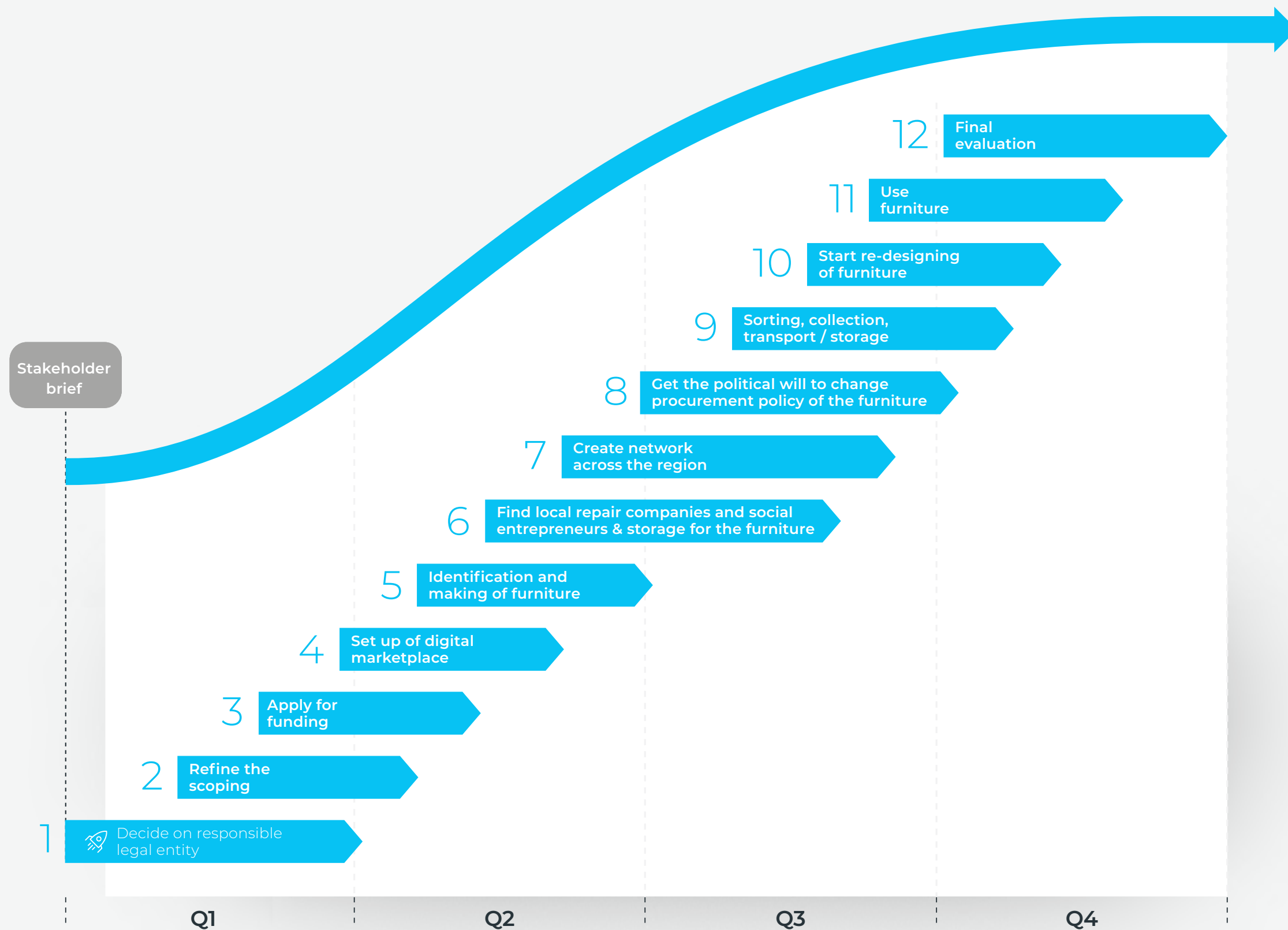
- ☒ Improved process and marketplace for new endeavours

SCALE UP

This pilot project will form the first node in the creation of a platform for reuse of furniture throughout the Kongsvinger's region. With the learnings from the pilot project, establishing a full-scaling strategy to expand to construction and demolition materials throughout the region would be the next step. It can be effective to coordinate the platform with planned renovations and demolitions.

With continued engagement and stakeholder roundtables, a greater network of circular-minded entrepreneurs and businesses can be formed. This network can support the development of the circular platform that will foster the reuse of all kinds of construction, demolition and interior materials within the region. This project could eventually be scaled to a national scale, which could offer 'scale benefits'





A scenic landscape featuring a misty lake or fjord in the background, with distant mountains visible on the horizon. The foreground is filled with a dense forest of trees in various shades of autumn, including yellows, oranges, and greens. The sky is overcast with soft, grey clouds.

3&4

Strategy 2: Shortening the Supply Chain

Logistics and timber production has historically been, and remains to be, an important economic activity for the Kongsvinger region. Hedmark (now part of Innlandet county) has 1.35 million hectares of productive forest and 0.1 million hectares of arable land, which account for 20 percent of Norway's forest resources. This cropland acreage is equivalent to about 125,000 football fields, or 10 percent of Norway's total agricultural area. Hedmark is Norway's leading farming and forestry county.¹³ All of the above, shows that the Kongsvinger region has an abundant resource pool of natural resources that can be used in the production of construction materials.

Despite the abundance of resources such as wood, imports of wooden products account for a big part of the built environment value chain consumption. Stimulating the use of low-carbon and sustainable materials and products can contribute to cutting embodied emissions of transport whilst stimulating innovation in the local regions economy.

We increasingly see calls to amplify the resilience of our systems as nations, businesses and cities seek to implement stimulus packages, amidst COVID-19, to 'build back better'. The key is to build resilience through a strong local supply chain, where resource efficiency, shared and regenerative resources and decentralisation are prioritised.⁴

IDENTIFIED DIRECTIONS

Increase use of local products

More local commerce of low-carbon and sustainable materials and products can help to cut embodied emissions of transport while stimulating innovation and value creation in the local economy.

Alternative forms of concrete / hempcrete / carbon capture in concrete

There are several alternative forms of concrete such as hempcrete, flyashcrete, timbercrete and ferrok. All materials with their own qualities and benefits. Additionally some of the existing forms are also able to capture carbon. Which alternatives could benefit the Kongsvinger region?

Material Recovery

Circular and higher-value recovery and recycling of construction and demolition wastes, through new construction practices or new technologies, can enable higher-value applications of secondary materials. Circular demolition practices, such as selective deconstruction, can enable and support these higher-value resource treatments.

Such an approach can help to reduce the use of virgin materials and generation of emissions during the manufacturing and transport of products ("embodied emissions") and prevent value-loss during end-of-life processing. There are great opportunities for the Kongsvinger region to stimulate new circular innovations and directions to increase material cycling and utilisation as well as value creation.



Vision

The Kongsvinger Region has set the ambition to recover the materials from demolished buildings into new constructions. One purpose for these materials could be in the construction project called the O-House (also known as Circle House, see appendix 1). The O-house is the first building project in the region that is circular by design and that aims to use demolition materials as construction material.

At least 50% of the building materials used in the construction of the O-house need to come from recycled or reused materials. Some of this 50% of recycled or reused materials will be directly cycled from buildings to be demolished in the region. Sør-Odal has identified 3 buildings (rural schools) about to be demolished that the O-house could potentially source construction materials from. This project focuses on capturing the value of materials stocked in buildings.

Project scope

Select a building that is planned to be demolished and assess the amount of materials that have the potential to be reused in the construction of the O-House and in other circular constructions. This project should coordinate with the O-house project timeline. The materials not used for the O-house project will be stored and available through the digital marketplace being piloted through his Scan. The pilot project demolition materials as a resource uses the following circular economy key elements: Design for the future and Use waste as a resource

Business case

For demolition materials as a resource there are three main stakeholders that exchange financial flows.

A) Engineer: the expert undertaking the material audit gets paid for the service, which identifies the potential supply of materials.

A) Deconstructor: the organization that needs to take out the materials so they can be reused needs to be paid for this extra time.

B) Material processor: the organisation that processes the material in a condition suited for reuse needs to be paid for this service.

C) Builder: the builder pays and uses the secondary materials instead of virgin materials.

Key performance indicators

- + Total tonnes of construction waste diverted from landfilling and other low-value treatment activities and reused for new constructions:** This indicator is crucial to capture the amount of materials being recirculated into the system through the pilot project.
- + Total reduction in CO₂ emissions associated with reuse of products:** This indicator can give an estimation of the climate mitigation associated with waste diversion from low-value treatment activities.
- + Total reduction in CO₂ emissions associated with transport of materials:** This indicator can give an estimation of the climate mitigation associated with decrease in transport of materials.
- + Total reduction in the consumption of virgin materials:** This indicator measures the virgin materials saving through the increased use of secondary materials.

INTERNATIONAL BEST PRACTICES:

Finding and utilising 'waste' materials for construction purposes:¹⁴ Villa Welpeloo is a house in the Netherlands constructed from 60 percent salvaged material. Google Earth aided the selection of the construction area based on accessibility to industrial waste materials. The Villa Welpeloo building highlights the massive potential of unused or 'misplaced' resources.

Reused bricks in building renovation, Copenhagen (DK):¹⁵

The City of Copenhagen explicitly required the use of reused bricks in the renovation of a school. The winning sourced bricks from the ongoing deconstruction of local hospitals, reducing the total cost of ownership over its life-time, while cutting 70 tonnes CO₂ emissions.



Engineer

Executing the materials audit on the quality of the materials.

- ✓ Revenue of 'new' kind of work
- 📁 Develop time and framework to quickly asses quality of materials.
- 📁 E.g. loopfront, SINTEF

Builder (O-House)

Use secondary materials for new building construction.

- ✓ Cost savings due to secondary material use, more sustainable building and design practice.
- 📁 Potential additional logistic and information processing.
- 📁 E.g. Erik Jernberg AS

Deconstructor

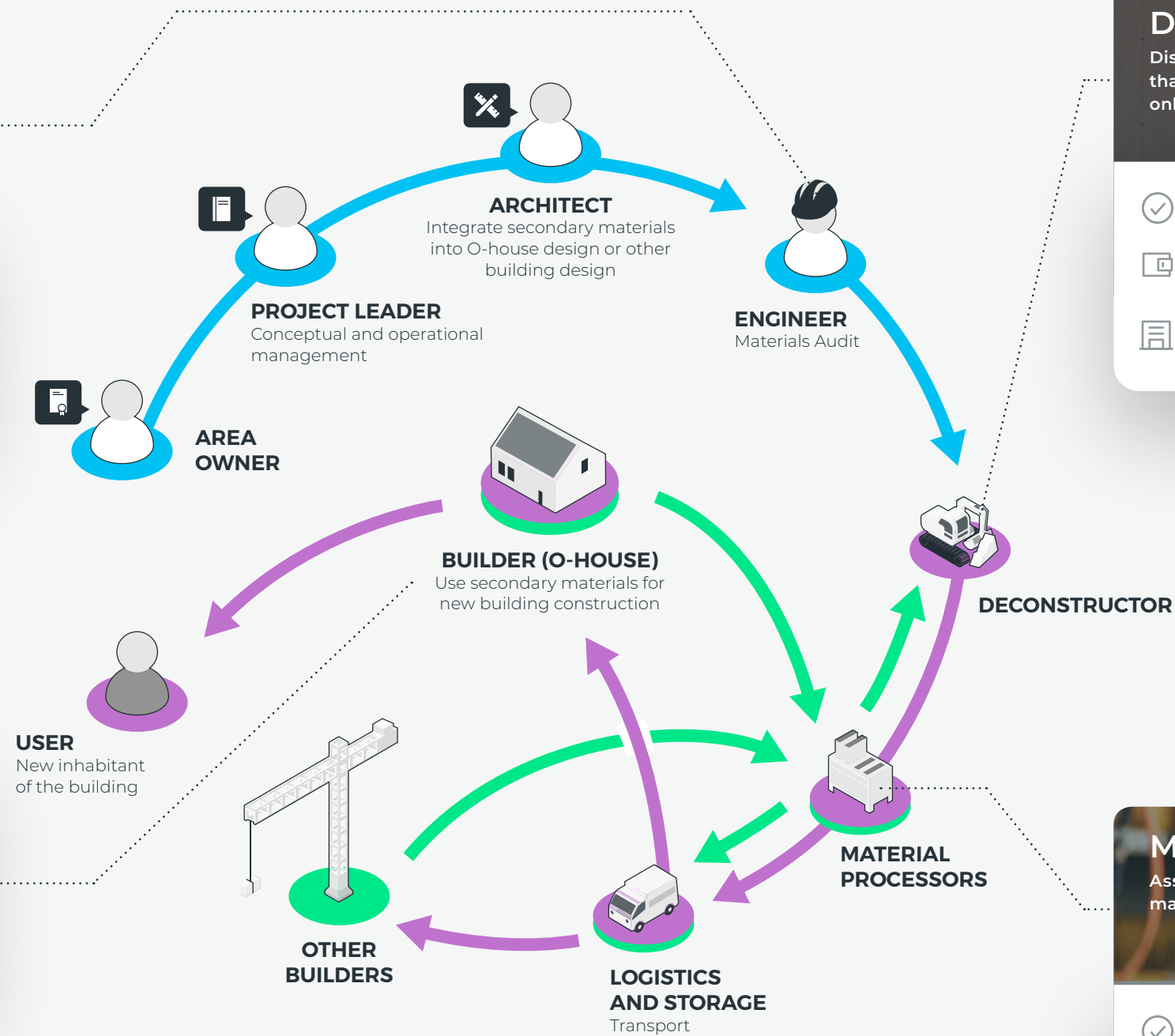
Disassemble, demolish and sort materials in a manner that allows for high quality material recovery via the online platform.

- ✓ Revenue from material sales.
- 📁 Capital investments if right machinery is lacking, labour cost and potential training.
- 📁 E.g. Volas

Material Processors

Assess and process secondary construction materials into a condition suitable for reuse

- ✓ Revenue of added value processes.
- 📁 Capital investment in right machinery if lacking, labour cost.
- 📁 E.g. loopfront



- INFORMATION / DATA FLOWS
- RESOURCE / MATERIAL FLOWS
- FINANCIAL FLOWS

- ✓ BENEFITS
- 📁 INVESTMENTS
- 📁 LOCAL STAKEHOLDER

1A Identification of demolition materials availability

Selection of the building to be demolished whose materials will be reused within the scope of the project and get political approval to proceed with the disassembly and deconstruction of the building to reuse its materials for new circular constructions.

Stakeholders: Project leader, architect, and local politicians

Outcomes of this activity

- ☒ Identification of quantity and type of materials available
- ☒ Political approval to use the building materials for circular construction

1B Legal assessment

Undertake a legal assessment to know whether the O-house project or any other circular pilot construction projects can reuse construction materials from old buildings, overcoming the barriers for materials reusability that the TEK-17 regulation presents.

Stakeholders: Project leader in alignment with relevant local stakeholders

Outcomes of this activity

- ☒ Legal greenlight to execute the pilot project

1c Selecting a location for the circular construction

Selection of an optimal location for the construction of the O-house and other potential construction projects in order to minimise the logistics complexity (i.e. transport distance). Ideally, the location will be close to the supply of construction materials (i.e. old building deconstruction and disassembly) and to the storage facility.

Stakeholders: Project leader, local politicians, material processor, builder, logistics and storage and architect.

Outcome of this activity

- ☒ Validated location for the construction of the O-house and other potential projects
- ☒ All the fundamental elements of the pilot project are confirmed: supply of materials, reuse and construction location.

2 Materials audit and quality assessment

Identify and select an engineering company that will make an inventory of the building materials and assess their reuse potential based on quality standards.

Stakeholders: Project leader and local engineering company

Outcomes of this activity

- ☒ Collection of data on the quantity and quality of the materials available

3 Design of the O-house

Incorporate into the design of the O-house, and other circular constructions, the use of the secondary materials identified by the material audit and quality assessment.

Stakeholders: Architect, project leader and local engineering company

Outcomes of this activity

- ☒ Circular construction project is ready for construction

4 Identify a demolition/deconstruction company

In alignment with the engineering company in charge of the material audit, identify a demolition or deconstruction company. The coordination between the different stakeholders should inform the deconstruction activities, and inform logistics and transport about the type and amount of materials that will have to be transported and stocked in the storage facilities.

Stakeholders: Project leader, local politicians, procurement department and other relevant stakeholders.

5 Deconstruction

Undertake the deconstruction of the identified building

Stakeholders: Deconstruction company





6 Sorting and collection of materials

On-site sorting and collection of the demolition materials and decision on what will be used at the O-house and what will be stored for the use in future constructions through the network and digital marketplace.

Stakeholders: Deconstruction company, project leader, logistics and storage, material processor and builder

Outcomes of this activity

- ☒ Matchmaking of materials for direct reusability

7 Transport of materials

The logistics and storage company transports some materials to the construction site and others to the storing facilities.

Stakeholders: Logistics and storage

8 Storage of the materials

The logistics and storage company stores the unused materials awaiting for future circular constructions.

Stakeholders: Logistics and storage

9 Construction of the O-house

Execution of the construction plan reusing demolition materials and monitoring the effectiveness of operations for future learnings.

Stakeholders: Architect, builder and project leader

10 Opening event and communication

Create a communication campaign to spread awareness of the O-house to citizens. Communication of the project is important to generate a buzz at its opening but also to maintain interest. Social media is an effective method to showcase the range of items through attractive and themed displays. Host an opening event for the O-house to generate buzz around the project. Organise a programme of workshops and speakers around the O-house and the circular economy. Engagement of citizens can be maintained by a regular offering of workshops and events.

Stakeholders: Project leader and other relevant stakeholders

11 Final evaluation of the results of the pilot project based on pre-established KPI's

Monitor and evaluate the pilot project against the pre-selected KPIs, and generate learnings that can be applied to future circular constructions.

Stakeholders: All

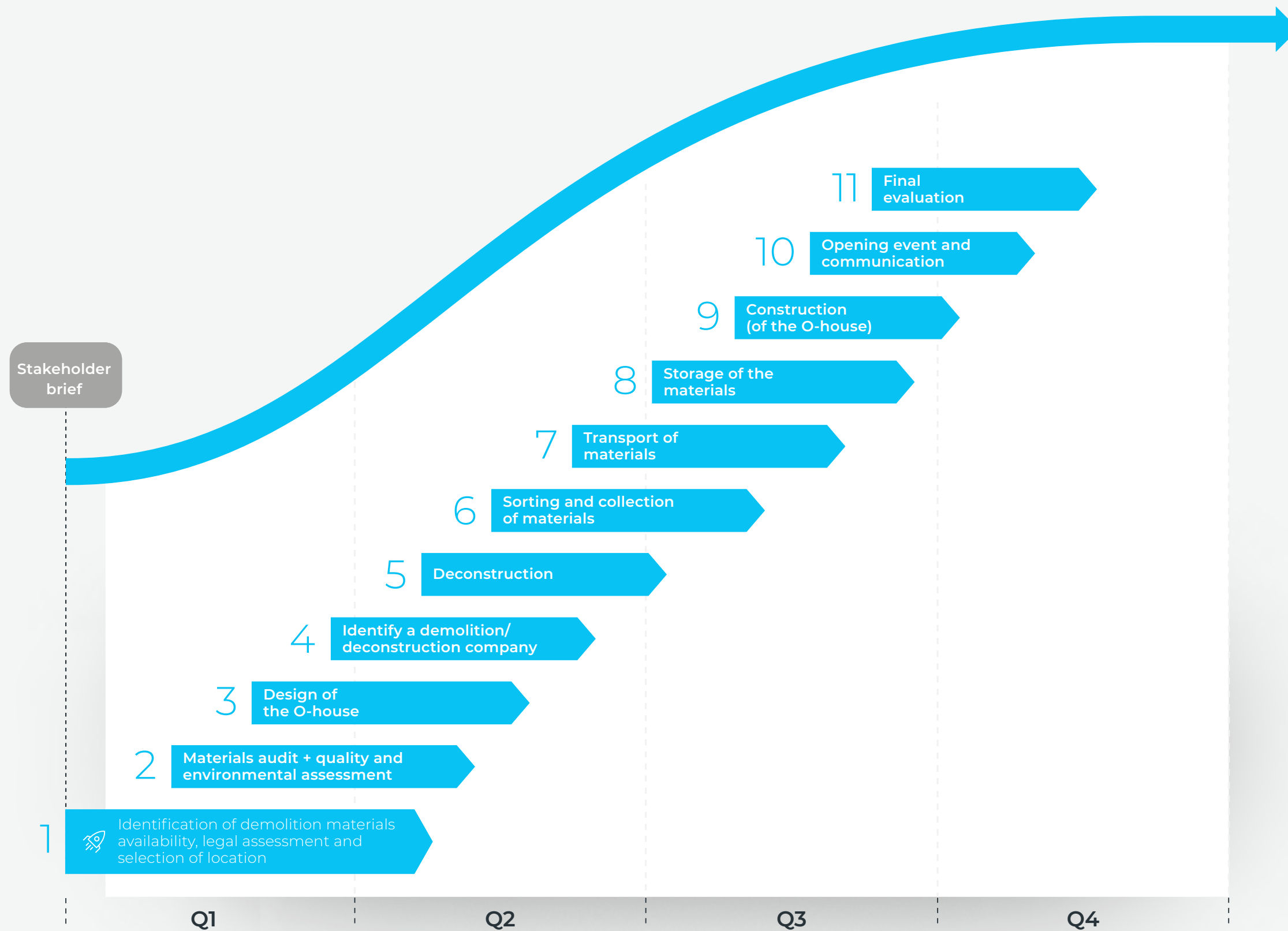
Outcomes of this activity

- ☒ Evaluation of the success of the project
- ☒ List of learnings of the pilot project
- ☒ Decision on its potential replication

SCALE UP

This project is a first value chain collaboration for the use of demolition materials as a resource. Once learnings and challenges have been identified for this way of working; different actors can decide to continue and scale by identifying new donor buildings and construction projects that are suitable to apply this way of working. It should be stimulated that the reused materials are used in the buildings so they could also have another life after this use (design for deconstruction). The local engineering company, deconstructor, material processors and architect have an essential role to play.

If this pilot is successful it could be beneficial to assign a contact person/place in the Kongsvinger region that can support the network and digital marketplace by identifying architects and deconstructors that can also use demolition materials as a resource. Additionally, an integrated urban stock of the Kongsvinger region could be developed for local stakeholders of the built environment value chain to use as potential sources for new construction. Circular procurement is also key to drive the demand of secondary materials for new constructions. Additionally policy could also establish a compulsory standard process of environmental assessment of every building about to be demolished.



A scenic landscape photograph showing a calm lake in the middle ground, with distant mountains on the horizon. The foreground is filled with trees in autumn colors, including yellows, oranges, and greens. The sky is overcast with soft, grey clouds.

3&4

Strategy 3: Circular education

Through our research in the Kongsvinger Scan we have seen organisations and businesses are increasingly recognizing the opportunities the CE approach provides, and making progress in initiating more sustainable practices. However, industrial and technological innovations by themselves cannot drive the systemic changes needed to achieve the transformation of the linear economic model. The circular transition requires a paradigm shift from individual behaviours to collective and cultural adoption of circular economy principles. The role of education through skills and knowledge development is key. From early ages to higher education and skills development in the private and public sector. If we want to instill new visions for our society and economy with respect to sustainable growth and prosperity, we need knowledge sharing.

IDENTIFIED DIRECTIONS

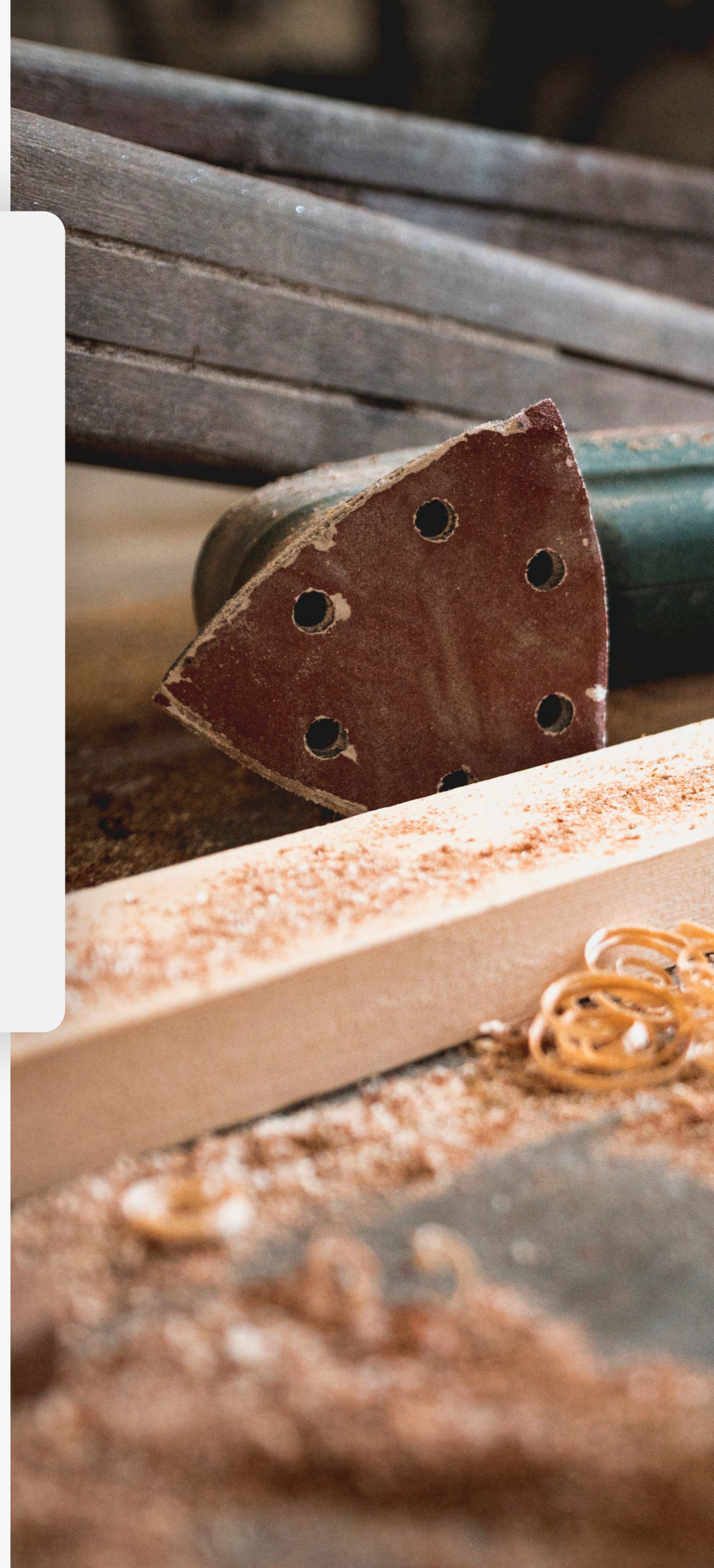
Circular Training for professionals

Training on circular economy can touch upon many different aspects. This should be tailored to the regions and stakeholders needs. Training can range from;

- Cross-laminated timber construction for tall buildings
- Circular procurement
- Selective deconstruction training

Educate homeowners on sustainable construction and renovation options

Showing the ease and more circular renovation alternatives to homeowners, who are the key decision makers within the built environment value chain.





Vision

The goal of the project will be to widely develop and implement circular procurement in the region. In order to do so, we need to train procurement employees, but we also need to get approval at a higher political level, since circular procurement often means change in budget set-up. This means that we need to incorporate all actors involved in a procurement process in the project. These are local politicians, municipality mayors, finance department of the municipality, administration of municipality and procurement personnel. The main action to happen is the set up of the procurement criteria at which the producers compete.

Project scope

This project focuses on providing the municipal tender team with the required skills and knowledge to independently set out successful procurement and/or tender. It will have a special focus on the members of administration that will participate in the first circular procurement. The training will be based around the 7 key elements for circular economy (see annex 3). The pilot project circular procurement training uses the following circular economy key elements: collaborate to create joint value.

This project can contribute to the other two pilot projects by:




-  **Regional construction network and digital marketplace** by training the involved municipalities how they can set out the right circular procurement policies in place to ensure they will first look at second hand or more circular options before having the option to decide for virgin materials.
-  **Demolition materials as a resource:** in any demolition tender the option of controlled disassembly should be included to ensure that the materials that could be re-used are taken out in a way, so they also actually can.

Business case

The main financial flows, from a training perspective are twofold:
Trainers: the organisations and individuals providing the training
Receivers of the training: the organisations and individuals receiving the training.

It will be the involved organisations that receive the training that have to pay for the service of the training.

Key performance indicators

-  **Total number of trainings delivered**
-  **Total number of professionals that have received the training**
-  **Final evaluation score of trainings:**
 - **Total number of completed procurements using the new circular procurement criteria:** indirect impact measured by the implementation of circular procurement processes among municipalities by using the knowledge provided by the training.
 - **Total reduction in the consumption of virgin materials:** This indicator measures the virgin materials saving through the increased use of secondary materials.
 - **Total tonnes of secondary materials used in construction projects:** this indicator evaluates the quantity of secondary materials that are used in the construction of the building or infrastructure.
 - **Total environmental impact procured materials:** This indicator is able to evaluate various aspects of the environmental impact of the materials procured for construction, including greenhouse gas emission, and biodiversity loss.

INTERNATIONAL BEST PRACTICES:

Kristian August Gate 13:¹⁶ A building that is being remodelled with circular particles. Reusing most of the original building, the interior is built with reused materials.

Piano | Dutch Public Procurement Expertise Center:¹⁷ Circular procurement is a relatively new topic, and the Netherlands is a global front-runner in this area. The Dutch government has an annual purchasing volume of € 60 billion with which they can encourage the development of a circular economy. Several pilot projects are currently being executed to increase experience and expertise in the practical implementation of circular procurement.

Circular Procurement Academy | Copper8:¹⁸ A Circular Procurement Academy was set up by a Dutch consultancy organization called Copper8. They train more than 60 participants from over 30 organisations per year. The program reflects on: the technical aspects, such as the definition and measurement of circularity; process-related aspects, such as selecting the right procurement procedure and establishing collaborations; and financial aspects, such as applying new revenue models to ensure circularity.

Municipal Circular Tender Team

The Circular Tender Team is responsible for the creation of clear circular ambitions, and criteria. They execute the tender and final procurement.

- ✓ Reduction in Total Cost of Ownership & Total Cost of Use.
- Positive environmental impacts.
- Stimulates innovation & competitiveness in construction sector.
- Knowledge creation & skill development in circular procurement.

- 📁 Leadership, internal coordination, and management support.
- Market consultation.
- Learning time and innovation process.

📁 Local politicians, municipal administration and procurement department

Circular Procurement Trainers

Will guide the municipal tender team to quickly acquire the skills and knowledge required to efficiently set out circular tenders.

- ✓ Share the insights and information for efficient circular tendering and procurement.

- 📁 Time investment and training development for Kongsvinger context.

📁 E.g. Circular Norway

✓ **BENEFITS**

📁 **INVESTMENTS**

📁 **LOCAL STAKEHOLDER**

Circular Economy Knowledge Experts

Circular economy knowledge experts can help to develop an appropriate and feasible circular tender for the pilot project, as well as broadly disseminate the findings and feedback of the process.

- ✓ Gained knowledge on the circular economy in the construction sector.
- Access to a network of circular stakeholders, both within the Kongsvinger region, and the Construction sector.

📁 Time investment.

📁 E.g. Circular Norway + network

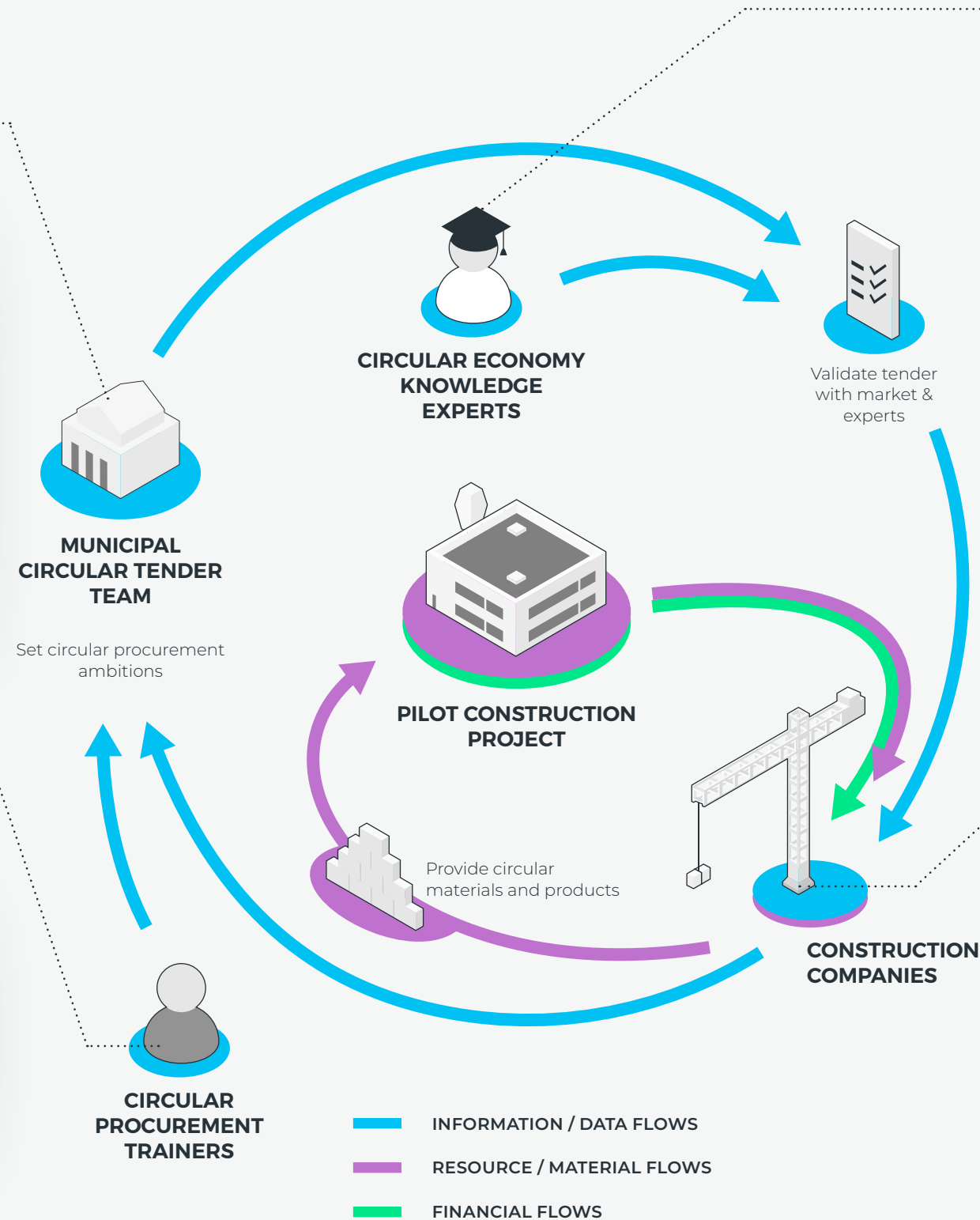
Construction Companies

Companies in the construction value-chain bid for the tenders and deliver the desired circular results. Validate the tender specifications in market consultations, as well as provide feedback when the tender is executed.

- ✓ Gained knowledge and experience in circularity. Access to a network of circular construction stakeholders. Gain competitiveness and innovation potential.

- 📁 Time investment in market roundtables and proposal writing. Expertise and skills to provide circular products and materials.

📁 E.g. ØM Fjell



1 Kick-off and set circular ambitions

During the kick off the trainers and a representative of the municipality will come together to discuss the 'procurement challenge' at hand. What are the ambitions and what is the current struggle to achieve these? Based on this discussion find 6 products or material categories that will be demanded and define what circularity means for these products/materials.

Stakeholders: Circular Procurement trainer and Municipal representative

Outcomes of this activity

- ☒ Select 6 products or material categories that are to be procured
- ☒ Clear understanding of the challenge
- ☒ Define first rough circularity criteria for product/material

2

Establish circular tender team

If not already existing, establish a circular tender team that can execute the circular tenders. It's key to involve the right stakeholders and decision makers from the start (e.g. person responsible for a construction framework project or a business with circular ambitions).

Stakeholders: Circular Procurement trainer and relevant public and private stakeholders

Outcomes of this activity

- ☒ A clear defined circular tender team

3

Market engagement and validation of circular tender

The next step of the circular procurement trainer is to test, validate and improve the first rough circularity criteria for the product/material through consulting relevant market and knowledge parties.

Stakeholders: circular procurement trainer and circular economy knowledge experts

Outcome of this activity

- ☒ Feedback on the rough circularity criteria

- ☒ Set the target for the project

4 Develop specification and awarding criteria

Based on the feedback of the market and knowledge, parties refine the change procurement criteria in order to make it circular.

Stakeholders: Circular Procurement trainer and municipal circular tender team

Outcomes of this activity

- ☒ Improved and validated set of circularity criteria for a given product/material

5 Publish and evaluate tender

Set out the new circular tender and improve and evaluate where needed.

Stakeholders: Municipal circular tender team

Outcomes of this activity

- ☒ Responses to tender

6 In-use contract management

Monitor the contract against KPIs that have been embedded into the contract. Ongoing improvement throughout the contract can be achieved by building requirements into the contract and managing the contract appropriately once awarded.

Stakeholders: Municipal circular tender team and construction company

7 Evaluate the process and share experiences

Evaluate the performance of the pilot project. Were the intended circular ambitions, criteria and outcomes able to be met? What were the (dis)advantages of circular procurement? Think about how this process can be replicated and scaled-up in the future. Be sure to consolidate these learnings and share with all relevant stakeholders: other municipal departments as well as other municipalities and regions.

Stakeholders: All

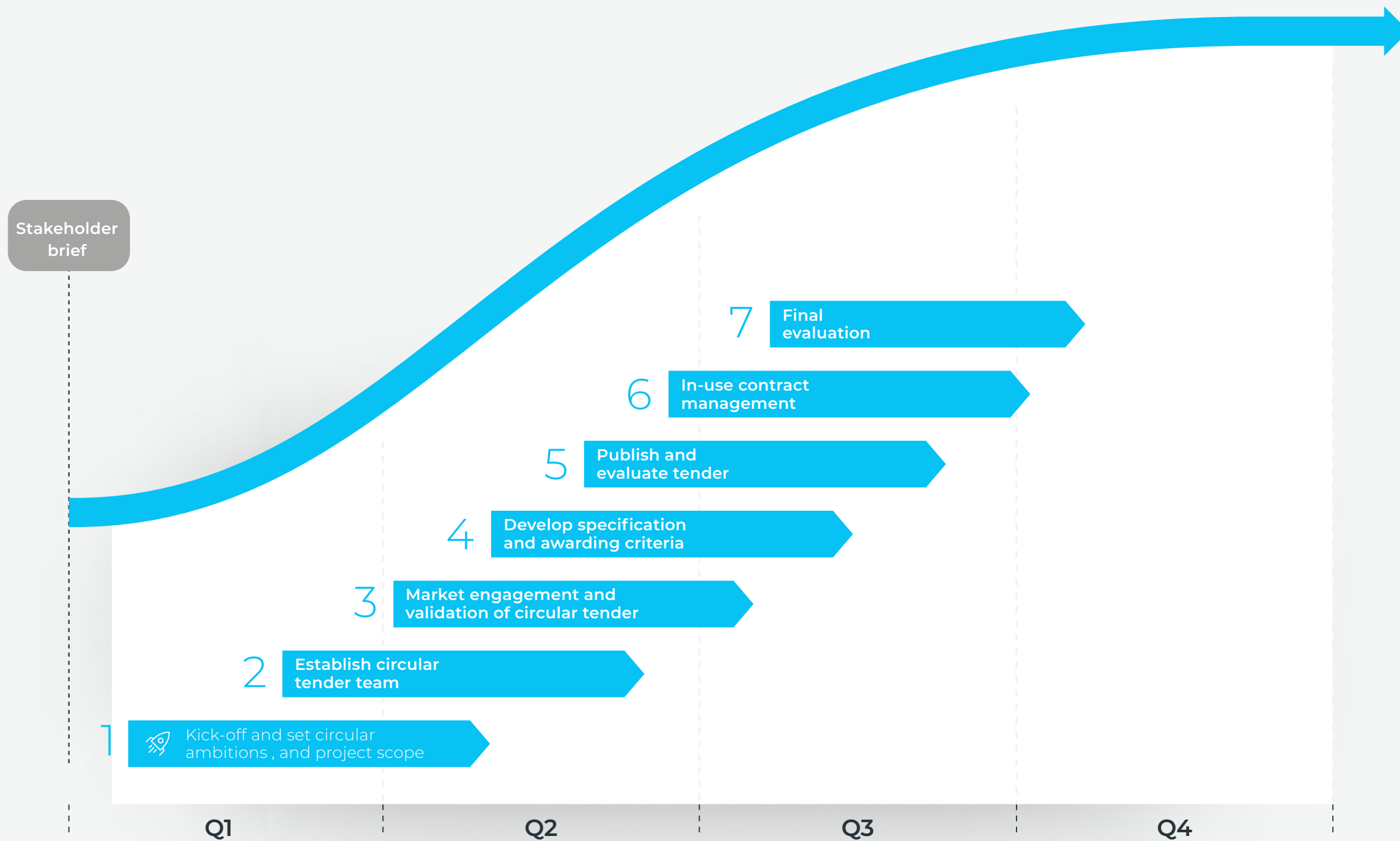
Outcomes of this activity

- ☒ Understood the costs, benefits and risks of circular procurement
- ☒ Understood the potential to roll-out, replicate and scale-up
- ☒ Disseminated learnings within the region and with other municipalities throughout Norway

SCALE UP

Circular procurement has a great potential to be scaled to all public construction projects throughout the Kongsvinger region. There is also high potential to use circular procurement for other processes such as smaller products and furniture. Use the lessons-learnt from the pilot project to create a circular procurement process guide.

Make sure to continually monitor and evaluate to build upon the successes and lessons-learnt, and establish a concrete case of the benefits. Once a refined process has been established and documented, start developing and applying circular criteria to the procurement of all public construction projects in the Kongsvinger region, including renovation.



Practical and scalable solution for a circular future

The Kongsvinger region has started their journey towards a circular built environment value chain. Through this multi stakeholder and collaborative process three circular strategies have been presented in detail with associated pilot projects. These pilot projects hold the potential to start the transformation of the built environment value chain. Each strategy and associated pilot project have been developed on its potential promise for circular impact.

The pilot projects have been developed to address the key impacts that the built environment value chain in the Kongsvinger region is facing (identified in phase 2) through the use of circular economy key elements that align with essential aspects to implement impactful and transformative projects, those are the following:

- **Market perspective:** Regional construction network and digital marketplace
- **Material perspective:** Demolition waste as a resource
- **Educational perspective:** Circular procurement training

Continuous public and private support

The transition to a circular economy is not an easy journey, and will not happen overnight. Continuous action and commitment is needed from both the public and private sector, in a collaborative manner. Through the process of the Kongsvinger region scan we have seen growing momentum for the circular economy. It is on all stakeholders involved to further materialise this movement, to bring every pilot into an impactful reality.

Opportunities to scale

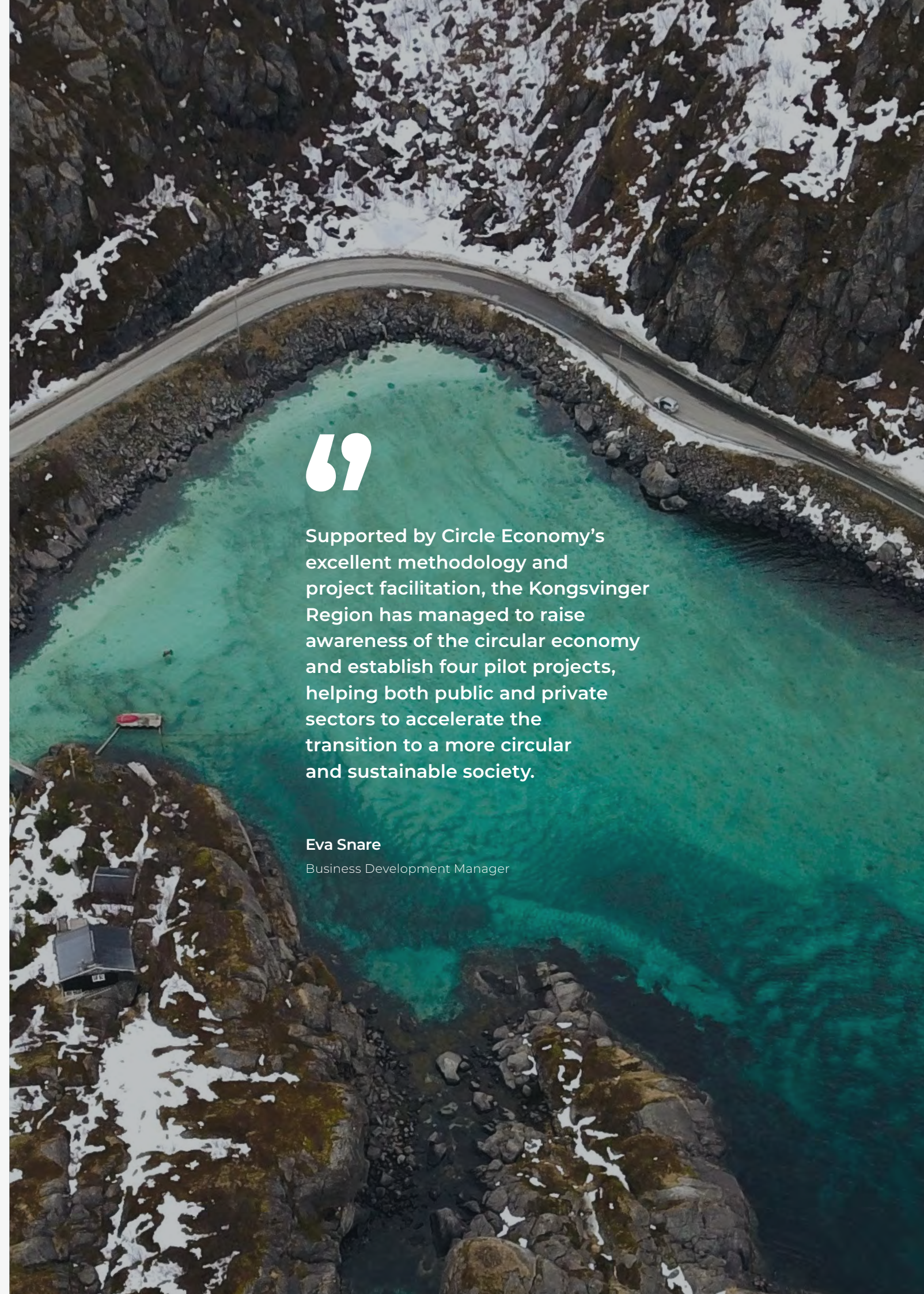
The pilot projects that are described in this report have clear steps for implementation that were set in the last workshop. However, these won't result in the required transition, if they remain stand alone initiatives. The Kongsvinger region should continue to build upon these initiatives and pursue new opportunities both within the built environment value chain and beyond.

“

Supported by Circle Economy's excellent methodology and project facilitation, the Kongsvinger Region has managed to raise awareness of the circular economy and establish four pilot projects, helping both public and private sectors to accelerate the transition to a more circular and sustainable society.

Eva Snare


Business Development Manager




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| Annex


IMPACT




Fossil fuel consumption




Energy
28.3 GWh




Non-renewable material consumption




Minerals & Chemicals
7600 tonnes




Low material reuse and cascading of materials




Waste
8720 tonnes




Value loss in construction, demolition and renovation practices



Mixed waste
3800 tonnes



Low-value treatment of wood



Biomass waste
770 tonnes

GLOBAL TRENDS



Design for the future: Buildings have a flexible design for multifunctional and continued use, enabling maintenance, repair and reuse at all life cycles stages. Techniques such as modular construction for future refurbishment, which minimises waste generation during construction and deconstruction stages, are developing with fast pace in the sector and are continued to drive productivity and efficiency.



Sustain & preserve what's already there: Reusing materials in the building design and harvesting reusable materials during deconstruction or refurbishment. It requires more complex stock management and modular (de)construction.



Use waste as a resource: Demand of resources for new constructions due to urbanisation is a major driver of scarcity. Together with a wide range of sustainability concerns and government standards, significant developments in resource recovery are pushing the industry to use waste from used products and resources and the production process to make products using secondary materials as feedstock.




Prioritise regenerative resources: Increase use of renewable materials (biobased and / or biodegradable) through nature-based design solutions that prioritise the use low impact materials. Use of local biodegradable and compostable materials in construction projects is driving innovation in the sector.




Team up to create joint value: Work together throughout the value chain, internally within organisations and with the public sector to increase transparency and create shared value. Best practices in areas such as digitising procurement and supply-chain workflows enable more sophisticated logistics management and just-in-time delivery. Collaboration and capacity building are key enablers for systemic change across value chains.


LOCAL TRENDS




Prefabricated and modular construction: These are factory-produced pre-engineered building units that are delivered to site and assembled as part of a larger construction unit. These elements can increase the efficiency and the sustainability of constructions sites.




Solid wood buildings: These are buildings that utilise a large share of wood (for example in walls and ceilings). There are several advantages of building with wood, such as carbon sequestration, as well as a higher insulation rating than either steel or plastic as a result of its natural cellular structure. This means that buildings require less energy to maintain heating and cooling. Plus, wood is said to help regulate humidity levels to a small degree.



Low carbon concrete: Low carbon concrete has attracted significant attention due to the amount of CO₂ that 'conventional' concrete emits. These are forms of concrete based on specific blends that reduce the amount of clay-limestone needed, producing less carbon-dioxide in their production process.




Passive houses: This is a voluntary standard for energy efficiency in a building, which reduces the building's ecological footprint. The design (e.g. orientation of the building and materials used) results in an ultra-low-energy building that requires minimal energy for space heating or cooling.




Demand for retrofit: Retrofitting a building involves changing its systems or structure after its initial construction and occupation. This work can improve amenities for the building's occupants and improve the performance of the building. As technology develops, building retrofits can significantly reduce energy and water usage.

STRATEGIES


Increase use of secondary materials



Shorten the value chain



Circular education

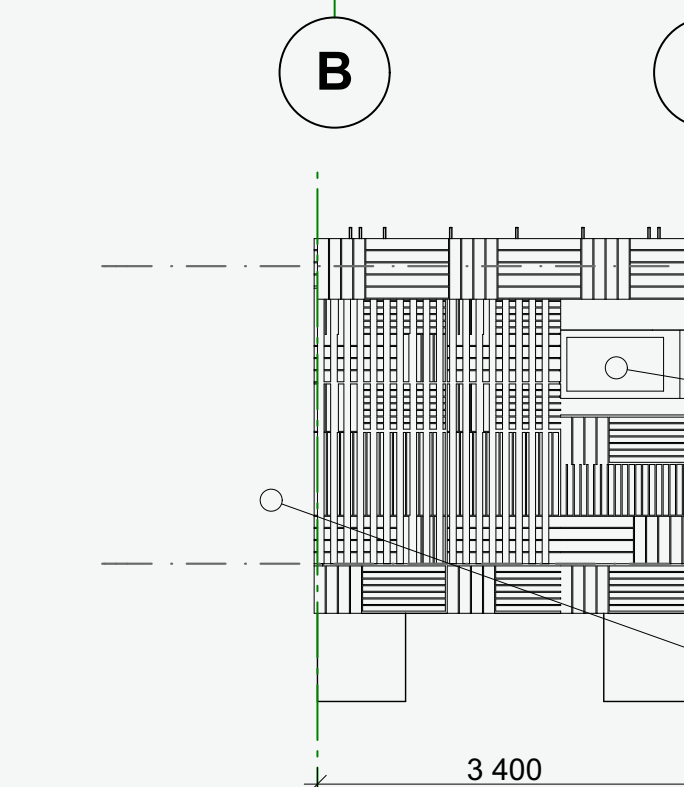
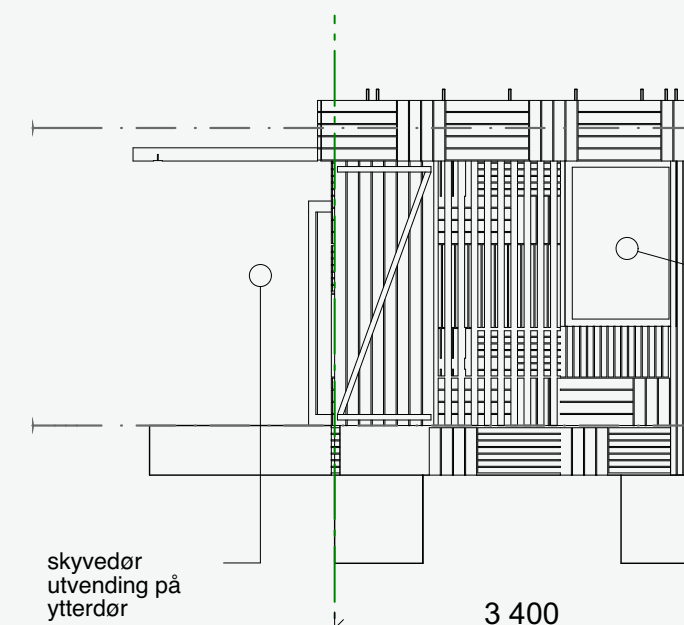
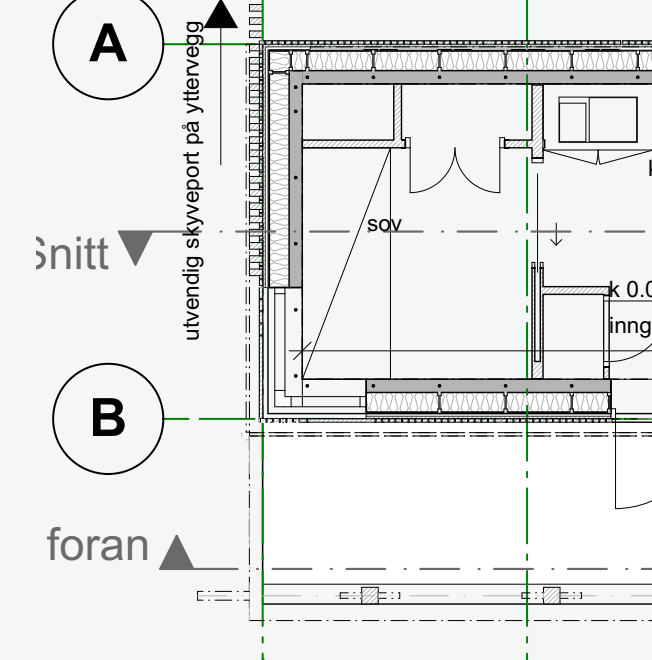


2. Having the O-House as a foundational element

One of the outcomes from the Kongsvinger region scan is the start of the O-house pilot project. To strengthen this project we use it as a chance in which we can also develop new pilot projects to increase the use of secondary and low carbon materials.

The purpose of the O-House project is to develop a prototype of an establishment home where at least 50% of the building material is based on either recycled or reuse of material. Other building materials must have the lowest possible climate footprint (= short-haul) be energy-smart (possibly passive houses). The prototype will probably be on a smaller scale, but have the necessary functions such as a toilet, bathroom and kitchenette in addition to a living room. The project will propose a financing model for young people without equity and a commercialization / scaling plan.

The Kongsvinger region has set out the ambition to develop pilot projects that enable the materialisation of the O-House.



3. DISRUPT: 7 key elements of the circular economy

The circular economy assumes dynamic systems, meaning there is no specific end-point, but it is rather a process of transformation. The DISRUPT model describes 7 key elements that give direction to this transformative process, with the aim of slowing the flow of resources, closing the loop and narrowing resource flows, while switching to regenerative resources and clean energy. The 7 elements describe the full breadth of relevant circular strategies and will be used throughout the report.



Design For the Future: Adopt a systemic perspective during the design process, to employ the right materials for appropriate lifetime and extended future use and optimal recovery.



Incorporate Digital Technology: Track and optimise resource use and strengthen connections between supply-chain actors through digital, online platforms and technologies.



Sustain & Preserve What's Already There: Maintain, repair and upgrade resources in use to maximise their lifetime and give them a second life through take-back strategies, where applicable.



Rethink the Business Model: Consider opportunities to create greater value and align incentives through business models that build on the interaction between products and services.



Use Waste as a Resource: Utilise waste streams as a source of secondary resources and recover waste for reuse and recycling.



Prioritise Regenerative Resources: Ensure renewable, reusable, non-toxic resources are utilised as materials and energy in an efficient way.



Team Up to Create Joint Value: Work together throughout the supply chain, internally within organisations and with the public sector to increase transparency and create shared value.

CIRCULAR KONGSVINGER REGION

Project Team

Circle Economy

Annerieke Douma (Lead Cities team), Jordi Pascual
(Project Manager), Noah Baars (City Analyst),
Yasmina Lembachar (Lead of Digital Communications),
Nicolas Raspail (Design lead), Alexandru Grigoras (Visual designer),
and Gayle Tjong-Kim-Sang (Visual designer)

Circular Norway

Sofie Pindsle (Project Manager), Leif I. Nordhus (CEO),
Ellen Anette Høvik (Communication Manager) and
Alexander F. Christiansen (Project Manager)

Kongsvinger Region

Eva Snare (Business Development Manager), Anne Huse
(Regional Council of the Kongsvinger region), and
Knut Hvithammer (Regional Council of the Kongsvinger region)

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