shaping our urban future
shaping our urban future
It is essential for the Growth Forum and Central Denmark Region to meet the Sustainable Development Goals of the UN. In collaboration with a number of public and private parties we tackle the complex challenges of creating sustainable business opportunities through innovative thinking. Construction and urban development with circular economy in mind is of paramount importance to us. Hence; we are immensely proud to have launched Circularity City.

— Anders Kühnau
President
Central Denmark Region
Call to Action

In 2012, the Central Denmark Region made circular economy a driver for sustainable business development. Today, circularity is widely acknowledged as the business paradigm of the future. Being first movers in the transition to a circular economy, the businesses and municipalities of Central Denmark Region are ready to seize the opportunities this paradigm presents. This publication aims to inspire stakeholders from both within and outside the region to take part. By presenting a vision and framework for how to accelerate business development through The Circularity City Project,

Cities are key in the transition to circular economy. Currently, cities are undergoing extensive transformations, as an unprecedented number of people are moving to urban areas, transforming businesses and the built environment in the process. This provides new opportunities for rebuilding our cities to accommodate circularity in all aspects of urban life, stimulating a transition to circular economy within the construction sector.

The Circularity City project will bring together actors from across the Central Denmark Region to create the circular cities of tomorrow and leverage circular construction and design to accelerate sustainable business growth.
Partners
# Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shaping the Future City</strong></td>
<td></td>
</tr>
<tr>
<td>A vision for the Circular City</td>
<td>06</td>
</tr>
<tr>
<td>Built Environment Trends</td>
<td>07</td>
</tr>
<tr>
<td>Advisory Board for Circular Economy</td>
<td>14</td>
</tr>
<tr>
<td>UN Sustainability Goals</td>
<td>16</td>
</tr>
<tr>
<td><strong>Circularity City</strong></td>
<td></td>
</tr>
<tr>
<td>The Circularity City Project</td>
<td>18</td>
</tr>
<tr>
<td>Circular Potential</td>
<td>20</td>
</tr>
<tr>
<td><strong>Business Models</strong></td>
<td></td>
</tr>
<tr>
<td>5 Circular Business Models</td>
<td>21</td>
</tr>
<tr>
<td>How to Prosper in the Circular Economy</td>
<td>22</td>
</tr>
<tr>
<td><strong>Circular Design</strong></td>
<td></td>
</tr>
<tr>
<td>Circular Design Strategies</td>
<td>58</td>
</tr>
<tr>
<td>Circular Design across Urban Scales</td>
<td>59</td>
</tr>
<tr>
<td>Challenges for Circular Cities</td>
<td>69</td>
</tr>
<tr>
<td>Opportunities for Circular Cities</td>
<td>72</td>
</tr>
<tr>
<td><strong>Roadmap</strong></td>
<td></td>
</tr>
<tr>
<td>Mission Statement</td>
<td>78</td>
</tr>
<tr>
<td>Circularity City Charter</td>
<td>84</td>
</tr>
<tr>
<td>Becoming a Partner</td>
<td>85</td>
</tr>
</tbody>
</table>


CIRCULARITY CITY

shaping the future city
A Vision for the Circular City

Our vision is to empower businesses and municipalities to create the circular cities of the future: cities that are not only enriching to live in, but where urban life itself enriches the city and the world around it.

Accelerating circular growth
Circularity City will be an engine for urban transformation and growth in the Central Denmark Region. Together, we will develop new urban solutions where resources and materials are designed for disassembly and embedded in closed loops making it possible to regenerate and reuse them again and again.

Today, most people in the world will live in cities. Finding enough resources to expand and rebuild our urban centres will prove a major challenge. At the same time, cities provide ideal conditions for developing new ways to build and organise urban life in a way that is resource efficient and abundant by design.

Circularity City will bring together those companies and municipalities in the Central Denmark Region that are willing to take the lead and demonstrate how to shape our future circular cities. We will support building developers in the region to create solutions that promote an industry with closed material cycles and positive environmental impacts. We will enable pathfinder projects for inspiration and learning for the whole sector, here and abroad.

The goal is to accelerate the circular transformation of cities, enabling them to become re-producers of resources rather than producers of waste. The ambition is to shape the future of cities as sustainable centres for rich and healthy lifestyles.

Recycling materials
We address systems and processes to recover reusable materials from the buildings we renovate or demolish, and integrate these into new construction.

New materials and methods
We develop clean building materials and flexible construction methods that make it simpler to take apart and recycle whole buildings.

Establishing value chains
We implement business models that promote circular construction and form new collaborative partnerships to work within construction value chains.
1. Assemble

We assemble the construction sector around circular building and urban development projects.

We identify barriers and opportunities that must be addressed to accelerate circular construction.

We distribute responsibilities to ensure that the right skills and solutions come into play.

We integrate companies through collaboration and thus create new opportunities for growth.

Circularity City facilitates increased collaboration between businesses and municipalities. Find out how you can take part in realising the vision here:

www.circularcitycity.dk/bliv-partner/ now.
Three Steps to Realising the Vision

Circularity City will assemble relevant stakeholders in the Central Denmark Region to map out opportunities and barriers for circular economy in the built environment. We will assemble regional and global inspiration and best practices in order to create innovative solutions and scale these across the region.

2. Innovate

We help businesses and builders develop and integrate circular processes.
We establish value chain collaborations to deliver circular building solutions.
We develop new circular business models for the construction sector.
We offer introductory courses to businesses wishing to transition to circular construction.
We provide financial support for the development of solutions and projects.

3. Initiate and Scale

We propose circular solutions for construction projects in the Central Denmark Region.
We match circular solutions with building and urban development projects throughout Denmark.
We bring solutions to cities around the world, with New York as the first destination.
There is no doubt in my mind that the circular economy will come. It is important for us to drive development in this area to ensure that we understand what kind of solutions we can provide, once clients realise that this is the new paradigm.

— John Sommer
Director of Strategy and Business Development
MT Højgaard Group
At the heart of creativity, innovation and growth, cities play a central role as motors of the global economy. 54% of the world’s population live in urban areas, and cities account for 85% of global GDP generation.

World Bank, Urban Development Overview

Cities are aggregators of materials and nutrients, accounting for 75% of natural resource consumption, 50% of global waste production, and 60-80% of greenhouse gas emissions.

UNEP, Resource Efficiency as Key Issue in the New Urban Agenda

Natural resources are currently being consumed at twice the rate they are produced. By 2050, this could be three times.

OECD, An Emerging Middle Class

Europe’s savings in resource consumption by 2030 is estimated to be up to 32% or €600.000 million versus today, thanks to a circular economy vision.

Ellen MacArthur Foundation, McKinsey Center for Business and Environment, SUN, Growth Within: A circular economy vision for a competitive Europe 2015

Denmark is increasing circularity by boosting overall recycling to 80% and reducing the amount of waste generated by 15%.

The Advisory Board for circular economy Recommendations for the Danish Government
The potential **economic benefits** are estimated of up to €1,800,000 million annually by 2030 for Europe’s mobility, food and building sectors.

Ellen MacArthur Foundation, McKinsey Center for Business and Environment, SUN, Growth Within: A circular economy vision for a competitive Europe 2015

**Europe’s resource productivity** will grow by up to **3%** annually, thanks to a circular economy and enabled by the technology revolution.

Ellen MacArthur Foundation, McKinsey Center for Business and Environment, SUN, Growth Within: A circular economy vision for a competitive Europe 2015

Denmark will gain **greater economic value** from materials by boosting resource productivity by **40%** based on amount of materials, and by **15%** based on their value.

The Advisory Board for circular economy Recommendations for the Danish Government

**What are the facts?**

The Circularity City project seeks to meet emerging global challenges while placing Central Denmark Region at the forefront of circular design, innovation, and business development.
Built Environment Trends

Several drivers of change in the built environment are accelerating the transition towards a circular economy. Digitisation, new models for collaboration, and modular fabrication and construction are increasing the potential of circular construction as a business area.

Digitisation: BIM, Big Data, and IoT
Building Information Modelling (BIM) drives a convergence in the building value chain, increasing transparency and the potential for collaboration around new business models for circular construction, operations and reuse. Big Data and IoT hold the potential to improve circular decision-making in design and construction, for example through BIM integrated Life Cycle Assessment (LCA) tools and material passports, or using real-time data to optimise building operations or reduce waste during construction.

Modular fabrication and construction
Modular fabrication of larger building elements off-site greatly enhances the possibility for circular construction. Modular buildings are increasingly envisioned as adjustable structures that can be adapted to changing needs throughout their lifetimes. Adaptation is essential for keeping resource intensive buildings in circulation for longer, while modular reuse can allow building elements, even whole rooms, to gain a second life as parts of new structures.
New models for collaboration

New models for collaboration will affect the business of all members of the construction value chain. Companies will look to new ways of organising projects which enable improvements from the earliest stages of the design process. Defining new models for cooperation throughout design, procurement, construction and operations can enable circular solutions through cheaper and better project delivery, up-scaling design for disassembly, and enabling recycling of building materials at a higher value during both construction and demolition.

12. Create a Circular Building Regulation
The Advisory Board recommends introducing requirements for disclosure about materials, undesirable substances, and volumes of reused and reusable materials from 2020; and introducing a voluntary sustainability class from 2020, made obligatory from 2025.

13. Develop Standardised Building and Product Passports
The Advisory Board recommends developing a standardised and free digital building passport as well as a product database with digital information sheets for producers and suppliers; establish national secretariat for driving development of international standards and passports.
The Advisory Board for Circular Economy

In 2017, the Danish Government established an Advisory Board for the circular economy. The advisory board comprised leaders from leading Danish businesses and organisations who formulated a vision for Danish Industry as a global leader in circular economy by 2030. The vision was supported by 27 tangible recommendations to the government, 4 of which aimed directly at accelerating the transition towards circular economy in the built environment.

17. Public Authorities Should Build and Procure on the Basis of Total Life Cycle Costs
The Advisory Board recommends that the Government develops new lifecycle cost tools that incorporate income and expenditure from waste management and resale into calculations, and to make these the primary economic criteria for public construction projects in excess of DKK 5 million (ca. € 690,000).

26. Disseminate Selective Demolition of Buildings
CE Advisory Board recommends regulatory demands for selective demolition, based on detailed demolition plans mapping out materials, undesirable substances, reuseable materials and potential value.
The UN’s 17 Sustainable Development Goals are an ambitious, globally shared framework for a better, cleaner, more just and sustainable world in 2030.

By implementing the principles of circular economy in the built environment, cities, companies and residents in the Central Denmark Region can take up this call to action and take the lead within a global movement.

3. Good Health and Well-Being
The circular economy can be a driver for a cleaner and healthier built environment, where Design for Disassembly and material filters place focus on high-quality products and a reduced reliance on chemicals, ensuring healthy lives and promote well-being for everyone.

8. Decent Work and Economic Growth
Promote continued, inclusive and sustainable economic growth, full and productive employment and decent work for all. Circular business development relies on local loops and promotes job creation and better integration of businesses in local communities.

11. Sustainable Cities and Communities
Make cities and human settlements inclusive, safe, resilient and sustainable. Circular economy in the built environment drives a new wave of adaptable and resilient urban development, mixing green and built environments to the benefits of all residents in our cities.

12. Responsible Consumption and Production
Ensure sustainable consumption and production patterns. Circular economy is vitally engaged with creating frameworks for integrating sustainable behaviours directly into the business models and practices of companies, municipalities and residents.
Circular City
The Circularity City Project

Circularity City is a business development project, which will be an engine for urban transformation and growth in the Central Denmark Region. During 2017–2020, the project will assemble stakeholders in urban development and the construction industry to develop circular construction methods for actual projects in the region.

Together, we will demonstrate that it is viable to build effectively with circular principles. Circularity City is anchored in the Central Denmark Region, where municipalities and private urban developers contribute with construction and urban development projects. These will serve as beacons for circular construction in the region. The projects must raise awareness, not only in Denmark but also abroad, to create new business and export opportunities for the region’s construction companies.

More than 50 companies in the Central Denmark Region are taking part in the circular transformation of the construction sector.

Four principles driving circular urban development

Preserve and enhance natural capital. by controlling finite stocks and balancing renewable resource flows.

Optimise resource yields. by circulating products at the highest utility at all times.

Foster system effectiveness. by revealing and designing out negative externalities.

Do more good. by involving stakeholders in decisionmaking.
Circular Potential in Central Denmark Region

The Central Denmark Region is the second largest in Denmark. Home to 1,3 million people and Denmark’s second largest city, the region is a bustling hub with many small and large companies, developers, suppliers and end-of-life contractors. Now it is time to bring together business and the public sector to create a vision and roadmap for circular regional development.
Population diagram showing major cities and their populations.

Connections diagram showing travel times to significant destinations.
The Public Sector can Accelerate the Transition

Policy makers have an important role to play in the transition to circular economy. The public sector is uniquely placed to take the long-term perspective required for setting ambitious goals and driving positive change.

For the better part of a decade, the Central Denmark Region has stimulated circular economy business development with more than DKK 100 million (ca. € 13.4 million). In the future, policymakers in the region can commit to stimulating market activity by changing public procurement, creating and sharing best practices, and providing financial and technical support to businesses.

“It is tricky to measure the positive impact of circular economy on both environment, resources and economy within current economic frameworks but this is crucial for securing resources and recognition for projects moving forward.”

— Hanne Juel, Circular Economy Team, Central Denmark Region
Scaling the Circular Economy

Circular business development and more efficient material loops are key to transforming the Central Denmark Region into a global leader in the circular economy. The potentials are already there, now it is up to the businesses and partners of the region to tie these opportunities together and achieve circularity at scale.
Cities are Taking the Lead

Skanderborg
In Skanderborg, the construction of a new multifunctional building has created greater cohesion in the municipality. The building houses the municipal administration and the police, a multi-purpose sports and events space, and a wide range of outdoor activities. The Multi House is characterized by being highly flexible, meaning it can be used for everything from smaller meetings to larger events with up to 4,000 participants. The building is DGNB certified, with very low energy consumption and minimised waste generated during the construction process. The procurement process has been crucial to achieving a good result. The municipality expects to save up to DKK 12 million (ca. € 1.6 million) per year in operation costs, which has been used to justify the slightly higher construction cost.
Aarhus
Aarhus Municipality is taking the lead in circular construction in the district of Gellerup, which is seeing major redevelopment. The municipality will complete a new administration building in 2018. The building will house 1,000 municipal employees as well as restaurants, entrepreneurship environments and public access to the roof terrace in order to reinvigorate Gellerup. The building is an excellent example of social and environmental sustainability in construction. Strategies for recycling of water and low energy consumption are integrated into the building, and large parts of building components, including brick, wood cladding, and fixtures, have been recycled from other municipal buildings.

Skive
With the project ‘Rebuild Skive’, Skive Municipality is introducing the circular economy to building practice. Alongside Hedensted and Arhus municipalities, Skive is taking the lead in developing circular tenders for public construction projects, starting with 41 homes for citizens with Autism Spectrum Disorders. The project is based on past experience from the ‘Genbyg Skive’ project, focusing on recycling construction waste; a focal area that will be developed further through the municipality’s experiences with circular procurement. These efforts are supported by the Central Denmark Region through the Circularity City project.

Samsø
The Island of Samsø has established itself as frontrunner in sustainable development. In 2007, Samsø achieved their goal of becoming an island run entirely on renewable energy, the first such place on the planet, as clean energy production surpassed total energy consumption. Today Samsø has the ambition of becoming a Circular Island. Under the motto ‘It stays on the Island’, the municipality, producers, and residents are working towards closing material and energy loops, with a special emphasis on bio resources.
I believe that the cities of the future must be more sustainable and incorporate circular economy. Aarhus has the potential and ambition to be a frontrunner in this endeavour.

— Jakob Bundsgaard
Mayor of Aarhus
Aarhus Municipality
Circularity City

business models
5 Circular Business Models

Circular business models are a key to the transformation from a linear to a circular economy in the construction sector, and must work alongside design strategies, governance, and regulations for the transition to be a success.

Circular business models generate new ways to develop and grow a business while improving planning, creating savings, and leading to responsible material choices¹. The business models are based on a comprehensive lifecycle approach and seek to forge new productive partnerships in the construction value chain. One way to implement the model, is to create consortia, which include designers, suppliers, service providers, contractors, and demolition companies, who all need to work closely together to forge robust business partnerships.

Sources: 1 Circulair bouwen

Find inspiration and insights about how to transition towards circular economy from pioneers in the Central Denmark Region.
Diagram showing how the five business models integrate in the building life cycle.
The 5 Business Models Are:

1. **Circular Supply**
   Replace virgin raw materials with materials that are renewable or bio-degradable.

2. **Resource Recovery**
   Recover discarded products or by-products to recycle or upcycle the materials.

3. **Life Extension**
   Extend the life cycle of a product, or parts of a product, while preserving the original function.

4. **Sharing Platforms**
   Increase the use of a product through new models for sharing, accessibility, and ownership.

5. **Product as Service**
   Optimise productivity of a resource or product while maintaining ownership of the product.
1. Circular Supply

**Circular Supply**

In this business model, the focus is on supplying fully renewable, recyclable or biodegradable resource inputs that support circular production and consumption systems. In this way, materials keep their quality and value, securing a steady supply of raw materials for new construction, while companies replace linear approaches and reduce the use of scarce resources and the production of waste.

*Diagram showing how the ‘Product as Service’ model integrates into the process.*
Revaerk is not only creating beautiful buildings but also developing sustainable construction materials for the future. The Aarhus based studio is exploring aesthetic potentials and fabrication methods of compressed clay with the aim of having the material approved for construction.

REN paint is developed and designed in accordance with circular principles; it has been documented that REN contributes to creating a healthy indoor climate where no emissions of harmful substances occur.

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It’s about perceiving buildings as raw materials. Materials should be produced for disassembly and recycling. The construction industry, residents and society as a whole - everyone will gain from this.

— Niels Heidtmann
Technical Director
Komproment

Image: A cradle to cradle certified development, housing in Albertslund. Image ©Komproment ApS
Company Case

Komproment

Komproment has had a breakthrough in export of C2C certified sustainable roof and facade systems. The company wants the construction industry to adapt to a circular mind-set.

We’ve got the materials for circular construction
In early 2017 Komproment gained a Cradle to Cradle certification for its roof and facade systems, based on bricks and natural slate. The Cradle to Cradle certification is part of a conversion process where the entirety of Komproment’s products will gradually be certified to document that the materials used in production are 100% pure and do not contain any substances that can obstruct the full reuse of materials at the end of product life cycles. In parallel with this certification process, the company is taking on new export markets. In some of these markets, circular construction is already becoming good business practice, but in order to further the transition, it is important to demonstrate strong business cases for the industry as a whole. According to Niels Heidtmann, Technical Director for Komproment in the Circle House project, Circle House will be a good demonstration project for circular construction which can show a way forward for other companies.

Sustainable facade and roofing solutions
Komproment has developed several facade systems for brickwork, natural slate and solar cells, all of which are designed as light ventilated solutions. Both the brickwork and natural slate facades can be used in roof and facade applications, thus presents as a comprehensive solution for the entire climate screen.

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2. Resource Recovery

**Resource Recovery**
This business model relies on reverse cycles for the recovery of embedded value at the end of product lifecycles. High quality resources lend themselves to recycling and upcycling processes that maintain, or even increase resource value as they are used as input for new construction materials.

The key is recycling value rather than simply volume, as waste from one production cycle can become input for another. One example could be a take-back system, including a collection service to recover useful waste materials from construction sites.

Diagram showing how the ‘Product as Service’ model integrates into the process.
Troldtekt is currently seeking to establish a take-back system to ensure optimal utilisation of Troldtekt waste from construction and demolition sites, and further advance their transition to circular economy. The company is exploring collaborative partnerships in both construction and adjacent industries to handle logistics and collect the necessary volume.

NCC has launched an ambitious goal for their sustainability strategy. The mission is to ensure that all construction materials used in NCC projects are a part of closed resource circuits by 2020.

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"We must be the ones who take it all. We must ensure that the materials are of a proper quality. When someone needs it, they buy it from us. Be the part of the supply chain that provide the needed materials."

— Ebbe Tubæk Naamansen  
Sustainability Director  
RGS Nordic
Company Case

RGS Nordic

The recycling company RGS Nordic is in the process of establishing a virtual resource bank for recyclable materials for the construction industry and certification for their concrete produced from recycled materials.

RGS Nordic has found their place
RGS Nordic works with industrialization processes for recycling building materials. As a direct result of their work with the principles of circular economy, RGS Nordic is establishing a platform for matching broken down building materials with new building projects, where it can be reused. In this work RGS Nordic is drawing on their strong position within logistics, which makes them able to secure a reliable supply of recyclable building materials in the market.

Special effort for upcycling of concrete
In order to encourage circularity within the construction industry, RGS Nordic is involved in various development projects. For example, they have collaborated with DK Beton to crush and reprocess concrete waste to become high quality recycled concrete. Today when a house is demolished, the concrete is crushed and used to fill roads. According to RGS Nordic and DK Beton however, the aim is to recycle concrete in the production of new concrete, and hence avoid the material is disappearing from the circuit, as it does when used as road fill, but can be used with full traceability again and again.

Ensuring the flow of recycled materials
The market for recycled building materials is still under development. RGS Nordic works, among other things, to develop and process recycled materials so they have the same quality as new, and will demonstrate this through a certification system. Meanwhile, the company aims to catch the interest of the material manufacturers and get them to incorporate recyclable materials in their new construction products. It is an important element to make the market and virtual resource bank work.

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RGS Nordic
Location: DK, SE, NO
Established year: 1991
Number of employees: 100-199
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3. Life Extension

Life extension
Life extension business models allow for capturing additional revenue based on extending the lifecycle and use of products and assets. Value that would otherwise be lost can be maintained or improved through:

- Direct reuse or resell.
- Repair and/or upgrade for resell.
- Separating products into parts for remanufacturing and/or refurbishing of the product in an upgraded version for resell.

Design for disassembly and adaptive reuse of the built environment can help extend the life of buildings and infrastructure, but demolition companies are also important pieces in the puzzle when it comes to life extension. They are in the position to ensure product life extension through new markets in reused and upcycled products.

Diagram showing how the ‘Product as Service’ model integrates into the process.
Dansk Genbyg is an online marketplace for reusable, high-quality construction materials. With this virtual sharing platform, the founders wish to contribute to the development of circular construction practices.

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Gamle Mursten specialises in cleaning and recycling secondhand brickwork, through their unique patented cleaning method. They clean the bricks by vibration, no water or chemicals are used in the production, releasing less CO2.

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It was a bit of coincidence that we got into it. What sparked our interest was the idea of reusing as many things as possible and selling them again.

— Gregers Frederiksen, Director
Salling Entreprenørfirma
Company Case

Salling Entreprenørfirma

After discovering the potentials of selective demolition, Salling Entreprenørfirma has introduced circular business models into their practice – including a social economic enterprise helping people find jobs in the construction sector.

Demolishing buildings while building up people
Since 2014 Salling Entreprenørfirma has been gradually refining their demolition methods using a more selective approach. This means localising reusable parts of a building on site and carefully dismantling them to enable resale, a process which requires more manual labour. Director, Gregers Frederiksen started up a social economic enterprise called Salling Genbyg, where demolition is carried out by people on the edge of the labour market as part of a job-clarification process. The process is managed by a social education professional especially hired by the company. After a three-month period, several of programme attendees re-enter the job market in full employment.

Municipal-led project started the development
Salling Entreprenørfirma initiated these circular and social-economic business activities after taking part in the “Re-build Skive project” (“Genbyg Skive”). The project was initiated by Skive Municipality in collaboration with partners, including the local Dania University of Applied Sciences. The purpose of the project was to promote business development from the reuse of construction materials. At the time, Salling Entreprenørfirma had won a contract for the demolition of five houses, and this job became a part of the project. Students from the local production engineer programme worked with Salling Entreprenørfirma on potential business models, which kick-started the development of the social economic enterprise, and the digital marketplace Dansk Genbyg.

Today reusable materials are sold before demolition
Today Salling Entreprenørfirma map and photograph materials suitable for reselling 1-2 months before demolition of buildings. The materials are then posted along with the photos for sale on the digital platform Dansk Genbyg. Selling materials before demolition means that they can be transported directly to the new owners without going into storage.

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4. Sharing Platform

Sharing platforms
This business model promotes sharing platforms to facilitate cooperation among users, either individuals or organisations. Virtual sharing platforms enable distribution of the surplus supply of materials and utilisation of underused equipment and services.

The model facilitates this either by enabling or offering shared use, access, or ownership. Emerging technologies for additive manufacturing and automated fabrication makes design and fabrication blueprints a shareable resource as well.

Diagram showing how the ‘Product as Service’ model integrates into the process.
Samsø Energiakademi, AplusB, Aarhus Municipality, Central Denmark Region and BF Ringgården have developed circular economy guidelines residents in Lisbjerg to help the sharing economy reach its full potential in the neighbourhood.

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3D Printhuset has built Europe’s first 3D printed building which is located in Copenhagen, Denmark. It was built to show the Danish construction industry the advantages of incorporating 3D print technology in the building process.

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Image © 3D Printhuset
It has lowered the costs in the industry and reduced the environmental impact through lower CO2 emissions and the extraction of fewer raw materials.

—Anders Torell
Head of Business Transformation and Digitalization
NCC Industry
Company Case

NCC Loop Rocks

NCC is the initiator of the Loop Rocks app and has, in collaboration with the Loop Rocks developers, created a free platform for individuals and businesses that allow for smarter matching of supply and demand directly between locations.

An open platform for distribution
Loop Rocks is an open platform and app for smartphones for the distribution of rock, dirt and other surplus building materials between construction sites, businesses and for private clients. With Loop Rocks, supply and demand for surplus materials at construction sites are matched by looping them directly between the sites.

“It has lowered costs in the industry and reduced the environmental impact through lower CO2 emissions and the extraction of fewer raw materials,” says Anders Torell, Head of Business Transformation and Digitization at NCC Industry and Loop Rocks. The app was first introduced in Sweden and a year later to Denmark. Today, there are over 4000 users of the app and NCC expects the number of users to keep increasing.

As a platform for sharing surplus materials for use in the construction industry, Loop Rocks combines two circular business models: sharing platforms and resource recovery.

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5. Product as Service

Product as service
This business model is an alternative to the traditional model of “buy and own”. The focus is on performance rather than products, and ownership usually stays with the service provider.

Through various service arrangements, including pay-for-use, leasing, rent or performance arrangements, the product is then used by one or more customers.

Key points
- The customer pays for the exact use of the product by buying a particular performance.
- Supplier and customer agree on the right to use the product for a defined period of time.

Diagram showing how the ‘Product as Service’ model integrates into the process.
3R Kontor is a company with a circular economy mind-set and a full-service business model. The company curbs unnecessary production of office furniture through acquisition, sale and rent of second-hand office furniture as well as a donation network.

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Fischer Lighting do circular LED retrofitting that prolongs the life of existing lighting fixtures and have developed a performance-based financing model that allows clients to pay for the LED retrofitting. Savings are therefore realised due to lower energy consumption.

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Eurotag Danmark is transitioning from a linear to a circular business model.
Company Case

Eurotag

With a Cradle to Cradle certified flat roof product, their Tight-Roof service model, and a take-back service, Eurotag Denmark is transitioning from a linear to a circular business model, and towards a full-service concept.

Taking the flat roof business to the next level
Sustainable flat roof solutions are the core business of Eurotag, the only Danish retailer of products from the Belgian company Derbigum. Choosing a sustainable flat roof solution should be easy and uncomplicated. To this end, Eurotag has created the service concept ‘Tight-Roof’, disseminated through a national network of authorised roofing contractors who specialise in Eurotag’s products. Under this umbrella, a range of services help customers pick and maintain the best solution. Firstly, The service offers a free roof check and a non-binding offer for any repairs. Secondly, if you subsequently select one of their sustainable solutions, an independent quality controller from Eurotag will ensure compliance with regulations and carry out any corrections required. Thirdly, an insurance guarantee is issued, covering materials, labour costs and possibly consequential damages for up to 20 years.

Excess and worn-out materials are recycled
Eurotag’s participation in the regional development project Rethink Business resulted in a new take-back service for flat roof surplus and waste materials. The take-back service offers customers the opportunity to save the costs and logistics of waste disposal, as Eurotag collects waste and excess materials from flat roof work from retailers and roofing companies. Collected materials are sent to Derbigum’s factory in Belgium for processing and recycling. Last year, Eurotag reused 4,000 tonnes of roofing material in this way, saving money, energy and raw materials while reducing environmental impacts.

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Eurotag Danmark A/S
Location: Glostrup
Established year: 1989
Number of employees: 10–15
Web: eurotag.dk
Circular economy is much more than just reuse and recycling. It will be at the core of 21st century business models, giving us a new perspective on how to ensure value creation. It is a framework for positive thinking and innovation, driving new business by solving the challenges of tomorrow.

— Jesper Minor
Founder and CEO
Minor Change Group
Diagram showing how different fields will be affected by the Circular principles.
How to Prosper in the Circular Economy

The first companies to successfully adapt to new circular business models will have a competitive advantage in the circular economy. However, their growth potential will differ, depending on their placement and role in the emerging circular value chain for the construction sector.

Public and private construction clients are key to changing practice in the construction value chain, and, providing they are able to apply circular business models to the construction and operation of buildings, will enjoy large benefits. Savings to operations and value from extended use and closed material cycles will accumulate to enable new forms of real estate investment.

The focus and methods of consultants, such as architects and contractors, will change, and companies who are able to offer strategic advice on how to best meet circular requirements will have an advantage.

End of life contractors will play a key role in resource recovery and life extension of building materials. As such they have an expanding business potential ahead of them, providing they manage to redefine their position as facilitators of resource loops within the construction sector.

If material producers and wholesalers in the built environment understand how to redefine their role from simply being retailers to also becoming service providers, a new prosperous business path will lay open for them.

For the suppliers of building materials and products, it can go both ways. The new circular business models will seriously challenge suppliers of simple products and materials based on virgin resources, which can easily be replaced by reused products and materials. But these suppliers can meet the challenge by establishing collaborations with demolition companies for supplying them with recycled raw materials. Suppliers of more advanced materials and products that are clean, recyclable and adaptable for service concepts will have great opportunities in a circular economy. But to benefit from this business potential, they will have to collaborate closely with wholesalers and/or embrace this part of the value chain themselves. If not, they risk losing out on capturing extra value from servicing and upgrading products, or even worse end up selling fewer products as the lives of the ones already sold are being extended.

“The first companies to successfully adapt to new circular business models will have a competitive advantage in the circular economy. However, their growth potential will differ, depending on their placement and role in the emerging circular value chain for the construction sector.”

“GXN and 3XN leverage circular design thinking to impact the built environment and create new value based business opportunities.”

- Kasper Guldager Jensen
Director and Senior Partner
GXN and 3XN
circular design
Circular Design Strategies

Circular design strategies are key to the transition from a linear to a circular economy in the construction sector. Design for disassembly and lifecycle design across urban scales is essential to building a truly circular urban environment and hold large potential gains for people, businesses, and environment.

**Circular design can improve human well-being in the Central Denmark Region**

Circular design should not be seen as simply a collection of design strategies, but rather as a comprehensive philosophy for improving living standards, meeting social outcomes, and increasing human well-being in the whole region.

Filtering materials and reducing waste will make circular designed buildings and neighbourhoods cleaner and healthier. Designing for disassembly will introduce a new kind of flexibility to the built environment, allowing it to adapt to the changing needs of residents. New value chains and business opportunities will also support localised growth and employment.

**Circular design can reduce our environmental footprint**

Circular systems design can radically reduce the amount of waste generated by the built environment in the Central Denmark Region and minimise the need for new materials. Making buildings and products easier to produce, maintain, and upcycle, is a first step to easing demands for raw materials and alleviating resource scarcity in cities.

If we create buildings that can truly be thought of as temporary collections of high value materials, the built environment will become a material bank, storing valuable resources for future generations. Urban areas in the Central Denmark Region can then become engines for regeneration of the wider environment.
Nails damage the material. Use screws, pins, nut and bolts.

Fasteners can be found in all shapes and size. Use common and similar fasteners.

Avoid glue and sealants. Use easy dissolvable binders.

Portland cement is impossible to disassemble. Use lime mortar instead.

Diagram: showing some strategies to follow when considering design for disassembly.
Diagram © GXN Innovation
Design for Disassembly

Cities, buildings and products in the Central Denmark Region should be made circular by design. ‘Design for Disassembly’ is a holistic approach seeking to make any given product easy to disassemble into its individual components without significant loss of value.

Design for Disassembly is a cornerstone of the circular economy. It allows resources to fit into looping material cycles, where they can be reused, reassembled, and recycled at similar or higher value. In the built environment, this requires a strategic approach to building components during design phases, consideration of the differing lifecycles of construction elements, as well as careful thought about what will happen to elements at the end of their life.

There are a lot of different ways to enable easy disassembly of products irrespective of scale. The key point is that all connections between components must be reversible, without causing damage to the parts. This means that screws, splits, and nuts and bolts are favoured over nails, and that binders, such as glue, should be avoided. To allow for easier deconstruction, connections must be easy to access and preferably visible.

Designing for disassembly in this way increases the possibilities for effective reuse of building components and materials, as well as the possibilities for integrating reused elements from former buildings or other industries in construction projects. Collaboration across the full construction value chain is the key to success, the complexity and different scales and lifecycles in the built environment require systemic solutions involving many products and partners.

The greatest opportunity for delivering buildings and products that fit within the circular economy is at the design stage.
A Representative Case Study

The publication “Building a Circular Future” calculates the effects of circular construction on a 42,000 m² representative case study office building with a new built value of DKK 860 million (ca. € 115.5 million).
Implementing circular design and economy’s best practices turned a DKK 16 million (€ 1.7 million) downside into a DKK 35 million (€ 4.7 million) upside on this representative case study by MT Højgaard Group.

1. A positive business case
Redesigning the case study building and implementing circular economy principles, turns the current demolition costs of the building into a positive business case.
- Go from today’s DKK 16 million (ca. € 1.7 million) in demolition costs.
- To a future with DKK 35 million (ca. € 4.7 million) in business upside.

2. Resale earnings
The resale value of the case study compared to turn key cost. Due to resource scarcity, earnings will increase over time.
- Earn 4% of new build value on super-structure and envelope, in today’s material prices.
- Earn 8% of the new build value on the entire building, in today’s material prices.
- Earn 16% of the new build value on the entire building, in +50 years projected material prices.

3. Prerequisites for reuse
To prepare buildings for a circular future, today’s building practice has to integrate the following.
- Design for disassembly: Make all joints visible, mechanical, dissolvable, and similar.
- Material passport: Establish functionality information at component level.
- Circular economy: Implement business models that supports a circular transition.

4. Short term gains
Implementing circular principles creates immediate gains and a flexible building.
- Improved flexibility: Immediate and short term gains.
- Faster construction by shortening drying times and optimizing workflow.
- Optimized maintenance by simple connection logic and detailed information at component level.

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Diagram showing the different lifecycles of building components.
This diagram is a reinterpretation of an original owned by Steward Brand.
Building Lifecycles and Circular Design

To be effective, circular design must take into account the different lifecycles of building components. It is essential to design buildings so that different layers do not overlap and prevent disassembly, upcycling, and reuse.

**Things (0-5 years)**
The things we bring into our buildings; furniture, curtains, lamps, etc. have short life cycles and are replaced regularly. Things should be considered in relation to the building’s total resource consumption so they are as circular as possible and can be efficiently reused at the end of their life.

**Fixtures (5-15 years)**
A building must be able to adapt to the changing needs of its occupants; flexibility of partitions, walls, and technical systems is key to achieving this. These elements must be optimised for modular adaptability in ways that do not affect the remaining layers of the building.

**Installations (15-25 years)**
Installations in our buildings are usually hidden and completely integrated, but still require ongoing supervision, maintenance, and regular replacement. By making installations easily accessible and separable, we can optimise operating budgets and make it easier to change these as need arises.

**Façade (25-50 years)**
Exposed to wind and weather, the façade is expected to go through alterations or, at the very least, major renovation during a building lifecycle. Modular systems and intelligent connections can make façade elements easy to repair and dismantled without degrading material value.

**Structure (50-100 years)**
The structure is the skeleton of the building and generally has a longer lifecycle compared to other building components, sometimes even the building itself. Elements may not be directly accessible but it is crucial that structural elements can be disassembled and reused in other buildings.
Circle House in numbers:

- Circle House is 60 social housing units built according to the principles of circular economy.
- The objective is that 90% of residential materials can be recycled without losing significant value.
- The project runs for over 3 years, starting in spring 2017.
- The building is expected to be offered, on market terms, by the end of 2018.
- The building is expected to start in 2019 and be completed by 2020.
- The project involves more than 30 companies from the Danish construction industry across the entire value chain.
Circle House

The Circle House project will see the construction of the world’s first social housing units, built according to circular principles. This means, among other things, that the construction can be disassembled again and the elements can be recycled almost without any loss of value.

The Circle House project consists of 60 social housing units in Lisbjerg outside Aarhus, which are expected to be completed by 2020 with Lejerbo as the client. In addition to serving as housing, Circle House is a scalable demonstration project that will provide the construction industry with new knowledge about circular design, construction, and business.

The building is sketched by a Collaboration Studio between Lendager Group, Vandkunsten and 3XN Architects. The project is expected to be tendered in 2018, with construction beginning in 2019 and completed during 2020.

Framework conditions and business development
The transition to circular building implies, among other things, that components must be produced so that they can be separated. This is not just a technical challenge. Today, necessary elements for enabling recycling of materials are missing from the built environment value chain. Manufacturers will, in a few cases only take back their own used products so that they can be sold again. And leasing of products, such as within the automotive industry, is not yet developed for construction.

There is also a need to renew traditional business models and ensure that legislation supports recycling, in order to accelerate circular construction. For example, it is currently unclear who is responsible for the quality and the materials used in recycled construction.

The Circle House project wants to get closer to answers to these challenges. Therefore the project aims to analyse value chains, business models, business cases and framework conditions. All results and insights are shared through a broad discussion of circular construction throughout the industry; Realdania has supported this part of the work.

Cross industrial collaboration
The Circle House project aims to develop and disseminate knowledge about circular construction across the industry and across existing silos. The project brings together 30 different companies across the entire value chain of the built environment. The goal is a scalable circular ‘lighthouse’ building project that is then tendered to the market.

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Simplifying components to fewer elements made from higher quality raw materials will allow for greater re-use, thereby minimising the need for new materials. It also holds the potential to simplify operations and maintenance as components can be easily accessed, repaired, and renewed.

Learn how Komproment use circular building materials to gain new export markets on page 37.

Healthier materials will directly benefit residents’ well-being. Design for disassembly will allow buildings to retain their value over time by enabling better maintenance, and by extending buildings’ value through adaptive reuse that meet changing needs of owners or residents.

See how Circle House is setting new standards for flexible design and construction on page 66.

By optimising resource flows and integrating solutions that support social and natural life, Urban systems can become key infrastructures for regeneration of neighbourhoods. Systems thinking and smart technologies can create responsive infrastructures serving several purposes at once.

Samsø has been implementing a fully circular energy infrastructure since 2007, find out more on page 31.

The circular economy favours local loops to preserve value. This local focus can drive regeneration of communities by tying people and local business closer together. Strategies for integrating nature into the urban fabric will improve well-being and provide greater access to green spaces.

Find out how Skive seeks to implement circular design and construction at neighbourhood scale on page 27.

By supporting circular industry development, and with circular economy principles as a foundation, the transformation of cities will provide a host of new opportunities. The Circularity City ‘lighthouse’ projects will act as a showcase both within Denmark and abroad.

Learn how you can accelerate the transition towards circular cities by becoming a partner, on page 89.
Circular Design Across Urban Scales

Design for disassembly and lifecycle design across urban scales hold large potential gains for people, businesses, and environment.

Circular Design delivers value across urban scales

Our cities provide and unprecedented concentration of resources, capital, people, ideas and talent. This concentration enables economies of scale and critical mass for material loops across urban functions. It can be the basis of a new form of green and social urban development through resource sharing, upcycling and localising links between producers and users.

Central Denmark Region has the necessary scale to enable new markets and new collaborative business models. Circular economy has been steadily developing in the region, which holds a large and varied supply of both products and producers for the built environment and beyond. Regional development and urban transformation should drive the demand for goods and services that enhance the circular economy within the region.
Circularity City is an urban condition where all resources and materials are designed for disassembly and embedded in closed loops, which makes it possible to regenerate and reuse them again and again to create new value. That is what we are aiming for.

— Hanne Juel
Circular Economy Team
Central Region Denmark
Stakeholders interviewed:

Challenges for Circular Cities in the Central Denmark Region

This regional vision is based on 60+ stakeholder interviews across the built environment in the Central Denmark Region and the wider country. During these interviews a number of challenges for circular economy in the region emerged. While challenges were many and varied, key barriers can be grouped under four headings.

The key challenges are:

1. Financing Models and Business Cases
2. Material Transparency and Building Data
3. Reverse Cycles and Asset Management
4. Tested Knowledge and Processes
“The sector is incredibly focused on driving down costs. There is little understanding for long term business cases at the moment, but we try to approach our projects with a more holistic view.”

— Rune Kilden
Urban Developer
Aarhus

1. Financing Models and Business Cases
The high construction costs and long life-cycles of the built environment make it hard to calculate the return on investment of circular construction. While decision-makers in construction are interested in circular economy, they lack models for making circular strategies relevant to their day-to-day business.
2. Material Transparency and Building Data
Currently, our cities and buildings are characterised by a near complete lack of material transparency and no tracking of building components. Stakeholders lack frameworks for creating and maintaining circular building data and enabling holistic building lifecycle management.

“Building data is going to be a resource with enormous potential, but right now it is a headache for the industry: Who owns the data? Who maintains it? We have to find out.

“To be able to fully exploit potentials for valuable reuse of existing buildings, mapping of resources and accessibility of this data is essential.

— Torsten Sack-Nielsen
Programme Director
VIA University College

— Vibeke Grupe Larsen
Sustainability Strategist
NCC Building Nordic
3. Reverse Cycles and Asset Management
Circular business models, where product ownership lies with the supplier, requires new frameworks for asset management, value tracking, and reverse logistics. There are few examples of how to trace the performance of components across buildings, and establishing economies of scale to make reverse cycles feasible pose a logistical challenge to many companies.

“We want to establish a take-back system to further advance our transition to circular economy. For this we need to collaborate with more partners to handle logistics and necessary volume.”

— Peer Leth
CEO
Troldtekt

“Smart use of data on performance of buildings and installations is key for the value creation in a future circular economy. But the problem is who owns the data and how can it be made accessible for everyone?”

— Brian Sørensen
Sales Director
Grundfos
Circular economy must be integrated right from the start. Imagine what we could learn, if we could sit down with the entrepreneurs and consultants and do this together on actual projects.

— Palle Jørgensen
Director
Ringgården Housing Association

4. Tested Knowledge and Processes
Circular economy is still in its infancy. There are few tested frameworks, strategies, and processes to follow, collaboration remains tricky within existing tendering processes, and lack of conceptual clarity can alienate clients when relationships and shared knowledge is needed more than ever.
Opportunities for Circular Cities in the Central Denmark Region

This regional vision is based on 60+ stakeholder interviews across the built environment in the Central Denmark Region and the wider country. During these interviews a great number of opportunities for circular economy in the region emerged. Along with the barriers in the former section, these opportunities has provided the necessary foundation for formulating a viable vision and mission statement for the Circularity City project.

The key opportunities are:

1. Circular Business Models
2. Public Procurement and Tenders
3. Life Cycle Services and Business Development
4. Thought Leadership and User Involvement
“Pension funds do not invest in buildings but in cashflow. When they realise that their cashflow will be better secured by design for disassembly and circular economy, we will see a change.”

— John Sommer
Director of Strategy and Business Development
MT Højgaard Group

Key opportunities for accelerating the transition to circular economy in the region.

1. Circular Business Models
Circular economy must link sustainable solutions intimately to business models and economic value to ensure that they become integral rather than an add-on to projects. New models for calculating lifecycle value in the built environment can change the current one-sided focus on construction costs to also include operations and demolition costs in decision-making.
2. Public Procurement and Tenders
Public procurement can spur innovation and accelerate the transition to circular economy by increasing demand for circular products, materials, and services. The public sector can also enable collaborative pathfinder projects that will stimulate the creation of industry networks and value chain links. This engenders circular systems rather than one-off solutions.

“By including circular principles and demands in public procurement and tendering, we can accelerate sustainable innovation in the market.”

— Anne Dorthe Josiassen
Head of Department Environment and Smart City
CLEAN

“Circle House has been invaluable in setting up a framework where we could examine and approach circular economy and our roles and business models collectively.”

— Nikolaj Callisen Friis
Architect
Lendager Group
3. Life Cycle Services and Business Development

New types of service providers who engage across the building lifecycle are needed to support circular economy in cities. Greater transparency through material passports and open-source data frameworks could support companies providing holistic life cycle assessments during design and construction phases, as well as new forms of life cycle services such as building check-ups and material maintenance after construction.

“We see increasing demand for client consultancy focusing on how to identify and agree upon the best circular requirements for individual projects.”

– Mette Nyman
Partner
Loop Architects

“We in 3XN and GXN are committed to the Circular Economy. By combining economic and environmental thinking we get new business and collaborations.”

– Kasper Guldager Jensen
Director and Senior Partner
GXN and 3XN
In Skive, we have for over a decade demonstrated that a focus on resource efficiency and circular economy can create growth and new jobs.

— Karl Egeriis Krogshede, Climate Coordinator, Energy Skive

In order to accelerate the transition towards circular economy it’s crucial to involve residents and make them understand the mindset.

— Peter Christensen, Project Leader, Samsø Energiakademi

4. Thought Leadership and User Involvement
The largest potential gains for circular economy in cities lies in sector wide and societal impacts of healthier buildings, a more flexible built environment, and improved resource security. Leadership and user involvement is needed to show how circular economy can link business objectives to wide ranging positive urban development for users of all kinds.
Mission Statement

We create circular cities that support local community and business development

... by accelerating the transformation towards circular economy in the Central Denmark Region to the benefit of people, environment, and business.

We create a built environment that is regenerative, responsive, and shareable

... by embracing principles of circular design and business models in our decision-making and seeking new ways of collaborating with partners.

We eliminate the concept of waste

... by creating closed material cycles that loop across all functions and scales in the built environment and circulate resources at their highest possible value.

We do this together!

... by formulating challenges and strategies in collaboration and implementing the Circularity City Charter.
The municipality is launching the Circularity City strategy plan. A Circularity City overall plan, which contains a specific strategy on how to transform the city, is created. The projects lead to political support for the municipality’s participation in charters in the form of a mayor’s signature. The municipality must initiate one or more projects that clearly show their involvement in Circularity City. The ticket to become part of the Circularity City Charter activities forms a letter of intent that indicates the high priority of circularity. The initial charter meeting is for all municipalities. A place to gain inspiration on how to create circularity in the cities.

Diagram showing current and future initiatives of the Circularity City Project.

Image © Minor Change Group
In the Circularity City project, municipalities in the Central Denmark Region will compose a charter where they, together with leading companies and organisations from the construction industry, commit to collaboratively work towards “Circularity City - an urban state of circularity”.

The Charter will set a precedent and demonstrate how we can build and adjust our cities in order to support the transition to circular economy. Initially, focus is on the built environment, but all aspects of the city are to be considered, including the way in which it is used in day to day life. In these areas, cooperation with other initiatives within and outside the region is necessary.

Skive and Aarhus municipalities have taken the lead in establishing the Circularity City charter and running it in cooperation with the other municipalities in the Central Denmark Region. The consortium acts as supporting body with expertise and facilitates the activities of the charter.

Circularity City Charter Partners will meet every 3 months, where the direction of the project and its themes will be discussed.

Municipalities can participate at various levels depending on ability and commitment, and move gradually up the ladder through implementation of specific projects. In addition to municipalities, a number of leading companies in the construction sector also participate in the charter. As Company Charter Partners, they take on the responsibility of helping to create the Circularity City.

Each Company Charter Partner contributes with the following:
1. Deliver one or more white papers about specific knowledge areas within circular construction.
2. Share their knowledge at selected charter meetings, which will serve as the basis for discussions and activities in the charter.
3. Participate as a knowledge actor in terms of formulating specific tenders or projects.
Become a partner in the Circularity City project:
Visit www.circularitycity.dk/bliv-partner/ now.

<table>
<thead>
<tr>
<th>Diagram</th>
<th>1. Introductory Meeting</th>
<th>The initial charter meeting is for all municipalities. A place to gain inspiration on how to create circularity in the cities.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Letter of Intent</td>
<td>The ticket to become part of the Circularity City Charter activities forms a letter of intent that indicates the high priority of circularity.</td>
</tr>
<tr>
<td>3.</td>
<td>Initiating Projects</td>
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</tr>
<tr>
<td>4.</td>
<td>Political Support</td>
<td>The projects lead to political support for the municipality’s participation in charters in the form of a mayor’s signature.</td>
</tr>
<tr>
<td>5.</td>
<td>Overall Plan and Strategy</td>
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<tr>
<td>6.</td>
<td>Realization Process</td>
<td>The municipality is launching the Circularity City strategy Plan.</td>
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The municipality is launching the Circularity City strategy Plan. A Circularity City overall plan, which contains a specific strategy on how to transform the city, is created. The projects lead to political support for the municipality’s participation in charters in the form of a mayor’s signature. The municipality must initiate one or more projects that clearly shows their involvement in Circularity City. The ticket to become part of the Circularity City Charter activities forms a letter of intent that indicates the high priority of circularity. The initial charter meeting is for all municipalities. A place to gain inspiration on how to create circularity in the cities.

Diagram showing the progression around ensuring a common vision, this 6-step ladder of participation illustrates the different ways to participate and advance in the Circularity City project.

Image © Minor Change Group
Becoming a Partner

Companies and municipalities within the Central Denmark Region are invited to take part in Circularity City and use it as platform to accelerate their own transition to circular economy. As shown below this partnership can take two forms.

**Charter Partner**
A charter partner takes on responsibility for creating green growth in the construction sector by initiating significant projects and initiatives that extend beyond individual companies and interests. Municipalities participating in a construction and/or urban development projects are automatically Charter Partners.

**Benefits**
1. Access to Circularity City’s quarterly charter partner meetings with VIP participants.
2. Contributions to the topics that need to be addressed within Circularity City.
3. Case description of your project and Company /Organization in our printed magazine on circular construction and urban development.
4. Online presentation of your project and your business on web and social media.
5. Access to the introductory course, events, national and foreign projects and promotions.
6. The possibility to apply for financial support to make a project circular.
7. Access to tool kits and other material in relation to circular construction at your disposal.

**Partner**
Being a partner in the Circularity City project entails taking on responsibility for creating innovation and growth within your own business. This is achieved through work with the circular principles and business models, and delivering circular solutions to the industry through involvement in a value chain collaboration.

**Benefits**
1. Access to knowledge with the intention of developing new solutions and prospects.
2. Assistance to establish value chain collaboration with other companies.
3. Case description of the company /organization in a printed magazine on circular construction and urban development.
4. Online presentation of the company on web and social media.
5. Access to introductory courses, innovation workshops, events and projects.
6. Ability to participate in market promotion and potential international projects.
7. The possibility to apply for financial support for the innovation of circular solutions.
8. Access to tool kits and other material in relation to circular construction at your disposal.
The trend is indicating that in the future the customers will have differentiated needs and demand sustainable solutions. When the time comes the construction industry has to be ready.

— Vibeke Grupe Larsen
Sustainability Strategist
NCC Building Nordic
Resources

Visit www.circularitycity.dk to find more information, toolkits, and cases on circular economy in Central Denmark Region.


Visit www.circularitycity.dk to find more information, toolkits, and cases on circular economy in Central Denmark Region.
Circularity City – Shaping Our Urban Future
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Circularity City – Shaping Our Urban Future

Circular economy is changing industries across various sectors and is projected by many to have a profound impact on the cities of the future.

This publication highlights the ongoing efforts of the Central Denmark Region to collect and advance public and private circular innovations within the building sector.