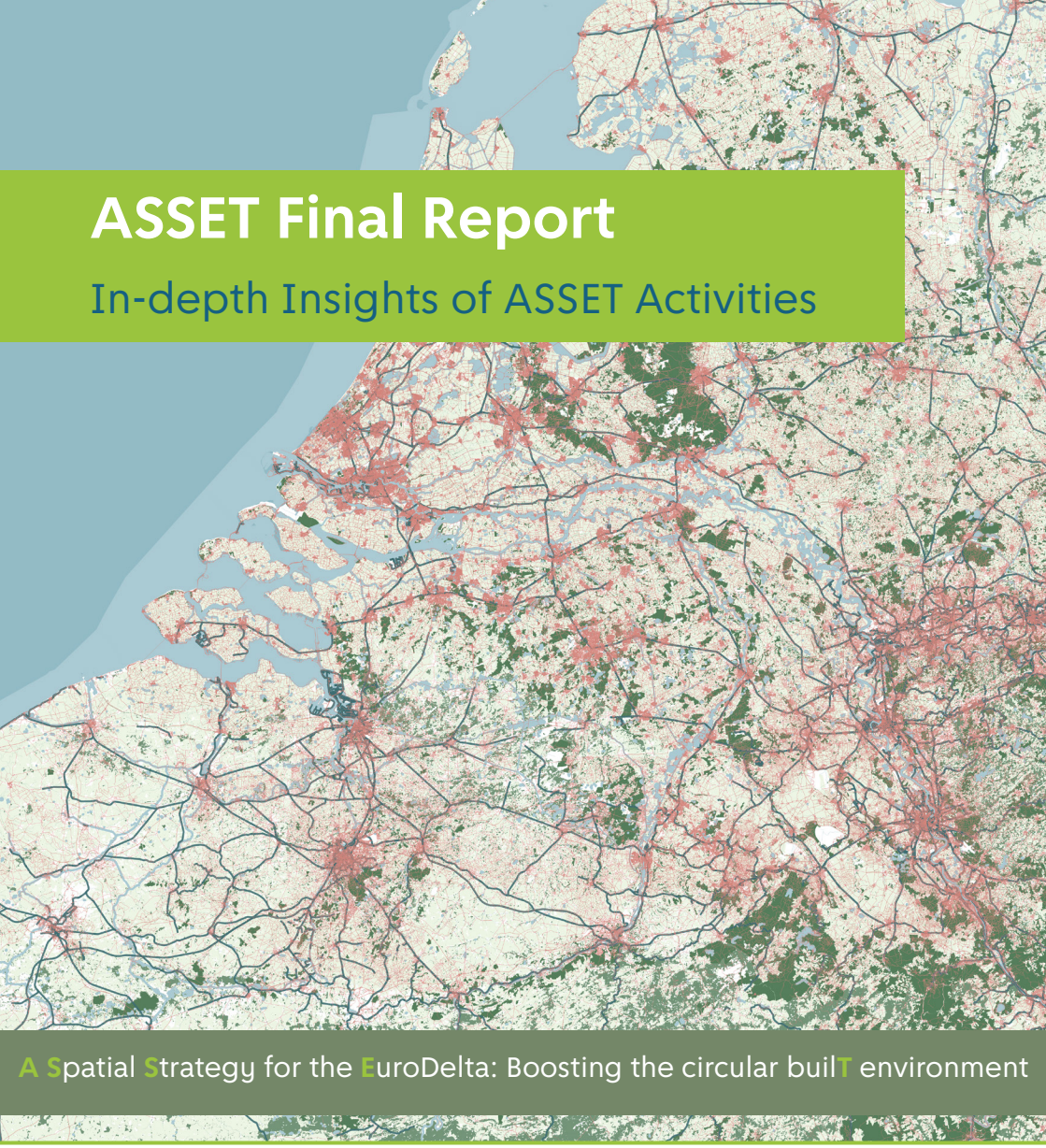
ASSET Final Report

In-depth Insights of ASSET Activities



A Spatial Strategy for the EuroDelta: Boosting the circular builT environment

Interreg
Co-funded by the European Union
North-West Europe

ASSET

Context

A circular built environment (CBE) comes with new demands for space – circular building hubs, storage spaces for reused materials, for sorting, and for developing biobased materials, etc. This transition adds to the already substantially large spatial claims of the energy transition, climate adaptation and regeneration of biodiversity.

ASSET, which stands for ***A Spatial Strategy for the EuroDelta: Boosting the circular builT environment***, is an Interreg North-West Europe (NWE) project with the aims of understanding the concept of a circular built environment (CBE), exploring the (spatial) implications and challenges of transitioning to a CBE, and finding innovative solutions for a CBE within the EuroDelta.

What is the EuroDelta?

The EuroDelta is a historically strong economically-related area that covers the Rhine, Scheldt and Meuse delta conurbations (including the Randstad, Brussels and Rhine-Ruhr area).

Through the ASSET project, the project partners also aim to determine the added value of cross-border collaboration on the EuroDelta scale and if it can help accelerate the circular transition of the built environment.

Who is involved in the ASSET Project?

There are 11 project partners in total including cities, regions, business associations and academic institutions from 3 countries – The Netherlands, Belgium and Germany. The City of Amsterdam is the Lead partner. There are also 30+ associated organisations supporting this project from academia, governmental, civil society, and business sectors.

City of Amsterdam

The Hague

unesco städtebau RWTH AACHEN UNIVERSITY

provincie Zuid-Holland

KREFELD BUSINESS Aus denkbar wird möglich.

TU Delft

bruxelles environnement leefmilieu brussel .brussels

METREX

perspective .brussels

DBI DUISBURG BUSINESS & INNOVATION

vereniging delta metropool

The Final Report is comprised of 2 booklets.
One describes the main findings and policy recommendations of the ASSET project.
This booklet describes ASSET's project activities, webinars and lectures.

Both booklets will be published on the ASSET Interreg NWE website:
www.asset.nweurope.eu/outcomes

In this booklet, the activities and webinars/lectures are colour coded (as shown below) and are sorted into the relevant chapter.

Activities
www. asset.nweurope.eu/activities

Meet and Learn Webinars (M & L)
www. youtube.com/@Meetandlearn

Chapter 1
Challenges

M&L | Space for the Circular Economy

Exploring the spatial requirements for the transition to a circular economy

Speaker: Dr. Emil Evenhuis
Date of webinar: 15 December 2023

About the speaker
Researcher on urban and regional development at PBL – Netherlands Environmental Assessment Institute with a PhD in Economic Geography from Newcastle University and background in Economics, Philosophy and Public Administration. His research focuses on the role that cities and regions play with respect to the transition to (more) sustainable and circular models development as well as other changes in economy.

WEBINAR SUMMARY

The Netherlands Environmental Assessment Agency (PBL) conducted research exploring the spatial requirements for transition to a circular economy (CE).

Goal of the study: to explore what transition to a CE requires in terms of space (both land use and other conditions), so national government (as well as subnational governments) can start anticipating on this within spatial planning policies.

Research methodology: Scenario development – 4 distinct scenarios that represent different world views on the implementation of circular economy, with a focus on spatial and economic impacts (exploratory not predictive)

6 core strategies were examined:
(1) consumption reduction, (2) extension of product lifecycle, (3) recycling strategies, (4) substitution by renewable (bio-based) resources, (5) greening of production processes, (6) rescaling of chains & loops to local levels. The 4 scenarios vary with respect to the use of these 6 strategies. The combination of these 6 strategies – as well as interaction between CE and other key trends like digitalization & (de) globalisation – then formed the basis for working out the spatial implications for three types of locations: urban areas, business sites/parks, industrial zones & seaports.

The 4 scenarios developed:
Global Corporations Scenario: Market-driven, large corporations have dominant role in CE transition. This scenario envisions concentrated economic activities, expanded industrial zones and increased global transportation of materials.

Highspeed World Scenario: As a consequence of fully embracing digital technologies and innovations, the virtual world becomes the main stage at which people's lives take place, at the expense of physical world. Economic activities become very footloose and will spread out. There is a strong tendency for consumption and production activities to mix with other functions in urban areas and business parks.

Photo: Marnix Breedijk / Filip de Blois

Green State Scenario: Environmental sustainability becomes the main concern. Strict norms and regulations are instituted by the government, including restrictions on the freedoms of people firms. Less space will be needed in industrial zones, seaports, and business parks. However, urban areas and business sites close to urban centres will need to be adapted to the increasing prevalence of sharing of goods and facilities, reuse of items & parts, and things repaired.

Regional Roots Scenario: Emphasis on local community solutions, with a preference for small-scale approaches and local governments as primary agents of change. This scenario involves: decentralized economic activities, smaller local recycling and production hubs, community-focused circular economy model with reduced large-scale logistics.

Policy recommendations:

- Anticipate increased demand for space to accommodate circular economy activities.
- Several types of sites will be of strategic importance for the transition to a CE, and enough and suitable space will need to be available on these sites: (1) accessible locations with zoning for high environmental impact, (2) large industrial zones, (3) locations accessible by inland water transport, (4) business sites in vicinity of urban areas, and (5) central and accessible locations in urban areas.
- Implement urban design strategies to encourage circular consumption behaviors e.g. sharing, repair & reuse.
- Implement coordinated policies across governmental levels, cross-border collaboration, and develop adaptive policy frameworks.

Key takeaways:

- CE transition is uncertain; multiple combinations of strategies to attain CE are conceivable.
- Spatial planning plays critical role in ensuring success of CE transition; flexibility & adaptability are key in adapting to emerging needs & challenges.

M&L | Territorial Cohesion

What Circular Economy means for territorial cohesion in Europe?

Speaker: Dr. Kai Böhme
Date of webinar: 28 June, 2024

About the speaker
Kai Böhme, founder and director of Spatial Foresight, specialised in European regional and territorial research and policies, international comparative studies in the fields of regional development policies, spatial planning, and in the territorial impacts of sector policies.

WEBINAR SUMMARY

The lecture focused on the intersection of circular economy and territorial development, emphasising the use of territorial foresight as a participatory research methodology. This approach focuses on exploring uncertain future scenarios by engaging diverse stakeholders across various age groups, professional backgrounds, and geographical regions to capture a wide array of perspectives.

Research methodology: A territorial foresight approach was adopted to compile a comprehensive understanding of the subject matter. This included document studies, data analysis, and large focus groups and workshops, to which participants from different educational and professional sectors, as well as diverse geographical areas, were invited.

Aim of study: Conducted by the Spatial Foresight Consultancy for the European Spatial Planning Observation Network (ESPON), the study aims to explore how Europe may transform under a fully implemented circular economy by 2030. Key focus areas included: resource-efficient production, changing patterns of resource utilization, global resource balancing, territorial implications of these shifts.

The following territorial development categories were identified: areas leading the way in circular economy innovation; areas that are frontrunners in the sharing economy; areas facing a decline in manufacturing and exports; areas facing a decline in hub functions; smart cities with potential for economic growth; places that are too small for an efficient sharing economy; and areas challenged by consumer behaviour.

Key takeaways:

- Transitioning to a circular economy presents behavioral and systemic challenges, which cannot be addressed with technical solutions alone, but also with significant behavioral changes. This requires: voluntary public engagement, identification of behavioral triggers

Place based Circular Economy: Production and New Economic Systems
(Source: MCRIT, Spatial Foresight, Possible European Terrtorial Futures, 2017)

and the creation of economic incentives.

- Recommendations for scaling and dissemination: utilizing platforms, such as city networks, and engaging potential players for funding and technical advisory services, e.g. EIB.
- In European policy-making, it is important to consider geographical diversity since significant territorial variations and diverse national perspectives necessitate flexible and adaptable regulations e.g. the Netherlands faces space constraints, while Finland and Sweden have abundant land and forest resources.
- The circular economy transition is complex, requiring technological innovation, behavioral adaptation, flexible policy frameworks and collaborative approaches.
- Future actions should focus on fostering cross-border collaborations, developing functional approaches over administrative ones, encouraging behavioral change mechanisms andsupporting localized circular economy initiatives.
- Potential implementation strategies include: sector-specific circular economy pilots, identification of behavioral change triggers, and the integration of technical and social innovations.

M&L | Port City Atlas
European Seaports and transitional challenges

Speaker: Carola Hein
Date of webinar: 19 July 2024

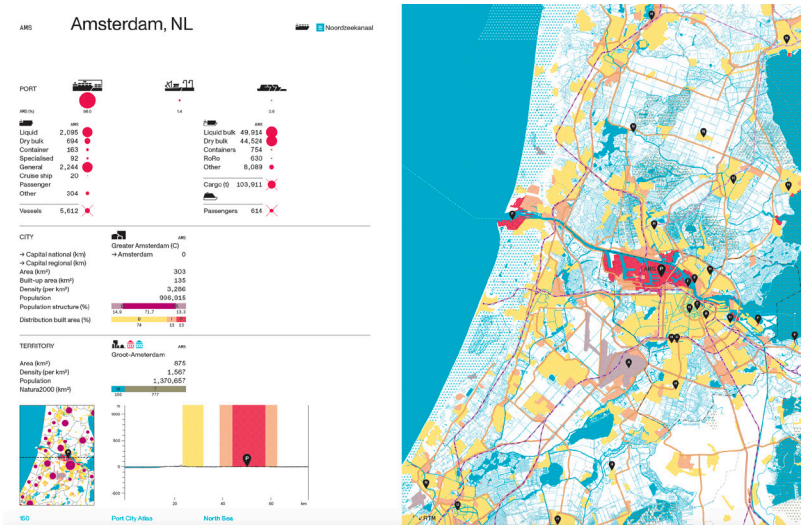
About the speaker
Carola Hein is a Professor in History of Architecture and Urban Planning at TU Delft, Leiden and Erasmus Universities. She holds the UNESCO Chair of Water, Ports and Historic Cities and leads the LDE PortCityFutures Centre. She has published widely in the field of architectural, urban and planning history, tying historical analysis to contemporary development. Her recent (co-)edited books include: Port City Atlas (2023), Oil Spaces (2021), Urbanisation of the Sea (2020), Adaptive Strategies for Water Heritage (2020), The Routledge Planning History Handbook (2018).

WEBINAR SUMMARY

Carola Hein provided a brief insight into the extensive research she had conducted over the past several years on the importance of ports and port city territories and how these areas have shaped the territorial development of North-West Europe.

Research approach and methodology: Building upon research on port cities from a historical, cultural, and geographical perspective, the presentation featured the Port City Atlas and its analysis of 100 European port city territories. Focusing on the North Sea and three leading port cities – Hamburg, Rotterdam, and London – it demonstrated the diverse development strategies that these cities have adopted for the growth and structure of their ports, cities and surrounding areas.

The Atlas proposes the concept of the port city territory emphasising the multiple ways in which flows of goods and people through ports impact nearby cities and other spaces on sea and land. Such a comprehensive mapping-based analysis allows for new insights into spatial development, raising questions on, for example, the role that multiple small ports in the vicinity of major ones. The Atlas provides the foundation for circular and sustainable development that integrates the global flows of goods and people through the territory. It calls for spatial development plans that connect sea and inland ports, that explore the connection between ports and that highlight the connections between the sea and inland ports. The presentation argued for interconnected spatial development plans for a circular and sustainable development within the EuroDelta and Europe more generally. An Atlas for river ports is under development and will focus on industrial, urban, peri-urban, and rural area development along European rivers in line with the concept of the port city territory.



Atlas of port in Amsterdam (Source: Port City Atlas, 2023)

Main takeaways:

- Historically, oil plays a big role in shaping ports and the territories around them. Oil also had both direct and indirect impact on the cities that controlled these oil hubs.
- The various stages of exploring, mapping, and interpreting the data on port city territories across the four seas of Europe, and particularly the role of ports therein, provide an important point of departure for future spatial development plans that help us prioritise global SDGs and put Europe ahead in the global arena.
- The Atlas' mapping approach provides sufficient spatial evidence indicating the importance of the ports and their territories for circular development.
- EuroDelta serves as the experiment bed for this approach, with cities like Amsterdam and Rotterdam accelerating this movement with the ASSET Interreg North-West Europe project.

M&L | Shaping the future of urbanising deltas by design

Speaker: Chris Zevenbergen
Date of webinar: 25 April 2025

About the speaker
Chris Zevenbergen is a Professor of Urban (Flood) Resilience at IHE Delft and of Delta Urbanism at TU Delft. With over 40 years of experience, he has led international research in environmental engineering and urban water management, focusing on integrated flood resilience strategies. His work explores innovative solutions for flood-proof design, urban systems, and decision support tools. He has authored or edited five books and over 160 scientific publications in his field.

WEBINAR SUMMARY

This lecture explored the evolving challenges and strategies of climate adaptation in the EuroDelta region, stretching from Amsterdam to the Ruhr. Historically managed through embankments and predictive models, the delta now faces rapid climate change, unpredictable rainfall, and rising heat, revealing the inadequacy of traditional approaches. A shift from controlling water to living with water was emphasized, promoting resilience and adaptation behind barriers.

Key themes included identifying both negative and positive tipping points, integrating time scales from emergency response to century-long planning, and the importance of design thinking – where imagination meets evidence – to drive transformation.

Main takeaways:

- The role of water as a transboundary connector highlights governance and equity issues in delta management.
- The lecture called for long-term, multi-scale collaboration, imaginative planning, and embracing natural systems to build flexible, future-ready urban deltas.

Construction of innovation tidal park in Rotterdam (Photo: Chris Zevenbergen)

Chapter 2
Policies

Activity | CBE-related Policy Analysis

ACTIVITY LEAD | The Hague

WHAT WAS ACHIEVED?

The policy analysis assessed current challenges, policies and strategies across ASSET partner cities and regions regarding circular built environment (CBE). Based on questionnaires filled out by city and region project partners regarding their respective areas and additional interviews conducted, this resulted in an inventory of circular-related policies and strategies, in which shared ambitions and main challenges in developing a CBE are identified and analysed accordingly. A final report of the policy analysis was prepared by REGENALYZE.

KEY INSIGHTS

Space constraints: Growing demand for space to accommodate circularity-related activities is competing with other land claims. Land acquisition and negotiations with landowners also limit opportunities to free up new spaces for circularity.

Development of circular markets: Secondary material supply chains are still under-developed; bio-based alternatives struggle with high costs and limited scalability.

Financial gaps: The CBE transition requires high investment, but limited funding mechanisms.

Data availability: Issues regarding data availability, but there are promising initiatives and tools to monitor CBE data.

Cultural shift: Awareness and acceptance of circular construction are limited, due to risk-adverse attitudes on new materials and processes. Needed: Incentives for building industry to prioritise transformation of existing built environment.

Cross-border collaboration: Aligning policies and standardising material flows across EuroDelta could significantly enhance circular transition.

General insight:
The policy analysis highlights existing gaps in the process of developing a CBE, identifies policy interventions needed for circular spatial planning, and lays the groundwork for harmonising efforts across the EuroDelta.

To read the Policy Analysis Report by REGENALYZE: **https://asset.nweurope.eu/policy-analysis**

M&L | Circular Construction Rules and Spatial Consequences

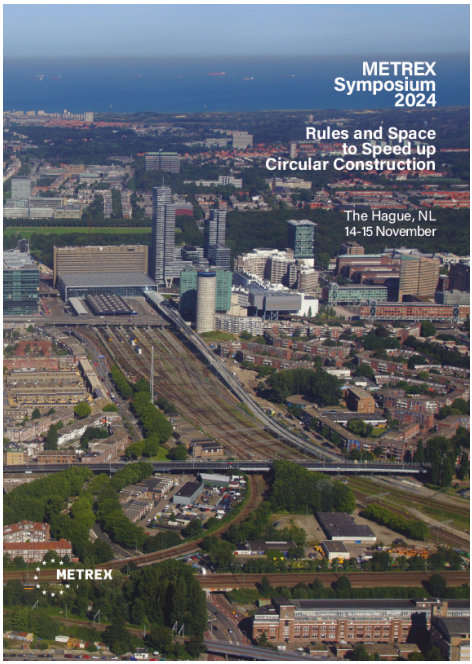
Speakers:
Eveline Bakker, Fanauw Hoppe, Chandar van der Zande & Joeri Schutte
Date of webinar: 27 September 2024

About the speakers
Eveline Bakker and Fanauw Hoppe are lawyers who work at CircuLaw, specializing in all aspects of circularity and has been examining the new European legislation.
Joeri Schutte works as a sustainability advisor at Dura Vermeer, developer/contractor.
Chandar van der Zande works at the City of Amsterdam on circular and biobased built environment.

WEBINAR SUMMARY

This is a digital session that focused on discussing European legislation and rules in relation to circular construction. In this webinar, the speakers touched on the EU legal framework set by the EU Commission on circular construction from their own perspectives and what this means for their work and in practice.

The first speakers, Eveline Bakker and Fanauw Hoppe, are from CircuLaw. They provided a broad overview of the position paper they are working on regarding important EU legislation and its implications on the circular construction sector plus the actors involved, as well as how EU legislation is translated into national and local policies.
The second presentation was by Chandar van der Zande, who works at the City of Amsterdam. He touched on Amsterdam's circular policies and circular projects (realised and planned) and his experiences dealing with rules at the European, national and local levels.
The third speaker, Joeri Schutte, represented the perspective of the private sector. He presented his work at Dura Vermeer in relation to circular construction and his experiences with the rules. Following the presentations, there was a plenary discussion between the speakers specifically on whether the EU regulations can help to stimulate circularity in the construction sector and its spatial implications.
The webinar was concluded with main takeaways and next steps.



Source: METREX Symposium 2024: Rules and Space to Speed up Circular Construction, 2025

Main takeaways:

- There is a certain amount of public perception surrounding sustainable building materials/construction that needs to be addressed to lead to acceptance
- It is important to determine what are the relevant rules when it comes to stimulate circular construction; which rules we need to have versus what are nice to have
- This session is only the beginning of this conversation; it is further expanded on in more depth during the live session in The Hague in November 2024
- Circulaw is working on a position paper to elaborate more on this topic (commissioned by The Hague and METREX) – objective is to come up with recommendations for Brussels to improve EU rules

Chapter 3
Assets of the EuroDelta

Activity | ASSET on Tour Excursion

ACTIVITY LEAD | Krefeld Business

WHAT WAS ACHIEVED?

The ASSET on Tour was a 1-week study trip across key cities in the EuroDelta – Amsterdam, South Holland, Brussels, Krefeld, and Duisburg. The trip aimed to provide firsthand insights into spatial strategies for circularity, facilitate knowledge exchange, and engage with local stakeholders. Each stop featured site visits, discussions, and presentations on circular economy initiatives, which were organised by the respective city/region partner.

KEY INSIGHTS

Amsterdam emphasized circularity in urban planning, focusing on repurposing port and integrating circular building hubs.

South Holland showcased its bio-based material initiatives and strategic policies on circular economy integration.

Brussels demonstrated extensive renovation strategies, emphasising energy-efficient building practices and material reuse.

Krefeld and Duisburg highlighted industrial-led circular transitions, with brownfield revitalization and material recovery strategies.

Across **all cities**, the necessity for regional cooperation, knowledge sharing, and dedicated circular hubs was reinforced.

The excursion created a foundational understanding of how different cities approach circularity and identified best practices that can be scaled across the EuroDelta. It reinforced the need for trans-regional cooperation to scale up circular initiatives, to understand the need for new spatial concepts and logistics, and to help shape the vision for a spatial strategy.

To read the Excursion Booklet: **https://asset.nweurope.eu/asset-on-tour**

Photos during the ASSET on Tour excursion:

Top — Left to right: Zoev City/CityDock facility in Haven-Stad, Amsterdam;
Group photo infront of VORM's agriculture plot for harvesting bio-based materials (Both photos: Fabio Bayro Kaiser)

Bottom — Left to right: Urban Miner facility of Dura Vermeer (Photo: Bas Horsting); BC Materials facility in Brussels (Photo: Bart Bomas)

Photos during the ASSET on Tour excursion:

Top — Left to right: Ship It facility in Brussels (Photo: Fabio Bayro Kaiser); Office Building of Interface in Krefeld (Photo: Krefeld Business)

Bottom — Left to right: TSR Reycling's metal recycling facility in Duisburg (Photo: Fabio Bayro Kaiser); Group photo in Duisburg (Photo: Krefeld Business)

The Hague

- Recognized as international city of peace and justice and plays central governance role in shaping circular policies and regulations
- It is uniquely positioned to facilitate the legal and financial frameworks needed to support a CBE
- The city focuses on embedding circularity into urban planning and procurement
- Key initiatives: integrating circular principles into zoning laws, incentivising circular building practices and aligning local regulations with the EU Green Deal
- The city's influence extends beyond municipal boundaries. and has potential of serving as a policy coordination hub, linking local implementation efforts with national and regional strategic goals

Province of South Holland

- One of the most economically and industrially dynamic regions in The Netherlands
- A key player in the CE transition as it processes 30% of The Netherland's material flows; this also presents spatial challenges.
- The *South Holland Circular Spatial Strategy* emphasises the importance of creating 'linking spaces' - zones where circular material chains can be established through the strategic reuse of industrial areas and logistics hubs
- The approach of the Circular Spatial Strategy (building up circular economic zones, transforming existing infrastructure, breaking down linear practices) is being integrated on a cross-border scale

Brussels Capital Region

- Has emerged as a leader in circular construction as Brussels uses reclaimed materials, adaptive reuse strategies and innovative construction techniques to reduce dependency on virgin resources
- The city's Circular Construction Hub facilitates the recovery and redistribution of building materials
- Due to space constraints and fragmented materials supply chain cross-border collaboration, there are significant challenges in scaling up efforts to transform pilot projects into a fully operational circular construction ecosystem

Amsterdam

- Positioned as frontrunner in circular transition with ambitious targets to cut primary material consumption in half by 2030 and become fully circular by 2050
- Due to dense built environment and limited space, Amsterdam faces significant logistical and infrastructural challenges in storing, sorting and processing secondary materials
- Has already implemented innovative solutions e.g. circular construction hubs, urban mining programs and material passports
- To ensure that surplus materials and by-products can flow seamlessly across city boundaries, circularity at scale requires regional coordination
- Amsterdam aims to transition from being a local circular pioneer to a strategic hub within a regional circular economy

Duisburg

- Has the largest inland port in Europe
- Strategically located at crossroads of major rail, waterway and road networks
- Has the opportunity to develop reverse logistics systems (as a new supply model for circularity) that ensures recovered materials, bio-based products and remanufactured goods can be seamlessly transported across the larger region
- Has the potential of becoming the backbone of circular logistics, supporting urban mining efforts, industrial recycling and cross-border material exchange

Krefeld

- Historically a major centre for steel and chemical production
- Now: at the forefront of industrial circularity through exploration of circular business models
- Still a strong presence of heavy industry
- Possesses industrial expertise and existing infrastructure
- Has potential to become a leading hub for circular steel production, in which secondary materials are reintegrated into manufacturing processes

ASSET
City & Region Profiles

Chapter 4
Best Practices

Activity | Circular Design Atlas

ACTIVITY LEAD | TU Delft

WHAT WAS ACHIEVED?

The Circular Design Atlas is an online open-source database developed by TU Delft, comprised of concrete examples of circular practices across all scales of the built environment. For ASSET, 10 best practices were analysed by city and region partners (with support of TU Delft), in which simplified atlas templates were filled out at the relevant scale – material, components, building, neighborhood, city, region. The analyses were uploaded to the Circular Design Atlas. There are 3 cases in Amsterdam, 1 in The Hague, 2 in South Holland, 2 in Brussels, 1 in Krefeld.

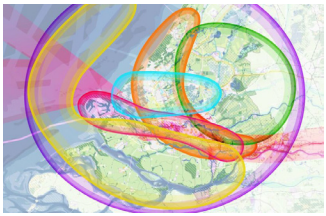
KEY INSIGHTS

- There is a clear lack of shared vocabulary/ terminology amongst built environment stakeholders.
- Priority is still given to energy use rather than building materials.
- Materials are central to most case studies - this is expressed through intensification of efforts for material reuse or promotion of biobased materials.
- Partners realized how complex it is to apply circular practices - specifically technical or practical hurdles, but also in ensuring continuation/longevity or monitoring project over time.
- There were notable findings when identifying stakeholders per case study in regards to their contributions to the circular initiatives and their respective dynamics.
- The importance of space is recognized in the CBE transition – the need to harvest, store and (re)manufacturing local materials.

- EuroDelta scale can play an important role in resource, reuse and upscaling biobased materials.
- Developing new circular initiatives and continuation of existing ones requires constant and coherent education/ training for all CBE stakeholders.

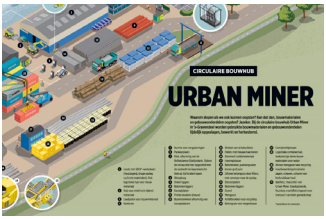
To learn more about the ASSET best practices:
https://asset.nweurope.eu/circular-atlas-best-practices

Circular South Holland Spatial Strategy



Location: South Holland, The Netherlands
Scale: Region

Urban Miner



Location: s'Gravendeel, The Netherlands
Scale: Neighbourhood / Business Park

The Groene Mient

Location: The Hague, The Netherlands
Scale: Neighbourhood

The Newton

Location: Amsterdam, The Netherlands
Scale: Building

Timber Convenant MRA

Location: Amsterdam, The Netherlands
Scale: Building

The Warren

Location: Amsterdam, The Netherlands
Scale: Building

USquare.brussels

Location: Brussels, Belgium
Scale: Building

RENOLUTION Brussels

Location: Brussels, Belgium
Scale: Region

Leem Block

Location: Brussels, Belgium
Scale: Materials

ZGM-Healthbuilding Guidelines: Sustainability in Building Construction

Location: Krefeld, Germany

Overview of ASSET best practices in Circular Design Atlas

To directly access the TU Delft Circular Design Atlas database platform: **www.tudelft.nl/en/architecture-and-the-built-environment/circular-design-atlas**

M&L | BEPROACT
Building an Ecosystem to PROACTively develop data-driven asset management

Speakers: Raymond Feron
Date of webinar: 26 January 2024

About the speaker
Programme Manager of BEPROACT and strategic advisor of digital transition at Rijkswaterstaat (Dutch Ministry of Infrastructure and Water Management).

WEBINAR SUMMARY

BEPROACT is a 4-year data-driven asset management project led by Rijkswaterstaat (RWS), the Dutch Ministry of Infrastructure and Water Management, with participation of the Netherlands, Ireland, Belgium, Luxemburg, France, and Germany.

Transnational collaboration is central to BEPROACT.
It is funded by the Interreg Northwest Europe Program and supported by the European Commission.

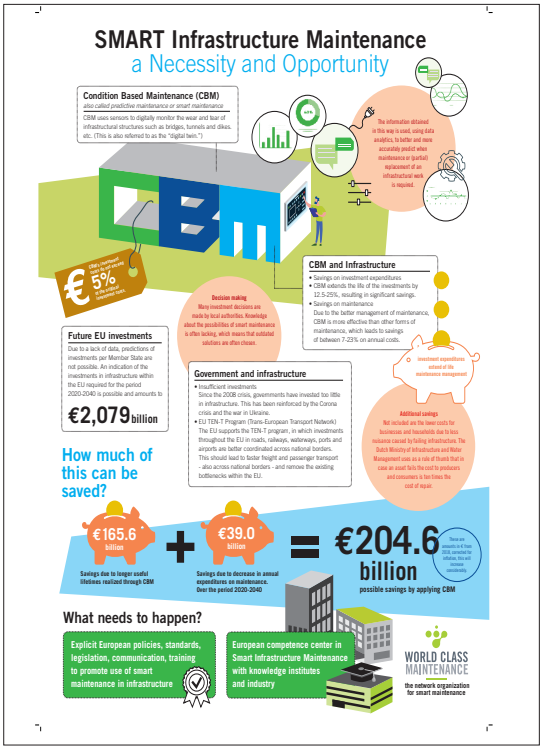
The project aim: to build an ecosystem that supports proactive, data-driven asset management, focusing on the transformation of infrastructure management practices across various domains e.g. road pavements, bridges, water management, water treatment, and the built environment.

Key challenge addressed by BEPROACT: The aging infrastructure across Europe, much of which constructed after World War II and now approaching the end of its useful life.

The project seeks to transform asset management from traditional, preventive maintenance to more advanced, data-driven approaches, including predictive and prescriptive maintenance. This transformation involves:
integrating new technologies like sensors, predictive analytics, real-time data transfer, drone inspections, GIS dashboarding, machine learning and data enrichment cycle.

Project methodology: A structured approach, with joint strategy development among partner organisations, pilot case implementations to test and validate technological solutions, and a focus on human capital development through training programs to enhance skills and adapt to new technologies.

Example in water management:
multiparameter probes and smart alarming technology enable constant water quality monitoring and pollution source tracing



Source: World Class Maintenance

Example in asphalt management: sensor-based wear assessments and lifetime prediction models are used to optimize road maintenance.

Key link to Circular Economy: Strategies that focus on material reuse, predicting material availability, and reducing waste through smarter, technology-driven maintenance approaches.
Project follows a maturity model that progresses through 4 levels: reactive maintenance, preventive maintenance, predictive maintenance, and prescriptive maintenance. It will explore future areas such as coastal city asset management, urban mining dashboards, and building resilience to extreme weather conditions.

Key takeaway:

- BEPROACT follows a holistic, technology-driven approach to infrastructure management, emphasising sustainability, efficiency, and international collaboration in transforming asset management practices for the future.

M&L | Circular economy in public works
The case of Dunkirk

Speakers: Olivier Bacquet and Cyrille Gaillard
Date of webinar: 8 March 2024

About the speakers
Olivier Bacquet is the Manager of the COLAS FRANCE agency of Dunkerque for more than 12 years.
Cyrille Gaillard is project manager at EcosystèmeD, the economic development agency of Dunkirk (Dunkerque Promotion has been renamed EcosystèmeD recently).

WEBINAR SUMMARY

The Dunkirk Decarbonization and Circular Economy Strategy focuses on transforming the industrial region of Dunkirk in Northern France; a major industrial hub known for steel production with significant carbon emissions.

With a population of approximately 250,000, Dunkirk is strategically located near the Belgian border. It is positioned as a key player in regional and cross-border industrial collaboration. The decarbonization strategy is built around 3 main pillars: circular economy, energy transformation, and carbon management.

Circular economy pillar: aims to reduce waste and increase resource efficiency by encouraging industries to use recycled materials e.g. aluminum from foundries and industrial co-products. This strategy seeks to minimize environmental impact while maximizing reuse of materials within industrial processes.

Energy transformation pillar: focuses on improving energy efficiency, transitioning industrial processes to electricity, and gradually replacing fossil fuels with hydrogen fuel. The energy shift also includes the development of large-scale renewable energy projects

Carbon management pillar: emphasizes the adoption of carbon capture technologies. The decarbonization plan also includes significant infrastructure development e.g. grid electrification, industrial water network expansion, CO_2 and hydrogen distribution infrastructure.

From the perspective of the Colas Group, a key player in the region, the circular economy strategy includes initiatives like recycling road construction materials and valorizing subgrade materials. The company has introduced innovative practices, such as using dredged sediment in road construction and reusing industrial

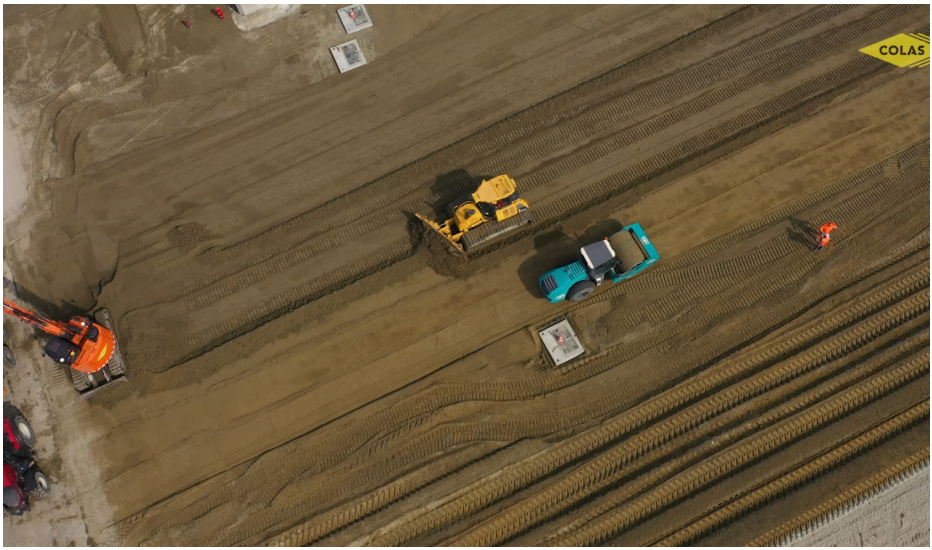


Photo: COLAS

by-products to reduce transportation emissions. Colas is also part of the IDEAL association, which promotes industrial symbiosis and resource sharing among companies in the region.

Key takeaways:

- Cross-border cooperation with Belgium is crucial in Dunkirk's strategy, due to shared water management initiatives and transborder economic working groups that foster collaboration with neighboring regions.
- The strategy also addresses strategic challenges related to transportation and space management
- Dunkirk's key performance targets include reducing direct CO_2 emissions by at least 30% by 2030, with a goal of cutting approximately 3 million tons from the current 11 million tons of CO_2 emissions. The French government has prioritised low-carbon industrial zones and is providing subsidies for decarbonization studies.
- Dunkirk envisions a complete transformation of its industrial ecosystem, with sustainable, interconnected industrial processes and a minimized environmental impact. This vision is aligned with the region's goal to foster economic development through green innovation and sustainable practices, positioning Dunkirk as a leader in the global transition towards a low-carbon, circular economy.

M&L | Circular concrete and Sustainable Construction Innovation

Spatial needs and innovation

Speakers: Niki Loonen and Lukas Arnout
Date of webinar:
29 November 2024

About the speakers
Niki Loonen, an advisor at TBI Holdings, plays an important role in over 20 technology, construction and infrastructure companies that operate independently but always seek explicit cooperation with each other in the chain.
Lukas Arnout is the managing director at ResourceFull, a research company that develops material technology for sustainable mineral construction materials.

WEBINAR SUMMARY

The presentation on Circular Concrete and Sustainable Construction Innovations by Niki Lonen (TBI Holdings) and Lucas Arnold (Resourceful) focused on sustainable concrete production, recycling, and CO_2 reduction strategies.

Background on concrete industry:
It currently follows a linear production model that heavily relies on raw material extraction, leading to significant environmental impact.
Concrete production is responsible for 8-10% of global CO_2 emissions, making it a major contributor to climate change, with emissions comparable to entire nations and significantly higher than those from aviation.
Despite its environmental impact, only 10% of concrete in the Netherlands is recycled, though studies suggest the potential to increase this to 50-80%.

Concrete Recycling: Amsterdam has taken a proactive approach to concrete recycling by establishing demolition zones, utilizing industrial harbor processing, and improving material recovery through separate demolition of concrete and brick. Advanced crushing technologies have further optimized the recycling process, reducing transportation distances and enabling the production of high-quality recycled aggregates.

Innovations in sustainable construction:
The focus is on smart crushing technologies, such as Urban Mine Smart Crushers, which efficiently separate materials and allow for potential carbon binding in concrete fines. Researchers are also exploring material substitution techniques, including replacing traditional cement with industrial waste products and alternative binding technologies like geopolymers.

Urban Mine concrete with 100% FreeGravel 60% FreeSand and Freement being casted for the Mama Shelter Hotel in Amsterdam (Photo: TBI and Urban Mine)

Key takeaways:

- To accelerate the transition toward circular concrete, policy interventions are necessary such as: mandating separate demolition permits, creating storage spaces for processed materials, banning crushed concrete in road foundations, and enforcing the use of recycled aggregates.
- Economic and environmental incentives e.g. taxing virgin material extraction and offering subsidies for recycled material usage, could further drive sustainable practices.
- Future goals for the concrete industry include developing zero-impact concrete, achieving carbon neutrality, and fully integrating circular economy principles.
- To achieve the above goals, collaboration between industry leaders, municipalities, and researchers is essential.
- The transformation of the concrete industry requires innovative technology, strong policy support, and a commitment to sustainability to significantly reduce its environmental footprint.

Chapter 5
Solutions

Activity | Local and Regional Workshops

ACTIVITY LEAD | Province of South Holland

WHAT HAS BEEN ACHIEVED?

City and region partners of ASSET organised their respective workshops with support of the Activity Lead and BVR, external advisor commissioned for this activity. The objective was to apply and test out BVR's methodology of the *Spatial Strategy of Circular South Holland* on other scales (including city and megaregional) through workshops. BVR developed a workshop guide on how to prepare a local/regional workshop which was used by the city/region project partners when developing their respective workshops (see workshop guide on following page). 4 workshops took place, namely those of Province of South Holand/The Hague, Amsterdam, Brussels, and Krefeld. The workshops differed in terms of format, length and actors involved, however they shared the same goals: gaining a common understanding of challenges in respective city/region as it relates to CBE, building networks at local, regional and EuroDelta scales, exploring concrete spatial solutions, and contributing to the outcomes of project, actions and strategy.

KEY INSIGHTS

The workshops were found to be extremely valuable, bringing different stakeholders together to discuss the implementation of a circular built environment (CBE) in their own cities and regions. This resulted in concrete insights that can form the base for (spatial) strategy of the project and can also contribute as vital input to follow-up projects and research.

EuroDelta as a Circular Hub: The region has the potential to become a global leader in circular building; however, scaling up requires coordinated spatial planning and infrastructure investment. In addition, in order to effectively scale up the circular market, collaboration at the EuroDelta scale is key.

Circular Logistics and Hubs: The need for dedicated circular hubs was emphasized and its implementation – in terms of size

of space and proximity to raw materials and/or cities depending on the type of hub – was discussed. with strategic locations near industrial clusters and transportation networks. Examples of different hub types crucial in a CBE include circular business sites (materials centres, wood parks) and harvesting

spaces (urban mining, arable land). Adaptability and modularity needs to incorporated in the design of circular hubs, without compromising its core function.

Regulatory and Financial Support: Adjustments in EU and national regulations could help facilitate circular procurement and incentivize the reuse of materials.

Knowledge and Data Gaps: Improving data-sharing mechanisms, such as material passports, is crucial to tracking circular progress and creating a transparent circular economy.

Challenges at the EuroDelta scale: There is a lack of maps and data that is needed to scale up, as well as critical differences between countries such as tax systems and difficulty encountered in managing network cooperation due to the high number of contractors involved.

The workshops provided direct input from stakeholders, ensuring that the ASSET strategy reflects real-world needs. They also strengthened ASSET's network of collaborators, paving the way for future partnerships and implementation projects.

Photos during local and regional workshops:

From top — Left to right: Province of South Holland and The Hague in Oct 2024 (Photo: BVR); Amsterdam in Oct 2024 (Photo: Jamila Jones); Brussels in Nov 2024 (Photo: Cécile Houpert; Krefeld in June 2024 (Photo: Simon Erath)

To read the Synthesis Report of Local and Regional Workshops by BVR: **https://asset.nweurope.eu/local-regional-workshops-1**

Source: Synthesis Report of Local and Regional Workshops, 2025

Activity | Next Generation Student Work

ACTIVITY LEADS |

RWTH Aachen, TU Delft, Deltametropolis Asssociation

WHAT WAS ACHIEVED?

A key portion of the ASSET project is the academic aspect. Students are engaged and involved through several (studio) courses at the TU Delft and RWTH Aachen as well as The Next Generation Podium hosted by Deltametropolis Assocation (Vereniging Deltametropool in Dutch).
Each academic deliverable will be further explained, including the Inspiration Publication – one of the main products of ASSET.

To learn more about the student work linked to the ASSET Project:
https://asset.nweurope.eu/student-work (to be updated shortly)

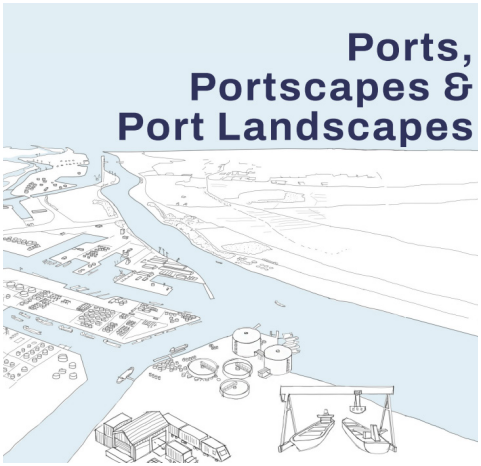
TU Delft Student Work

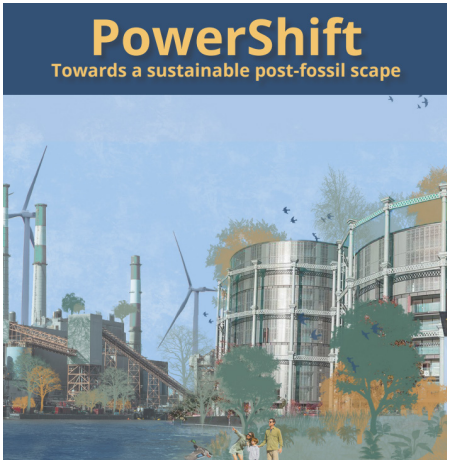
WHAT WAS ACHIEVED?

TU Delft organised a studio course and summer school program inline with ASSET.

The ***Spatial Strategies for the Global Metropolis*** is a studio course within TU Delft's MSc Urbanism education program. This course focuses on regional design and exploring the impact of sustainability transitions on peri-urban regions within the Rhine, Meuse and Schelde delta area in The Netherlands. Circularity is a core principle specifically the spatial dimensions and effects of a circular economy (CE) / circular built environment (CBE). Each student team was asked to create a spatial vision and development strategy in which different spatial claims that emerge as a result of sustainability transitions are addressed across scales – from local repair hubs and neighborhood loops to clustered infrastructures and regional metabolic flows – highlighting regenerative agriculture, renewable energy, and closed-loop systems. The studio promoted circular thinking not just as technical optimization, but as a transformative, socially embedded practice that rethinks land use, supply chains, and governance. Ultimately, the studio positioned regional design as a tool for imagining sustainable futures and operationalizing circularity within complex urban-rural systems.

In addition to the Studio Course, the 3rd edition of ***Summer School on Circularity in the Built Environment*** took place in July 2024. The participants (students, PhD researchers and professionals) analysed existing circular practices to identify resource flows and synergies of different actors in the EuroDelta.





Samples of student projects from Spatial Strategies for the Global Metropolis studio:

Left – Ports, Portscapes and Port Landscapes (by E. Agterdenbos, F. Manshande, N. Samuels, R. Sanchez, M. Theye)

Right – PowerShift Towards a sustainable post-fossil scape (by E. Vamvakousi, F. Jeniardina Purba, K. Jadys, N. Ham, S. Pfisztner)

KEY INSIGHTS

- The concept of refuse is central in regional design
- Innovation in spatial planning is key to ensure that the spatial requirements of new forms of production (that develop over time) will be accommodated
- Regenerative territorial capitals (natural, cultural human, infrastructural and relational) are essential building blocks to transition to CE that is resilient
- Regional participatory planning and design needs to be adopted to ensure that local communities are at the heart of the CE transition
- Strategic planning and design at the supra-national scale is also necessary to maintain alignment and coherence across borders
- Regional collaboration is essential when creating a circular future

RWTH Aachen Student Work

WHAT HAS BEEN ACHIEVED?

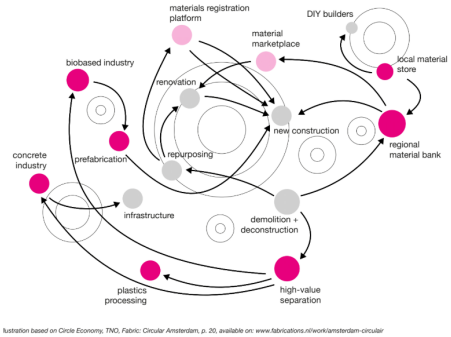
RWTH Aachen organised multiple courses in collaboration with the ASSET project.

The ***Integrated Project II: Evolution of functional urban areas*** is a core Masters course under *Transforming City Regions Masters* program that took place from April to August 2024. The aim: to apply the *Circular Zuid-Holland Spatial Strategy* to one of the largest developments in The Netherlands within the metropolitan area of Amsterdam called Port-City (Haven-stad in Dutch) using set guiding questions. The result: 3 project proposals for a circular built environment in Harbour City. The assignment: to produce several deliverables including analysis of case study site using SWOT methodology, a spatial vision, a strategy, a process timeline, master plan, and zoom-ins of solutions.

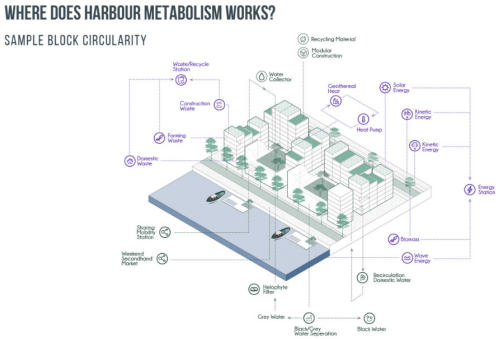
The ***EURODELTA 2050+*** Research module is also under the T*ransforming City Regions Masters* program, focused on analyzing spatial conditions needed for a circular transition and developing spatial strategies to achieve a circular built environment specifically the EuroDelta – Europe's most densely populated region. Assignment: to conduct in-depth research and analyze spatial conditions at large scales required for a circular transition. Students were also tasked to translate research into actionable strategies and compelling narratives for the future of circular EuroDelta 2050+.

Circular Urban Landscapes is an elective course, in which students explored spatial strategies for circular urbanism and participated in the Urban Design Colloquium, which involved experts and case studies from The Netherlands, Belgium and Denmark. Through this experience, the students learned about the transition from linear to circular planning, the role of circularity in climate action and the spatial translation of these principles. In this course, students explored various critical challenges of scaling up circularity e.g. policy barriers, economic feasibility and public engagement. Assignment: to analyze existing strategies such as South Holland's 3-tiered approach for the *Circular South Holland Spatial Strategy*. Students prepared a reflective essay and a poster, that captured narratives for circular urban transformation.

In addition to student courses, there was also a ***thesis project*** that explored how cross-border stakeholder arenas can drive the implementation of a circular economy in the EuroDelta region. This thesis will contribute as a chapter in the *Inspirational Publication* with valuable insights for urban planners, policy makers and industries working towards a more sustainable & resource-efficient EuroDelta.



Sample of student work from Circular Urban Landscapes elective course (Source: Circular Construction Hubs poster by H. Broß)



Sample of student work from Port-City Project (Source: Final Report of Metabolism in Harbour by Q. Chen, E. Ertemix, E. Horeman and L. Yuhan)

KEY INSIGHTS

- Neighbourhood-level circular design can be successful if early partner involvement and continuous feedback support concept development, as shown in the Port-City Amsterdam project.
- Macro-regional circular strategies require the integration of spatial analysis with stakeholder narratives to develop empirically grounded visions for a Circular EuroDelta 2050+.
- Spatial enablers of circularity, such as urban mining, material hubs and adaptive reuse, are essential but face political, economic and engagement challenges, as discussed in the *Circular Urban Landscapes* elective.
- Cross-border collaboration between government, industry, and academia is essential to address fragmented systems and unlock circular potential in regions such as the EuroDelta.
- Interdisciplinary and applied learning equips students with skills in storytelling, research and strategy – crucial for driving sustainable urban change.

Next Generation Podium

WHAT HAS BEEN ACHIEVED?

The ***Next Generation Podium*** is an annual cross-border symposium and workshop that serves as a platform to foster knowledge development andinterdisciplinary collaboration among students and young professionals in the fields of urban planning, (landscape) architecture, research and policy, focusing on future spatial development of the EuroDelta. This is the 4th edition, which was integrated into the ASSET project, taking place over a span of a week in February 2025 with 3 interrelated themes: Circular Delta, Accessible Delta, Inclusive Delta. The program included an opening ceremony, lunch forums, a working conference, student workshops and a closing ceremony – all online. The lunch forum portion of the Next Generation Podium consisted of 3 online lunch sessions over a span of 3 days, each following one of the interrelated themes. Each lunch session had different speakers present on their work relevant to particular theme of the day. The working conference included key note presentations, panel discussion between experts, resulting in 4 teams fine-tuning their ideas under the mentorship of practitioners, and developing and presenting actionable spatial narratives for 2035 and 2050 to a jury panel.

KEY INSIGHTS

- Real-world challenges were integrated into its methodology, emphasising circularity, accessibility and climate resilience within a framework of interdisciplinary collaboration – this allowed participants to not only discuss theoretical solutions, but also develop tangible strategies applicable in real-world planning contexts.
- A layered approach to spatial planning is promoted and applied, in which local, regional and mega-regional strategies are connected to address the complex challenges of the EuroDelta.
- There is a notable gap in university curricula regarding megaregional thinking, particularly in bridging local design scales with strategic regional perspectives – Next Generation Podium addresses this gap, however, early coordination with academic partners and integration into studio curricula are key in ensuring its future success.
- To translate a vision into action, the following steps are to be considered: aligning actors and long-term collaboration; proactively addressing spatial and social inequalities; overcoming hindering factors (e.g. fragmentation and public resistance); differentiating short-term actions from long-term projects; leveraging financial instruments and funding opportunities; promoting territorial cohesion and spatial justice; building public legitimacy through transparency; developing institutional capacity;adopting a phased approach with built-in evaluation moments.

Inspiration Publication

TEASER

EuroDelta 2050+ Spatial strategies for a circular built environment examines how cities and regions in the EuroDelta can work together to support a more circular built environment. Drawing on the findings of the ASSET project, the book explores how spatial planning, policy and infrastructure can help reduce waste, reuse materials and rethink urban development. It addresses both opportunities and limitations, as well as providing insights into real-world challenges such as housing needs, resource scarcity and fragmented governance. Aimed at planners, policy makers and practitioners, the book does not offer one-size-fits-all solutions, but encourages practical, place-based approaches to circularity. It is a step towards more coordinated thinking at the regional level, where many of the conditions for change already exist.

- **Why:** The linear economy is no longer sustainable – circularity is essential to address climate, resource and spatial challenges.
- **Where:** The EuroDelta region, with its dense networks and shared dependencies, is uniquely positioned to pilot and scale circular practices.
- **How:** Coordinated spatial planning, policy alignment and cross-border cooperation are key enablers of a circular built environment.
- **Who:** Cities, regions, planners, policy-makers and communities all have important, interlinked roles to play in driving the transition.
- **What:** The book provides a framework, case studies and actionable insights to support a more circular, resilient and regionally connected built environment.

Draft cover of the Inspiration Publication

The publication is being finalized.
It will be uploaded on the outcomes page of the ASSET Interreg NWE website.

M&L | The Flexible City
Solution for a circular and climate adaptive Europe

Speaker: Maarten van Tuijl
Date of webinar: 24 November 2023

About the speaker
Maarten van Tuijl (lead expert at URBACT) is a co-author of The Flexible City with Tom Bergevoet (architect at temp.architecture.urbanism).

WEBINAR SUMMARY

The Flexible City project, organised by EuroDelta, a part of European Network of Metropolitan Areas (METREX), aims to explore collaborative solutions to urban challenges, focusing on accelerating the circular transition in the built environment.

One of the key cities involved is Amsterdam with ambitious sustainability goals including to reduce CO_2 emissions by 5% by 2025, 60% by 2030, 95% by 2050. Amsterdam also seeks to reduce primary abiotic resource use by 50% and achieve a fully circular economy by 2050.
Circular building approaches play a central role in achieving these goals. The 3 key strategies are:

Adaptive buildings: Using dry joints and modularity, allowing for future flexibility and to be disassembled without generating waste. Example: Trios Bank Headquarters – includes a material passport for future reuse of building components.

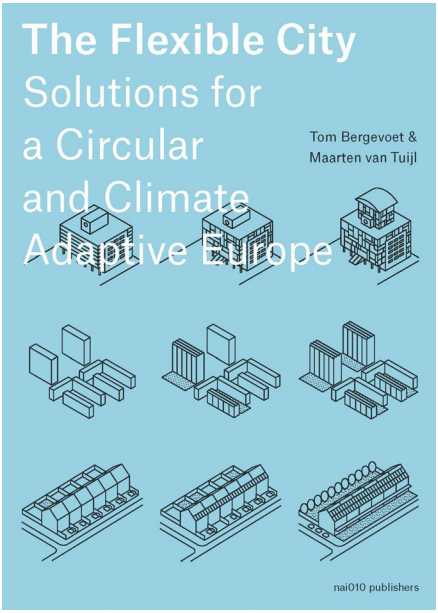
Biobased buildings: Using renewable, organic materials (e.g. timber) to significantly reduce CO_2 emissions. Examples: Timber construction in Finland and the Aier Luma project in France.

Repurposing waste materials
Example: Resource Row project in Copenhagen in which bricks from a demolished factory were reused – reducing C02 emissions from facades by 75%.

Key barriers in scaling these circular urban development challenges:

- Logistical complexities of material reuse
- Need for certification and regulatory compliance
- Development of robust material exchange systems

Potential solutions: digital platforms for material exchange, regulatory changes (e.g. France requirement for 20% reused materials), and increased interdisciplinary collaboration.



Source: The Flexible City: Solutions for a Circular and Climate Adaptive Europe, 2024

In addition to technical considerations (e.g. demolition bans, material passports, regional material mapping), aesthetic and philosophical aspects of urban design are to also be reconsidered – with the goal of integrating circularity into architectural visions and to develop new aesthetic paradigms based on sustainability.

Key takeaways:

- The future of circular urban development requires collaborative approaches, particularly within regional networks like EuroDelta.
- Essential: knowledge sharing through interdisciplinary workshops and standardization of circular building guidelines
- Circularity is not just a technical challenge but a holistic approach that involves reimagining roles, regulations, and design principles.
- Collaboration across disciplines and regions is critical to achieve circular urban development goals.

M&L | Spatial Strategy for Circular Economy in South Holland

Speakers: Bart Bomas and Frenk Bekkers
Date of webinar: 5 April 2024

About the speakers
Bart Bomas is a landscape architect and senior project leader at BVR in Rotterdam. For the spatial consequences of the circular economy, Bart works on strategies for different scales. Inventing spatial visions and designs for the Circular Economy is part of his profession.
Frenk Bekkers (now retired) worked as a senior policy officer at the Province of South Holland in The Hague. The last years he programmed, organised and guided strategic policy research and explorations.

WEBINAR SUMMARY

The Circular Economy policy for South Holland outlines the Netherlands' ambition to transition to a fully circular economy by 2050, with an interim target to reduce use of primary raw materials by 50% in 2030. This addresses pressing challenges: climate change, biodiversity decline, environmental pollution, and supply chain insecurity, all while promoting a transition from linear to circular. The transition is expected to be gradual and long-term, with potential challenges. Spatial effects and space required for this transition are especially at stake in this province with limited and valuable space. A spatial strategy for the circular transition is essential.

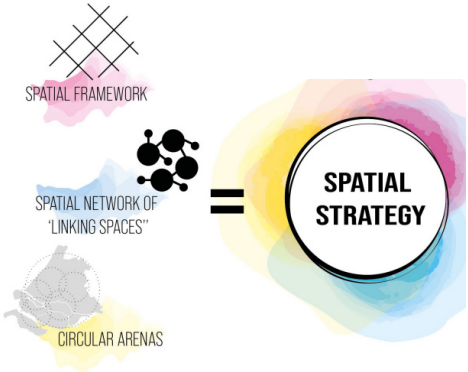
A key framework for this strategy is the Butterfly Diagram proposed by the Ellen MacArthur Foundation, which emphasizes the importance of renewable materials, closing and narrowing economic loops, and sustainable resource management.

Approach of the spatial strategy:
A research by design based approach with workshops creating spatial narratives that incorporate biobased perspectives, reuse, and loop-closing strategies.
Analyzing key regional characteristics e.g. urban areas, ports, corridors, rural regions, to tailor strategies to different environments.

Focus of the strategy: Creating circular 'linking-spaces' for critical material chains e.g. biobased and food chain, manufacturing industries, construction, and plastics.

Spatial typologies within CE determined to be essential in enabling circularity in various sectors:

- Harvesting spaces for resource extraction and urban material mining
- Utilization spaces for living environments and product usage areas



Source:
Main Messages: Circular Zuid-Holland Spatial Strategy, 2022

- Production and processing spaces for material reconstruction and remanufacturing
- Logistical spaces that facilitate interconnected material flow networks.

These spaces are essential for enabling circularity in various sectors.

Key takeaways:

- The strategy calls for the development of spatial circular frameworks, creating linking spaces, establishing CE arenas, and promoting cross-scale collaboration.
- Implementation is based on 4 critical systems: healthy circular soil and water system, sustainable energy infrastructure, logistical circular material flow network, and transformed waste management.
- Stakeholder engagement is crucial especially with focus on multi-stakeholder circular arenas and collaborative dialogue.
- Scalability is a key consideration, with the strategy adaptable to different regional and local contexts and cross-border collaboration.
- Challenges to CE transition: need for intensive land use, transforming existing infrastructure, and balancing new CE needs with existing systems.
- Policy and legislative support from government is essential, including development of supportive policies and encouraging innovative circular business models.
- The transition to CE is a complex, long-term systemic transformation that requires collaborative efforts
- Spatial planning is a critical element for the successful implementation of this strategy.by the Ellen MacArthur Foundation, which emphasizes the importance of renewable materials, closing and narrowing economic loops, and sustainable resource management.

M&L | Circular building within DGNB certification scheme for new buildings and DGNB building resource passport

Speaker: Isabell Viola Wellstein
Date of webinar: 24 May 2024

About the speaker
Isabell Viola Wellstein is part of the research and development department at the German Sustainable Building Council (DGNB) since 2022. She has a civil engineering background specifically structural building construction and has significant experience with digital Building Information Modeling (BIM). At DGNB, she is involved in the development of the DGNB certification systems for sustainable building and research projects in the field of circular economy in the construction sector.

WEBINAR SUMMARY

The German Sustainable Building Council (DGNB), is a nonprofit organisation that was established in 2007 and is dedicated to promoting sustainable building practices with over 2,700 members – Europe's largest sustainable building network. The DGNB's members are diverse including planners, architects, engineers, product manufacturers, and global companies; all working together to foster sustainable building solutions.

The DGNB certification system:
A comprehensive system that focuses on a holistic evaluation framework that assesses several key areas: environmental quality, economic quality, sociocultural quality, technical quality, process quality, and site quality.

The certification systems are applied to a variety of building types and construction projects, including new constructions, building renovations, interior spaces, district certifications and other applications such as construction sites and the deconstruction of buildings. The system also evaluates buildings in use and even considers end-of-life assessments to ensure the sustainability of materials and structures throughout their lifecycle. The certification process is also aligned with European regulatory frameworks, including the EU Taxonomy and the Level(s) Framework.
Since the DGNB certification system can be easily adapted to various climate zones, regional regulations, and national requirements, the DGNB is able to certify worldwide. (Denmark (DK-GBC), Austria (ÖGNI), Switzerland (SGNI), Spain (GBCe) and Croatia (CGBC) are the five European countries in which the DGNB works strategically with a system partner. The local Green or Sustainable Building Councils have adapted the DGNB Certification System to their local requirements and act as independent local certification bodies. Also, there is an international

DGNB Building Resource Passport sample (Photo: DGNB)

version available of the systems for new building and renovation) Evaluation indicators for circularity include: material quantity tracking, secondary material usage, construction and demolition waste management, detachability, material separability and material recovery potential.

Key takeaways:

- A key principle of the DGNB's approach is its commitment to the circular economy.
- DGND's definition of circular building: building stock is a valuable resource for material reuse, with focus on minimizing waste, ensuring the long-term use of materials, and aligning with natural cycles.
- The Building Resource Passport, a digital documentation tool which can also be used to optimize the buildings resources, plays a vital role in this process as it tracks material origins, assesses material circularity, and provides transparent data about the building's resource use.
- The certification system has shown considerable impact, with new buildings certified at the Gold to Platinum levels achieving significant performance improvements, up to 7% increase in real estate value and a 12% rent premium.
- DGNB aims to further standardize international sustainable building assessments, enhance digital documentation, and promote material tracking to support urban mining as key lever to a future circular economy.
- Advantages of the DGNB certification system: increased property value, enhanced sustainability, alignment with international standards. regional regulations, and national requirements.

M&L | Territorialising Circularity

A territorialising approach towards a circular transition of the built environment

Speaker: Alexander Wandl
Date of webinar: 30 August 2024

About the speaker
Dr. Alexander Wandl is an Associate Professor and head of the Section of Environmental Technology and Design of the Department of Urbanism at the Faculty of Architecture and the Built Environment at Delft University of Technology (NL). He is a steering committee member of Circular Built Environment Hub, TU Delft's Think Tank, for the circularity transition from the material scale to the region.

WEBINAR SUMMARY

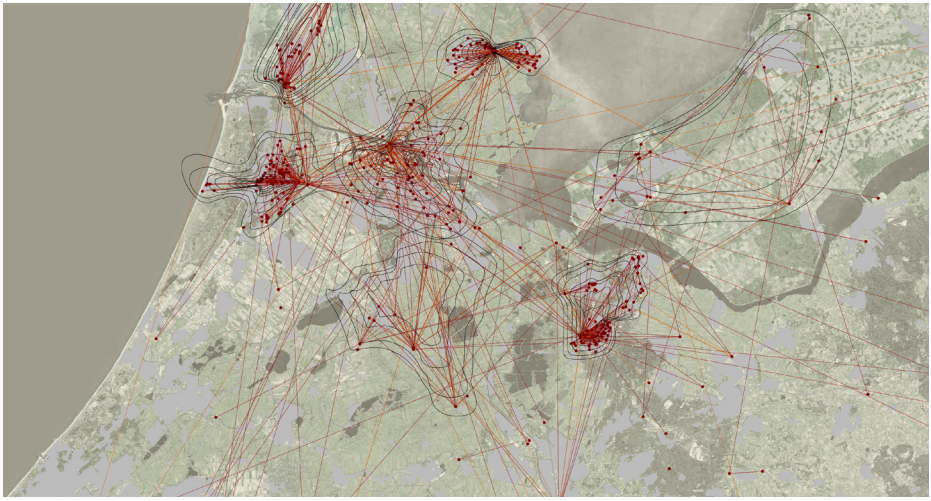
Dr. Alexander Wandl delivered a lecture on the circular built environment, emphasising the creation of spaces that facilitate circularity within urban settings. He focused on the EuroDelta region, which encompasses areas between Amsterdam, Lille, and adjacent rural locales, where he highlighted a collaborative effort involving 11 project partners.

Central to his discourse was the definition of a circular built environment, which is grounded in systemic design principles aimed at narrowing, slowing, and closing resource loops. This holistic approach integrates cultural, environmental, economic, and social values, all directed toward achieving sustainable living within the Earth's planetary boundaries.

Dr. Wandl introduced the concept of territorial circularity approach, advocating for a perspective that transcends abstract flow diagrams. He emphasized the importance of understanding material flows as integral components of the environment, rather than merely technological systems. This perspective acknowledges the multi-scalar and multifaceted nature of territorial systems.

Research methodologies discussed: Activity-based spatial material flow analysis – involves mapping actors and flows, identifying material properties, and analyzing both quantities and qualities. Systemic sectioning as a method to connect places, qualities, and conditions, thereby examining value chains and webs.

Spatial Implications of transitioning to a circular economy: There is an increased demand for space during this period. Factors contributing to this include: Harvesting of biobased materials, establishment of processing facilities, and development of renewable energy infrastructure.



Source: Territorialising Circularity, 2022

Key considerations were highlighted: longer time cycles, a more decentralized organization, and strategies to manage material dependencies.

The lecture also touched upon the European Union's policy goals concerning critical raw materials and spatial planning. The EU aims to extract 10% of its annual consumption within member states and process 40% internally by 2030, a significant shift given that currently, 90-95% of processing occurs outside the EU.

Dr. Wandl presented various scenario plans, each with distinct spatial characteristics and focal points, ranging from concentrated growth emphasising innovation to decentralized systems focusing on urban mining.

Key takeaways:

- Dr. Wandl emphasized that circularity extends beyond mere resource efficiency; it necessitates strategic collaborative decision-making and involves complex interdisciplinary approaches.
- He underscored the crucial role of spatial planning in facilitating circular transitions.
- Future research areas were recommended such as: economic modeling of circular transitions, spatial impact assessments, infrastructure adaptation strategies, and the development of policy frameworks.
- Suggested courses: Spatial Circularity Strategies, Circular Building Products, and Sustainable Development Approaches for those interested in delving deeper into the subject.

M&L | Timber Loops

Circular Construction Hubs: Timber Reuse in Amsterdam

Speaker: Tanya Tsui
Date of webinar: 18 October 2024

About the speaker
Tanya was a researcher at MIT at the time of the webinar. She is now a postdoc at the Institute of Environmental Sciences (CML) at Leiden University in The Netherlands. She uses spatial data science to help cities mitigate climate change. Her expertise is spatial analysis methods for circular economy research. She was the main researcher for the Timber Loops project.

WEBINAR SUMMARY

The "Timber Loops - Circular Construction Hubs" project, led by postdoctoral researcher Tanya Tsui from MIT's Senseable City Lab and the AMS Institute, focuses on advancing Amsterdam's transition to a circular economy by optimizing the reuse of timber in construction.

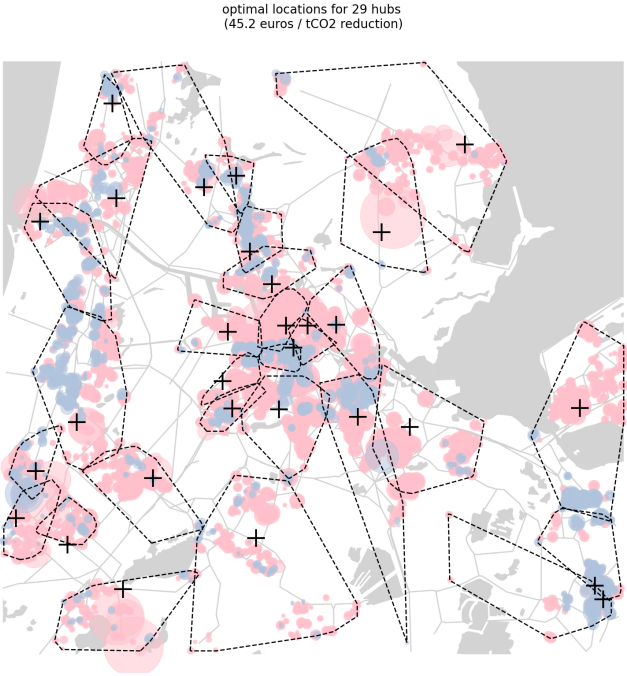
Project aim: To establish facilities that collect, store, and redistribute construction waste, particularly timber, to new building sites, thereby reducing reliance on virgin materials and minimizing environmental impact.

Research question: Determining the optimal number and locations for these timber hubs within Amsterdam.

Approach / Methodology: Predictive datasets were utilized to forecast future timber waste supply and demand across construction sites. A spatial simulated annealing algorithm was used – 130 scenarios were analysed, varying from a single hub to 135 hubs. Cost-effectiveness in terms of euros per ton of CO_2 reduction was assessed. Factors considered included storage and transportation costs, and emission reductions.

Key takeaways:

- The findings suggest that it would optimal to establish 29 hubs throughout Amsterdam, each with an average service radius of 3 kilometers; this configuration can save up to €20 million and reduce approximately 500 kilotons of CO_2 emissions.
- While transportation costs decrease with an increasing number of hubs, storage costs begin to rise after approximately 30 hubs due to redundancy.
- Transportation emissions were found to be relatively insignificant compared to material emissions, which are 1,000 times more impactful. Therefore, altering the number of hubs does not significantly affect emission reductions.



Source: Spatial optimization of circular timber hubs, 2024

- Specific locations were identified that were consistently preferred for hub placement across various scenarios, suggesting strategic areas for future implementation.
- There are limitations to the research that do not fully capture complexities of real-life conditions: a short study period of five years and using assumptions that all timber waste can be reused and that demolitions occur evenly over time.
- The project recommends urban planners to develop a long-term vision that prioritises strategic locations for timber hubs, initiating experimental implementations, and maintaining flexibility in approach.
- Future research directions: exploring wider geographical scales, investigating temporary and flexible hub configurations, analyzing different material types, and considering impacts of modular construction.
- Establishment of circular construction hubs is crucial for sustainable urban development, with an optimal strategy balancing cost, emissions, and logistics.
- Continuous research and adaptation are essential to effectively integrate these hubs into the urban fabric and achieve environmental goals

M&L | Urban production in mixed-use environments
Spatial conditions for circularity

Speaker: Birgit Hausleitner
Date of webinar: 28 March 2025

About the speaker
Birgit Hausleitner is a lecturer at the Section of Urban Design at Department of Urbanism of TU Delft. She is an expert in spatial analytics, with a focus on urban and socio-spatial conditions that enable different types of economic activities, living and working to coexist. She develops and tests multi-scale analytical methods and design tools including generative pattern languages and configurational typologies to guide a city's or region's potential development for economic activities at multiples scales. She coordinated the TU Delft team for the JPI Urban Europe project "Cities of Making".

WEBINAR SUMMARY

Urban production plays a central role in the circularity transition. Space scarcity and increasing development pressures require a rethinking of how urban production – particularly small and medium enterprises (SMEs) and repair-based industries – can be integrated into the spatial fabric of European cities to support circular cities and regions.

The presentation draws from the *Cities of Making* framework (Hill et al 2020), which highlights three interrelated pillars for development: urban integration, people/policy/networks, and materials/technology, all contributing to sustainable manufacturing and circularity and the research 'Fixed in the City' (Clossick, Hausleitner, forthcoming), emphasising the relevance of spaces for repair in the circularity transition.

Key takeaways:

- Urban land must be treated as a strategic system, not just a passive backdrop for flows of goods and people.
- Production no longer sits at the city's periphery; it now intersects with residential and commercial areas, requiring new methods to address this complex situation.
- Environmental zoning and systemic instruments such as pattern languages can support organising complex land use and the engagement of multiple stakeholders.
- Design patterns like "transition zones" help mitigate friction between different land uses by structuring

"Spaces of work _ Bethnal Green, 2018" by Birgit Hausleitner is released under CC BY-NC-ND 4.0. on Flickr https://flic.kr/p/2kUvrQ9

gradual shifts between noisy, large-scale production sites and quieter residential zones.

- Spatial structures such as main streets and inner urban borders form a backbone of metropolitan develoment, that allow differentiating scale of space and accessibility and thereby visibility and affordability. They support the integration of diverse forms of work when aligning infrastructure, building types to form coherent environmental conditions, while modular building types enhance flexibility for manufacturers.

- Careful spatial transitions support thus a proximity of companies to customers and employees, while 'keeping good neighbours'.

- Repair activities play a special role for circular cities; they have to be conveniently located in respect to industries and everyday life, and require special attention in metropolitan strategies to make space for them, and make those spaces affordable.

- Spaces for officially classified repair and craft and repair businesses are currently underserved in urban plans, where community driven repair cafés find their place in financially subsidised culture-hubs or community centres.

Chapter 6
Dissemination

Activity | Communications

ACTIVITY LEAD | METREX

WHAT WAS ACHIEVED?

For the communications aspect of the ASSET project, the main aim is to maximize the project's reach to and impact on the relevant stakeholders and actors in the built environment, including within the partner cities and regions of the project, and throughout the EuroDelta. The communications objectives included raising awareness on the urgency to transition to a circular built environment and to emphasize its spatial implications at different scales; to encourage the active participation of stakeholders in their local context within the EuroDelta; and to help build a EuroDelta community of experts, local authorities and other key stakeholders with the common objective of cross-border collaboration.

Throughout the project, several communications deliverables were achieved: an internal communication plan to guide the project partners on communication-related matters; the ASSET Interreg NWE website including news and outcomes webpages; the dissemination of project progress and outputs through different online platforms and social media outlets; the broadcasting of monthly educational webinars (Meet and Learns) that highlight different speakers from various relevant fields, exploring the topic of the Circular Built Environment from different perspectives.

KEY INSIGHTS

- The ASSET website was used as a means for interested audiences to learn more about the project, upcoming events, as well as outcomes of the project. Visits were volatile but peaked whenever an event or outcome would be posted.
- LinkedIn was the most effective means of sharing information and progress updates about ASSET as well raising awareness of the EuroDelta and topics
- The Meet and Learn webinars were successful, with an average of 30 participants per session – they brought awareness and interest to the different topics/perspectives presented related to Circular Economy and the Circular Built Environment.
- The feedback received on the ASSET project are very positive – the EuroDelta scale in relation to the Circular transition of the build environment is gaining more attention and relevancy
- Potential partners have shown interest in learning more about the outputs and outcomes of ASSET

To learn more about what is happening with ASSET:
https://asset.nweurope.eu/news

Activity | Working Seminar

ACTIVITY LEAD | Duisburg Business and Innovation

WHAT HAS BEEN ACHIEVED?

The aim of the Working Seminar was for the ASSET project partners to come together in a physical setting to reflect on project progress and work on a strategy for cross-border collaboration in the EuroDelta to accelerate the transition towards a CBE. This activity was split into 2 parts – Part I took place in Eindhoven, the Netherlands and Part II in Duisburg, Germany 2 months later. Part I included presentations by activity leads on completed activities, updates on ongoing deliverables and working sessions. Part II included updates on project progress, presentations by relevant stakeholders in Duisburg, a walking tour of a former industrial park and harbour area, and working sessions on final products. Results: discussing main takeaways/insights gained from completed activities, further development of a EuroDelta narrative and discussions on products including the agreement of further cooperation and network establishment, policy recommendations, design principles and inspiration publication progress. These achievements contribute to the development of strategy of CBE in the EuroDelta.

KEY INSIGHTS

- Each city or region has its own culture and identity as well as its own set of challenges and regulations relating to the transition to a CBE – this could provide opportunities for cross-border collaboration to use the strengths of a city/region to address gaps/weaknesses of others.

- Within the ASSET consortium, there are different perspectives on how to achieve the circular transition (e.g. through spatial planning and approaches in involving market parties); project partners are also at different stages of the circular transition.

- The importance of ensuring that the momentum on accelerating the transition to a Circular Built Environment continues after ASSET – hence the need to establish a network and agreement of further cooperation.

Photos during Working Seminar:

Top — Left to right: Brainstorming session during Part I in Eindhoven (Photo: Jamila Jones); Presentation by Duisburg stakeholders during Part II (Photo: Duisburg Business and Innovation)

Bottom — Left to right: Discussion during Part II; Group photo during Duisburg tour (Both photos: Duisburg Business and Innovation)

Activity | Final Conference

ACTIVITY LEAD | perspective.brussels and Brussels Environment

This version of the **ASSET Final Report: In-depth Insights of the ASSET Project** does not yet contain the achievements and main insights of the Final Conference.

The Final Conference will take place on 21 May 2025 in Brussels, wrapping up over a year of exploring the spatial implications of circular economy on the built environment and exchanging innovative practices within the EuroDelta. Experts, researchers, urban practitioners and industry representatives active in circular economy will delve into strategic perspectives and spatial planning constraints for the circular economy in various local contexts, explore how transregional and cross-border collaborations can significantly boost the transition to a Circular Built Environment (CBE), as well as looking ahead to future collaborations. The event will also be official launch of the EuroDelta Alliance, in which the ASSET partners will be the founding members of this Alliance.
The event will consist of the following: a keynote speech, an overview of the ASSET project and outputs, the signature ceremony commemorating the formation of the EuroDelta Alliance, an exhibition of the student works of TU Delft and RWTH Aachen, a roundtable with relevant experts discussing CBE and the added value of macro-regional cooperation, an afternoon session of workshops on the themes of Why scale matters, Bridging the policy gap and Reshaping the hardware and software towards a CBE, followed by workshop conclusions and next steps.

On the following page, there is space for the participants of the Final Conference to write down their own insights and reflections based on their experience.

To note: this text will be updated in the final pdf version of the booklet and will include key insights of the Final Conference.

KEY INSIGHTS

By participants of the Final Conference

Colophon

Title: *ASSET Final Report | In-depth Insights of ASSET Activities*

Date: *May 2025*

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