



**Examples of [Horizon 2020](#) and  
[Bio-based Industries Joint Undertaking](#)'s projects on  
circular economy and circular bio-based economy  
with local and regional components**

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*Research and  
Innovation*

## BUILDINGS

### **BAMB: Buildings As Material Banks: Integrating Materials Passports with Reversible Building Design to Optimise Circular Industrial Value Chains**

The building industry produces a significant volume of waste, which, in turn, creates a sizeable environmental impact. BAMB has developed know-how and tools to help the construction sector embrace the circular economy and increase the reuse, reconfiguration and recycling of products, materials and components of buildings. The BAMB project advanced two key concepts: materials passports and reversible building design tools. Materials passports are digital data sets that describe the characteristics of materials and provide information on their recovery and reuse potential. Reversible building design is a strategy for the production of structures that can be easily transformed or deconstructed, enabling parts to be added or removed without damaging the building, the products, the components or the materials. Furthermore, the project put forward Building Level Integrated Decision Making Model, a Building Information Modelling (BIM) Resource Productivity Prototype and new business based on reverse logistics and circular value chains in buildings, to enable the systemic shift in the building sector towards the circular economy.

Website: <https://www.bamb2020.eu/>

### **CINDERELA: New Circular Economy Business Model for More Sustainable Urban Construction**

European construction sector generates about 9% of Gross Domestic Product (GDP) in the European Union and directly employs 18 million people being one of the most important industries of the European economy. At the same time, it is one of Europe's biggest consumers of resources that uses about half of all materials extracted and also generates one third of all EU waste. Construction and demolition waste (CDW) together with waste from industry, municipal services and others, can make excellent secondary raw materials (SRM) for construction works and thus provide an enormous potential for reducing the demand for virgin materials, the production of waste, and maximizing the value of recovered materials. The CINDERELA project aims to untap this potential by developing and demonstrating a new business model (CinderCEBM) to assist companies in setting up successful circular economy business cases based on waste-to-resource opportunities. The business model will be accompanied by a "one-stop-shop" (CinderOSS) service offering all that companies need to know for manufacturing and application of SRM-based construction materials in buildings and civil engineering works.

Website: <https://www.cinderela.eu/The-project/About>

**CIRCUIT: Circular Construction In Regenerative Cities**

Four European cities – Copenhagen, Hamburg, Helsinki's region of Vantaa and Greater London – are planning to undertake a full circular and regenerative transition. These cities joined in a partnership to create a value chain that will allow them to become fully smart, eco-friendly, regenerative, and circular economies. The project will aim to present the whole system of elements engaged in the transition process: from dismantling buildings for reuse of materials to Circularity Hubs and CIRCuIT Academy, promoting the development of further solutions. In 36 demonstration projects, CIRCuIT will present the tools of today and the future that will boost regeneration while substantially reducing the use of virgin raw materials.

Website : <https://cordis.europa.eu/project/id/821201>

**CityLoops: Boosting the circularity of organic and construction and demolition waste**

Construction and demolition waste (CDW) – including soil – and organic waste (OW) are two of the most significant urban material flows with a remarkable environmental impact in European cities. The CityLoops project will develop a circular city scan methodology and indicators by adapting material flow analysis (MFA) and urban metabolism methods to drive the transition to a circular economy. Seven small- to medium-sized cities in Denmark, Finland, the Netherlands, Norway, Portugal and Spain will test a number of innovative tools and processes to support circular planning and decisions making related to CDW and OW. The project will prepare scale-up plans in each of the demonstration cities, while collaborative learning networks will be established at the regional level.

Website: <https://dev.circularcities.eu/>

**HOUSEFUL: Innovative circular solutions and services for new business opportunities in the EU housing sector**

HOUSEFUL proposes an innovative paradigm shift towards a circular economy for the housing sector by demonstrating the feasibility of an integrated systemic service composed of 11 circular solutions. HOUSEFUL will introduce solutions to make buildings more resource efficient throughout their lifecycle, taking into account an integrated circular approach where energy, materials, waste and water aspects are considered. The solutions will be demonstrated in four different buildings located in Vienna and nearby Barcelona.

Webpage: <https://houseful.eu/>

## PLASTICS

### **CIRC-PACK: Towards circular economy in the plastic packaging value chain**

CIRC-PACK aims to develop a more sustainable, efficient, competitive, less fossil fuel dependent, integrated and interconnected plastic value chain. CIRC-PACK developed, tested and proved a range of biodegradable and compostable bio-polymer formulations with a high content of renewable sources such as carrier bags, shampoo bottles, packaging for hygiene products, food trays and coffee capsules. The project also proved the feasibility of producing sustainable and eco-friendly multi-layer packaging without a loss in consumer satisfaction. Materials developed include a film for fresh product trays and packaging for detergent powder. It also contributed to enhancing sorting and recycling methods of plastic waste.

Website : <https://circpack.eu/home/>

### **Plasticircle: Improvement of the plastic packaging waste chain from a circular economy approach**

PlastiCircle aims to develop and implement a holistic process to increase recycling rates of packaging waste in Europe. This will allow to reprocess again plastic waste in the same value chain (i.e. Circular economy; closure of plastic loop). This process is based on four axes: collection (to increase quantity of packaging collected), transport (to reduce costs of recovered plastic), sorting (to increase quality of recovered plastic), and valorization in value-added products (i.e. foam boards, automotive parts like engine covers/bumpers/dashboards, bituminous roofing membranes, garbage bags, asphalt sheets/roofing felts and urban furniture like fences/benches/protection walls). PlastiCircle's innovative circular economy solutions are being tested in three European "pilot" cities: Alba Iulia in Romania, Valencia in Spain, and Utrecht in the Netherlands.

Website: <https://plasticircle.eu/home/>

## WASTE (including bio-waste and food-waste) and SLUDGE from WASTEWATER

### **DECISIVE: A DECentralized management Scheme for Innovative Valorization of urban biowaste**

DECISIVE project proposes to change the present urban metabolism for organic matter (foods, plants, etc.), energy and biowaste to a more circular economy and to assess the impacts of these changes on the whole waste management cycle. In this objective DECISIVE project offers to demonstrate the ability to decrease the generation of urban waste flows (from household or assimilated) and increase recycling and recovery by focusing efforts on decentralised management and valorization of the biowaste, through anaerobic digestion and solid-state fermentation within the urban and peri-urban areas in relation with urban and peri-urban agriculture.

Website: <http://www.decisive2020.eu/>

### **EMBRACED: Establishing a Multi-purpose Biorefinery for the Recycling of the organic content of AHP waste in a Circular Economy Domain.**

A sizeable category in terms of organic content within MSW is represented by Absorbent Hygiene Products (AHPs; e.g. nappies, adult incontinence products, feminine hygiene items, wipes, etc.) waste, which is currently considered as non-recyclable fraction of MSW and finds its way to landfills or incineration, leading to important environmental concerns. Within EMBRACED project, a first-of-its-kind multi-purpose integrated biorefinery will be established in order to valorize in a relevant environment scenario the cellulosic fractions obtained from AHP waste towards the production of bio-products of significant commercial interest, and – concurrently – high added-value co-products, such polyolefinic plastics and SAP (superabsorbent polymers).

Website: <https://www.embraced.eu/>

### **FORCE: Cities Cooperating for Circular Economy**

The overall objective is to minimise the leakage of materials from the linear economy and work towards a circular economy. Specific objectives are to: 1. Engage cities, enterprises, citizens and academia in 16 participatory value chain based partnerships to create and develop eco-innovative solutions together. 2. Develop 10 viable end-markets by demonstrating new applications for plastic waste, metals (EEE devices), biowaste and wood waste. 3. Develop a governance model for cities based on value chain based partnerships. 4. Develop decision support tools and assess the actual impact by use of Big Data. 5. Ensure replication through the FORCE Academy aiming at enterprises, citizens and policy makers. The eco-innovative solutions will be demonstrated across four cities (Copenhagen, Hamburg, Lisbon and Genoa).

Website: <http://www.ce-force.eu/>

### **PERCAL**

Chemical building blocks from versatile MSW biorefinery. PERCAL will exploit Municipal Solid Waste (MSW) as feedstock to develop intermediate chemical products at high yield and low impurity level with huge industrial interest. These will be complementary to the bioethanol (current PERSEO technology), to achieve a cascade valorisation of the MSW components, i.e.: Lactic acid (LA) to produce: 1) Eco-friendly ethyl lactate solvents by reactive distillation from lactic acid & bio-ethanol to be used in cleaning products and inks and 2) hot-melt adhesives for cardboard and other non-food applications in combination with maleic anhydride by reactive extrusion; Succinic acid (SA) as an intermediate building blocks to production of polyols for the polyurethane industry; Biosurfactants by chemical and/or microbiological modification of protein and lipid fraction from remaining fraction of MSW fermentation.

Website: <https://www.percal-project.eu/>

### **REPAIR: REsource Management in Peri-urban AREas: Going Beyond Urban Metabolism**

The objective of REPAIR was to provide local and regional authorities with an innovative transdisciplinary open source geodesign decision support environment (GDSE) developed and implemented in living labs in six metropolitan areas. REPAIR developed the first geodesign software that includes waste and resource flows. REPAIR addresses five preliminary flow categories: construction & demolition waste, biowaste, post-consumer plastic waste, electrical waste and electronic equipment, and municipal solid waste. To further extend the concept of urban metabolism and make it applicable to support the development of place-based eco-innovative solutions, REPAIR developed an activity-based material flow analysis (AS-MFA). In order to be able to assess eco-innovative solutions a sustainability framework was developed, that is holistic and comprehensive in the sense that it covers social, economic and environmental aspects, and considers local to global impacts, based on a life cycle perspective.

Website: <http://h2020repair.eu/>

### **URBAN WASTE: Urban strategies for Waste Management in Tourist Cities**

In comparison with other cities, tourist cities have to face additional challenges related to waste prevention and management due to their geographical and climatic conditions, the seasonality of tourism flow and the specificity of tourism industry and of tourists as waste producers. The project UrBAN-WASTE has developed eco-innovative and gender-sensitive waste prevention and management strategies in 11 pilot cities with high levels of tourism to reduce waste production and improve the re-use, recycle, collection and disposal of waste.

Website: <http://www.urban-waste.eu/>

### **Urban-Wins: Urban metabolism accounts for building Waste management Innovative Networks and Strategies**

Urban\_Wins develops and test methods for designing and implementing innovative and sustainable Strategic Plans for Waste Prevention and Management in various urban contexts that will enhance urban environmental resilience and guarantee progress towards more

sustainable production and consumption patterns together with improvements waste recovery and recovered materials use.

Website: <https://www.urbanwins.eu/the-project/>

#### **RES URBIS**

**REsources from URban Bio-waSte.** The overall objective of the project is to integrate into a single facility and to use one main technology chain for the conversion of several types of urban bio-wastes into valuable bio-based products, while also minimizing any residual or consequent waste to be disposed of.

Website: <https://www.resurbis.eu/>

#### **SCALIBUR**

Scalable technologies for bio-urban waste recovery. SCALIBUR creates a holistic consortium to cut urban biowaste and replace it with a new production chain of biomaterials, forming a partnership of end users to recover and transform biowaste from three municipalities, namely Madrid (ES), Albano (IT) and Kozani (EL), into value added products. In SCALIBUR, HORECA waste will be transformed to proteins, lipids and chitin from insect rearing, while the organic fraction of MSW will generate biopesticides and bioplastics by high-solid enzymatic hydrolysis followed by fermentation. The resulting biogas from MSW and USS will be upgraded by bioelectrochemical treatment to produce commodity chemicals and bioplastics, such as PHBV.

Website: <http://www.scalibur.eu/>

#### **URBANREC: New approaches for the valorisation of URBAN bulky waste into high added value RECYCled products**

URBANREC project aims to develop and implement an eco-innovative and integral bulky waste management system (enhancing prevention, improving logistics and allowing new waste treatments to obtain high added value recycled products) and demonstrate its effectiveness in different regions. URBANREC project also improves the separation and disassembling of bulky waste - implementing advanced fragmentation techniques to obtain high quality raw materials, promoting innovative valorisation routes for those considered more problematic (PUR foam, mixed hard plastics and mixed textiles), not recycled due to lack of eco-innovative cost-effective solutions.

Website: <https://urbanrec-project.eu/>

#### **URBIOFIN**

Demonstration of an integrated innovative biorefinery for the transformation of Municipal Solid Waste (MSW) into new BioBased products (URBIOFIN). The aim of URBIOFIN project is to demonstrate the techno-economic and environmental viability of the conversion at semi-industrial scale (10 T/d) of the organic fraction of MSW (OFMSW) into: Chemical building blocks (bioethanol, volatile fatty acids, biogas), biopolymers (polyhydroxyalkanoate and

biocomposites) or additives (microalgae hydrolysed for biofertilisers). By using the biorefinery concept applied to MSW (urban biorefinery), URBIOFIN will exploit the OFMSW as feedstock to produce different valuable marketable products for different markets: agriculture, cosmetics. URBIOFIN will offer a new feasible and more sustainable scenario alternative to the current treatment of the OFMSW.

Website: <https://www.urbiofin.eu/>

#### **VALUEWASTE**

Unlocking new VALUE from urban biowaste. VALUEWASTE will implement three new value chains that will use urban biowaste as raw material for its valorisation into high-value end products in a cascading process, generating economic, social and environmental benefits: food & feed proteins and other ingredients, and biobased fertiliser. VALUEWASTE will be developed at two very different European locations, Murcia (ES) and Kalundborg (DK) with the purpose of finding a solution both technical and socially adapted to the different socio-economic contexts existing across Europe.

Webpage: <http://valuewaste.eu/>

#### **Waste4Think: Moving towards Life Cycle Thinking by integrating Advanced Waste Management Systems**

WASTE4Think seeks to design solutions based on the use of information and communication technologies that would enable the improvement of all waste management stages, adopting a global approach and particularly focusing on citizen participation in order to build more sustainable, eco-friendly cities. The main objective of this project is to move forward the current waste management practices into a circular economy motto, demonstrating the value of integrating and validating a set of 20 eco-innovative solutions that cover all the waste value chain. The benefits of these solutions will be enhanced by a holistic waste data management methodology, and will be demonstrated in 4 complementary urban areas in Europe.

Website: <https://waste4think.eu/>

#### **WaysTUP!**

Value chains for disruptive transformation of urban biowaste into biobased products in the city context. The project is set to showcase a rash of new products produced from urban bio-waste-to-bio-based processes starting from different feedstocks, including fish and meat waste, spent coffee grounds, household source separated bio-waste and used cooking oils. In its implementation, WaysTUP! will develop a behavioural change approach with citizens and local communities, improving and changing longstanding perceptions on urban bio-waste. It will also help promote active participation of citizens in the collection of urban bio-waste. 8

Website: <http://waystup.eu/>



## WATER

### **B-WaterSmart**

The project applies a large-scale systemic innovation approach to select, connect and demonstrate a tailored suite of technology, management and smart data solutions for multiple users and sectors, and create new business models based on circular economy and water-smartness in six cities and regions as living labs – Alicante (ES), Bodø (NO), Flanders (BE), Lisbon (PT), East Frisia (DE), Venice (IT). B-WaterSmart will demonstrate in real systems, at multiple scales, a range of promising technologies for water reuse/nutrient recovery, and smart data applications for more efficient, safe allocation & use of resources (water, energy, nutrients). The project applies a participatory approach for co-creation & implementation of solutions through local Communities of Practice and a joint innovation alliance of problem owners, and develop recommendations for suitable governance models, regulation & policy instruments.

Website: <https://cordis.europa.eu/project/id/869171>

### **Digital-Water.City**

Digital-water.city's (DWC) main goal is to boost the integrated management of water systems in five major European urban and peri-urban areas (Berlin, Milan, Copenhagen, Paris and Sofia), by leveraging the potential of data and smart digital technologies. DWC will create linkages between the digital and the physical worlds by developing and demonstrating 18 advanced digital solutions to address current and future water-related challenges.

Website: <https://www.digital-water.city/>

### **Fiware4Water: FIWARE for the Next Generation Internet Services for the WATER sector**

Fiware4Water project intends to replicate success stories by linking the water sector to FIWARE, an open-source IT platform created in 2011 under the Future Internet Public Private Partnership funded by the European Commission. The connection of the water sector to the FIWARE platform will contribute to the application of innovative digital solutions. In particular, it will make it possible to combine and process various data streams, into a standardised output, leading to a better and more sustainable use of resources. Fiware4Water solution will be first demonstrated in four demo cases covering a wide range of challenges, as exemplary paradigms of its potential. Then, the project will build and develop an EU and global community of adopters around the Fiware4Water ecosystem, as a go-to platform for innovative solutions and resource management.

Website: <https://www.fiware4water.eu/>

**HYDROUSA: Demonstration of water loops with innovative regenerative business models for the Mediterranean region**

HYDROUSA will provide innovative, regenerative and circular solutions for (1) nature-based water management of Mediterranean coastal areas, closing water loops; (2) nutrient management, boosting the agricultural and energy profile; and (3) local economies, based on circular value chains. The solutions will be demonstrated on 3 major touristic islands in Greece. Detailed technical and financial deployment plans will be established for replication in additional 25 locations worldwide.

Website : <https://www.hydrousa.org/>

**INCOVER: Innovative eco-technologies for resource efficiency for wastewater.**

INCOVER concept has been designed to move wastewater treatment from being primarily a sanitation technology towards a bio-product recovery industry and a recycled water supplier. INCOVER solutions permitted to recover energy (biomethane) and bioproducts (bioplastics, organic acids, biofertiliser, biochar, irrigation water) from municipal, industrial and agricultural wastewater, while reducing the overall operation and maintenance costs of wastewater treatment.

Webpage : <https://incover-project.eu/>

**NAIADES: A holistic water ecosystem for digitisation of urban water sector**

NAIADES Ecosystem envisions transforming water sector through automated and smarter water resource management and environmental monitoring, achieving a high level of water services in both residential or commercial consumers, exploiting the efficient use of physical and digital components of water ecosystem. 3 pilot cities: Alicante, Braila and Carouge

Website : <https://naiades-project.eu/>

**NextGen: Towards a next generation of water systems and services for the circular economy**

NextGen will demonstrate innovative technological, business and governance solutions for water in the circular economy in ten high-profile, large-scale, demonstration cases across Europe, and we will develop the necessary approaches, tools and partnerships, to transfer and upscale. The circular economy transition to be driven by NextGen encompasses a wide range of water-embedded resources: water itself (reuse at multiple scales supported by nature-based storage, optimal management strategies, advanced treatment technologies, engineered ecosystems and compact/mobile/scalable systems); energy (combined water-energy management, treatment plants as energy factories, water-enabled heat transfer, storage and recovery for allied industries and commercial sectors) and materials (nutrient mining and reuse, manufacturing new products from waste streams, regenerating and repurposing membranes to reduce water reuse costs, and producing activated carbon from sludge to minimise costs of micro-pollutant removal).

Website : <https://nextgenwater.eu/>

**POWERSTEP: Full-scale demonstration of energy positive sewage treatment plant concepts towards market penetration**

PowerStep transforms existing municipal wastewater treatment plants from net power consumers into energy neutral or even energy positive service providers, exploiting the chemical energy bound in the organic matter.

Website : <http://www.powerstep.eu/>

**Project Ô: Demonstration of planning and technology tools for a circular, integrated and symbiotic use of water**

Project Ô demonstrates approaches and technologies to drive an integrated and symbiotic use of water within a specific area, putting together the needs of different users and waste water producers, involving regulators, service providers, civil society, industry and agriculture.

Website : <http://eu-project-o.eu/>

**RUN4LIFE: Recovery and utilisation of nutrient 4 low impact fertiliser**

Domestic wastewater (WW) is an important carrier of nutrients usually wasted away by current decentralised WW treatments (WWT). Run4Life proposes an alternative strategy for improving nutrient recovery rates and material qualities, based on a decentralised treatment of segregated black water (BW), kitchen waste and grey water combining existing WWT with innovative ultra-low water flushing vacuum toilets for concentrating BW, hyper-thermophilic anaerobic digestion as one-step process for fertilisers production and bio-electrochemical systems for nitrogen recovery. Different parts of Run4Life will be large scale demonstrated at 4 demo-sites in Belgium, Spain, Netherlands and Sweden, adapting the concept to different scenarios (market, society, legislation). Performance tests will be carried out with obtained products (compared to commercial fertilisers) with close collaboration with fertiliser companies. Process will be optimised by on-line monitoring key performance indicators (nutrient concentration, pathogens, micro pollutants).

Website: <https://run4life-project.eu/>

**SCOREwater: Digital solutions for water: linking the physical and digital world for water solutions**

SCOREwater enhances the resilience of cities against climate change and urbanisation by enabling a water smart society and securing future ecosystem services. The project introduces digital services to improve management of wastewater, storm-water and flooding events. Services are developed and verified by relevant stakeholders (communities, municipalities, businesses, civil society) in iterative collaboration with developers, tailoring to stakeholders' needs. The project identifies best practices for developing and using the digital services, addressing water stakeholders beyond the project partners and develop technologies to increase public engagement in water management. SCOREwater delivers an innovation ecosystem driven by the financial savings in both maintenance and operation of water systems that are offered using the SCOREwater digital services, providing new business opportunities for water and ICT SMEs.

Website: <https://www.scorewater.eu/>

**SMART-Plant: Scale-up of low-carbon footprint material recovery techniques in existing wastewater treatment plants**

SMART-Plant will scale-up in real environment eco-innovative and energy-efficient solutions to renovate existing wastewater treatment plants and close the circular value chain by applying low-carbon techniques to recover materials that are otherwise lost. The processes considered in this project are: Bio-resource recovery; Phosphorus recovery; Bioplastics recovery; Cellulose recovery. 9 pilot systems will be optimized for 2 years in real environment in 5 municipal water treatment plants, including also 2 post-processing facilities.

Website: <https://www.smart-plant.eu/>

**ULTIMATE: indUstry water-utiLiTy symbiosis for a sMarter wATer society**

The project aims, through 9 large –scale demonstrations of Water Smart Industrial Symbiosis (WSIS), to recover, refine and reuse wastewater; extract and exploit energy and materials from municipal and industrial wastewater. ULTIMATE nurtures partnerships between business (incl. industrial and technological ecosystems), water service providers, regulators and policy makers and actively supports them through immersive Mixed Reality storytelling using technology and art to co-produce shared visions for a more circular, profitable, socially responsible and environmentally friendly industry, with water at its centre. The project mobilises a strong partnership of industrial complexes and symbiosis clusters, leading water companies and water service providers, specialised SMEs, research institutes and water-industry collaboration networks, and builds on an impressive portfolio of past and ongoing research and innovation, leveraging multiple European and global networks to ensure real impact.

Website: <https://cordis.europa.eu/project/id/869171>

## URBAN PLANNING AND CULTURAL HERITAGE

### **CENTRINNO: New CENTRALities in INdustrial areas as engines for inNOvation and urban transformation**

CENTRINNO aims to develop and demonstrate strategies, approaches and solutions for regeneration of industrial historic sites and areas as creative production and manufacturing hubs, that 1) hold true to the ecological challenges of our time, 2) boost a diverse, inclusive and innovative urban economy, and 3) use heritage as a catalizer for innovation and social inclusion. European cities have the opportunity to evolve the productive model to become circular, where materials stay local, and information travels globally, enabling the recovery of local knowledge around design and production. Within this new industrial paradigm, new players offer new capacity and infrastructure for local production, enabling the re-circulation of material flows at the local scale, following the main Circular Economy principles. CENTRINNO gives centre stage to craftsmen, vocationally trained professionals, entrepreneurs, makers, SMEs, Fab Labs, Food Labs and Makerpaces to become key players in the cities supply of local goods and support them to take on a fundamental role in future cities, thus opposing disengagement and stagnation of local economies.

Website: <https://imagineic.nl/projecten/centrinno/>

### **CLIC: Circular models Leveraging Investments in Cultural heritage adaptive reuse**

The CLIC project applies the circular economy principles to cultural heritage adaptive reuse to achieve environmentally, socially, culturally and economically sustainable urban/territorial development. Adaptive reuse of cultural heritage is seen as a mean to make the flows of raw materials, energy, cultural and social capital truly circular. Thus, the project put emphasis not on economic growth but also on the promotion of human development. The project CLIC is leading the Taskforce on "Circular models for cultural heritage adaptive reuse in cities and regions", launched in the framework of the European Year of Cultural Heritage 2008. The main aim of the taskforce is to foster dialogue and exchange best practices and evidence between two communities of stakeholders that were not used to work together, notably those focusing on cultural heritage and those dealing with circular economy sectors (defined in a narrower manner).

Website: <https://www.clicproject.eu/>