URBAN INNOVATION IN DEVELOPING THE URBAN CIRCULAR ECONOMY

/// BACKGROUND: WHY TAKE ACTION FOR THE URBAN CIRCULAR ECONOMY?

Every single business sector and geography potentially stands to benefit from the circular economy. Cities, however, play a particularly central part in this transformation process, due to the amplifying power of the human concentrations found there.

The concept of the circular economy first made its appearance in French law with the Energy Transition Act for Green Growth (17 August 2015), aimed at «moving past the linear business model built around extracting, manufacturing, consuming and disposing, by ushering in a tempered and responsible way of making use of natural resources and primary raw materials». Cutting back the footprint left by cities is thus the major sustainable development challenge facing our societies.

Cities are hotbeds of activity and interaction. They are the driving forces of our economy, providing jobs and services, and can accurately be described as catalysts of creativity and innovation. Nearly 50% of the world's population (80% in Europe) live in urban environments, which in turn generate more than two-thirds of the world's GDP. However, they are also the source of dead-end situations, as already-developed or fast-growing societies find themselves inevitably incapable of concurrently doubling their urban growth rates and reducing their environmental footprint (the current environmental footprint per person on the planet is 2.3 ha, which already exceeds the Earth's capacity level of 1.8 ha). Lastly, the urban environment is the source of 70% of greenhouse gases and most of the waste production on the planet (5.5 tonnes per year and per inhabitant, including 452 kg of household waste).

By 2030, 600 cities across the world - 300 Northern countries and 300 Southern - will be home to two-thirds of the global population and concentrate 60% of the world's GDP.

/// WHAT ARE THE MAIN AREAS FOR INNOVATION WHEN IT COMES TO THE CIRCULAR ECONOMY?

The innovative ideas can be classified into 3 main categories:

► The urban local economy: It is in urban services that the greatest potential for resources can be found. The local circular economy approach makes it possible to use the waste and refuse from a production cycle, turning it into resources for another cycle, of the same or different nature. Geographic proximity is often a key success factor for production cycles of this kind. With cities and rural areas now located close to one another, there is real opportunity to develop new complementary modes of production.

► Recycling, re-usage and reuse, eco-design: circularity in material use and in usages makes it possible to optimise the consumption of natural resources. Circularity, in this case, encompasses all the responses available to companies interested in cutting back their resource consumption (re-use, re-sale, repair, recycling, etc.), but also in taking action upstream, by...
designing products differently, based on analysis of the entire life-cycle and construction operations on the scale of a building, an urban development operation, or an infrastructure, and focusing in particular on looking for alternative sources of material and ways to reduce environmental impact.

- **The ownership economy**: This approach stands in for the sale of services and products: the seller, remaining the product-owner, has more to gain from improved product life cycles.

The innovative ideas shown in the pamphlet fact sheets illustrate each category of innovation separately -- but, on the ground, they can be combined or blended.

/// WHAT KINDS OF INNOVATION ARE INVOLVED?

The innovative ideas presented generally combine several different types of innovation.

- **Technological**: solely-technological innovation can be necessary, but is not necessarily the norm, nor the most frequently-chosen type of solution. That being said, the use of new information and communication technologies based on digital is, in most cases, a prerequisite for rolling out and speeding up the spread of the targeted innovations.

- **Economic and legal** to enable the development of new business models and facilitate the integration of urban functions.

- **Organisational** to innovatively bring together players from very different walks of life (companies, local authorities, universities, citizens, etc.) around shared projects to reduce their city’s environmental footprint, reduce raw-material intensiveness to provide the same service at lower environmental cost, by turning the waste from a service or production cycle into a resource for another cycle of a different kind.

Most of these innovative ideas need to be backed up by **behavioural change** on the part of the players involved, first and foremost, the users.

/// WHAT ACTION IS BEING TAKEN IN FRANCE TO SUPPORT THIS INNOVATION?

For many years now, France has designed its public policy to support development and experimentation with innovative techniques for saving raw materials in industrial processes and service provision. In 2016, the following programmes were of note:

- **The Investments for the Future Programme (PIA)** supporting innovation designed with an all-encompassing view of the life cycle;

- **The “Zero Waste Territories” programme** championed by the Ministry of the Environment, which supports and provides assistance to municipalities that have committed to considerably lowering waste generation and developing new avenues for re-use;

- **Mobilising the elected officials and civil society**, for instance by creating the Institute for the Circular Economy, the OREE Association, or ADEME’s support for multiple initiatives on the ground;


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26 hectares at the heart of the Valenciennes Metropolitan Area, a former industrial fallow land (ex-Vallourec site), later granted ZAC status, achieving high energy and environmental performance. By pooling their needs and re-using the fatal energy generated by the Data Center, Vallourec’s former drilling site was re-conditioned, creating a virtuous circle and making it possible to do without fossil fuel energy consumption entirely.

INNOVATIONS

- An up-to-date comprehensive cost study that takes into account ZAC development programme phasing (optimising offer and energy demand) As existing drilling facilities were re-used, investment were cut
- A technical first for a ZAC
  Fatal energy from the Data Center was recovered to supply an entire ZAC and carve out a 100% sustainable project (ENR&R), 70% of CO2 emissions were cut by 70% and ultra-deep geothermal energy and direct-exchange were used to concurrently satisfy heating and cooling needs.
- Support was also provided to real estate developers to etch out a virtuous circle for the project.

KEY DATA

- A truly multi-faceted development programme (93,000 m²)
  - Digital Greenhouses
  - The Convention Centre
  - The Data Centre
  - A geothermal plant (2MW)
  - Industrial, re-conditioned drilling units
  - A temperate water loop enabling re-use of the Data Centre’s fatal heat
  - Student housing
  - Offices and Shops

STAKEHOLDERS

- Project Manager: La communauté d’agglomération de Valenciennes.
- Upstream study:
  - Regulatory paperwork: TPFi
  - Technical, legal and financial feasibility: IFPEB - TPFi - PARME Avocats
- Project Management Assistance and Public Service Delegation: TPFi and PARME Avocats
- Project Management Assistance to real estate developers: TPFi and ANTEA
- Project Manager: TPFi (co-creative engineering)
- Operator: Groupement ENGIE et Eau &Force
IMPLEMENTATION

- The public authorities were committed to re-conditioning this former industrial site and turn it into an excellence area for digital creation, and sustainable and intelligent territory (thermal smart grid).
- Detailed upstream studies, with multiple scenarios reviewed, so as to give the project manager as many well-suited options as possible, from the technical, financial and legal standpoints
- A multi-disciplinary approach and commitment to pooling energy
  A decision-making assistance tool
- Support was provided throughout to the real estate developers so that they understood every aspect of the cycle and could plan for compatible facilities

“...the Creative Banks of the Escaut ZAC, a truly sustainable and smart neighbourhood spans 26 hectares and multi-faceted programme combining many functions: housing, a city park, companies, offices, world-renowned schools, shops, and B-to-B firms. With a geothermal grid put to work across the site, the project became a living example of dynamic and sustainable energy management. The grid recovers fatal energy from the Data Center, the key component of the thermal smart grid. Secondary energy systems guaranteed to be compatible and optimised in the buildings connected to the geothermal loop, energy supply exactly tuned to building needs, and a design fostering energy efficiency and low-intensity consumption: all of these were key features in the project...”

RESULTS

/// Economic attractiveness:
  - ENR&R in place across the ZAC, energy spending completely under control, multi-use programme

/// Environmental conservation and enhancement
  - An industrial fallowland was turned into a high-performance urban site
  - Environmental footprint reduction: renewable energies (75%) and recovered energies (25%), energy pooling, geo-cooling, lower GHG emissions (CO₂ < 50 g/kWh)

/// Responsible use of resources
  - Shallow geothermal technology and reinjection into water table

/// Well-being
  - Comfortable heating in buildings
  - Sustainable transport (tram)
  - Landscaped park

Winner of the EU’s «Territorial Excellence» call for projects

FINANCIAL ASPECT OF THE OPERATION

/// Won the Energy Users’ Award for highly competitive energy well-managed over time
/// Investments, operating expenses and maintenance costs all shared
/// New business model

KEY DATA

- 6 300 MWH/year
- CO₂ < 50 g/kWh
- First 100%ENR&R project in France