Concepts and applications of circular economy for the design of an industrial park in Toulouse industrial region

Principes et pratiques de l’économie circulaire pour la conception d’un parc d’activités au sein du bassin industriel toulousain

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Outline

• Context

• Industrial project

• Methods and tools

• Conclusion
Context

- From linear economy model
  - with limitations
    - Economic loss and structural waste, scarcity of resources, price volatility, supply risks, natural systems degradation (climate change, loss of biodiversity and natural capital, land degradation, and ocean pollution), ...
Context

• To circular economy model

From 1966 ... (Pearce et Turner, 1989)
To nowadays

“an economy that is restorative and regenerative by design and aims to keep products, components, and materials at their highest utility and value at all times, distinguishing between technical and biological cycles“ (Ellen MacArthur Foundation, 2015)

« système économique d’échange et de production qui, à tous les stades du cycle de vie des produits (bien et services), vise à augmenter l’efficacité de l’utilisation des ressources et à diminuer l’impact sur l’environnement tout en développant le bien être des individus » (ADEME, 2014)
Concepts

- A package of solutions in systemic and LCT approach to manage resources use and local and global impacts
  - “collaborative” approach: by-product exchange, industrial network, industrial park/estate, ...

« Un mode d’organisation inter-entreprises par des échanges de flux ou une mutualisation de besoins »
(ADEME, 2014)
Eco-industrial park (EIP)

- “an industrial park in which businesses cooperate with each other and with the local community in an attempt to reduce waste and pollution, efficiently share resources (such as information, materials, water, energy, infrastructure, and natural resources), and help achieve sustainable development, with the intention of increasing economic gains and improving environmental quality.” (Cohen-Rosenthal, 2003)

Kalundborg, Shanghai, ...

In France, many projects but few projects in new design

And many success factors such as information exchange, collaborative context, trust, temporality issue, governance model, manager know-how, ...

(Adoue, 2007) (Abitbol, 2012) (Heeres et al., 2004) (Gibbs et al., 2007)
• Exchange and mutualisation for a park within a network
  – by-product (water, energy, materials)
  – and infrastructure, equipment, HR, logistic & service

Tenant organisation for a real estate development and common sustainability patterns

From (Lowe, 2001)
Industrial project

- « LesPortesDuTarn »
  - a mixed-use development
  - with industry priority
  - managed by SPLA81 urban planning agency

INDUSTRIE : 77,5 ha - 61 %

SERVICES LOISIRS COMMERCES : 25 ha - 19,7 %

BUREAUX : 4,3 ha - 3,4 %

AGRICULTURE : 19 ha* - 15 %
* Agriculture & Apiculture, Viticulture, pâturages & circuits courts *

TOURISME & AGRICULTURE

AIRE DE SERVICES
Industrial project

Key issue: to be in accordance with circular economy and industrial ecology framework (Grenelle I and II, Transition énergétique, AEU)

Diagnostic archéologique
PHASE 1 ET 2 (nord et sud de l'A68)

1re Implantation: Vinoviale
Obtention Permis de Construire

Aménagement du Point d'Informations des Portes du Tarn

Départage des travaux
PHASE 1 : Contournement de Saint-Sulpice (échangeur n°5, future voie départementale)

Fin des fouilles archéologiques
Pose du tablier du pont de la voie ferrée

AVRIL - MAI 2016

JUIN 2014
JANVIER 2015

NOVEMBRE 2014

OCTOBRE NOVEMBRE 2013

AVRIL 2012

FÉVRIER 2012

CONCERTATION PRÉLABLE

Création de la ZAC « Les Portes du TARN »

Création de la SPLA 81 (Société Publique Locale d'Aménagement)

ENQUÊTE PUBLIQUE

JUIN 2010 NOVEMBRE 2011

Création du SMIK « Les Portes du Tarn »

JUIN 2009
Industrial project

- “game of” Stakeholders
  - a dynamic and complex relationships process
  - a challenging management of data

- some technics for relationships
  - animation and transparency strategies, park office to visit and meet, blog, newsletter, YouTube channel
  - research laboratories agreement
Methods and tools

• A R&D project in association to park development

**COPREI**
COnception d’un Parc d’activité selon les pRincipes de l’Ecologie Industrielle
36 months

SPLA81

Main deliverables:
An operating mixed-use park acting as a demonstrator and open to everyone
A tool box for park manager
Inner and outer synergies between park components and its territory

- **Educate**
- **Operate**
- **Improve**

- **Design, Layout and commercialisation process**
- **Governance rules and collaborative economic model**
- **Experimental field**

- **Collaborative decision-making framework for applicant company**
- **Environmental performances assessment**
- **Integrated information system and “real-time” monitoring**

- **Commence**
- **Decide**
- **Evaluate**

- **INP ENSIACET**
Methods and tools

- Park lifecycle

Key criteria used in the CDM process:
- Industrial synergies (inter-park and extra-park)
- Environmental assessment
- Energy efficiency, renewable energy sources
- Waste and water management
- Material flow
- Mobility, transportation (materials and people)
- Prevention of air pollution
- Noise prevention
- Cultural, social, health and safety

Industrial water network (200 m³/h)
Energy network in progress (Solid Recovered Fuel, ...)
Type of synergy: Material (water incl.) and energy, service (HR and logistic incl.), infrastructure and equipment

Insitu land recycling
50 kms as the territory boundary
Demonstration office and agro-industrial tourism
Biodiversity
Methods and tools

- Tools box for managing the park lifecycle

  - Data collection tool
  - IT tool for managing companies information and supporting commercialization decision
  - Software tool for environmental life cycle assessment
  - Information system for park operation and performances tracking

  - Stakeholders
  - Metrics
    - « Big-data » acquisition and computation (Digitalisation “4.0”)
  - Impacts assessment
    - Benefits valuation
    - Scenarios rating

  - Companies data and flows
  - Synergies search
  - Installation scenarios simulation
  - Impacts assessment
  - Benefits valuation
  - Scenarios rating

- Water, air, noise and traffic “real-time” monitoring system

- Methods and tools
  - Tools box for managing the park lifecycle

- Digitalisation “4.0”
Methods and tools

• IT tool for managing information and supporting decision
  – collaborative web application
    • 3 kinds of access: managers, commercials, company contacts
  – main usage components:
    • company, end-user access, cartography, synergy, tools and requests

Former or current initiatives i.e. Act’if, Presteo, FAST, IUWAWM, SymbioGIS, EDITER, CRISP, IEPT, IEDP... (Grant et al., 2010)
Methods and tools

- Common search tool for synergies

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méthode d’identification de synergies (Adoue, 2004), méthode STRATIS (Brullot, 2009), méthodologie COMETHE (2011)
Methods and tools

- Search tool for the best plot
Conclusion

• A way for “sustainable” activities and “better balanced” economic development near the stressing Toulouse metropole

• Current status of industrial project
Conclusion

• Our view for managing park lifecycle and making decisions

CE as “strategical” framework

LCA (eco-design) and IE as required “operational” methods
Thanks!

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