ENTPE

UNIVERSITÉ DE LYON

Laboratoire d'Economie des Transports
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LYON

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FACING THE CHALLENGES OF A NEW ERA: SMART CITY PROJECTS

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POLITÉCNICA

European Investment Bank · Institute

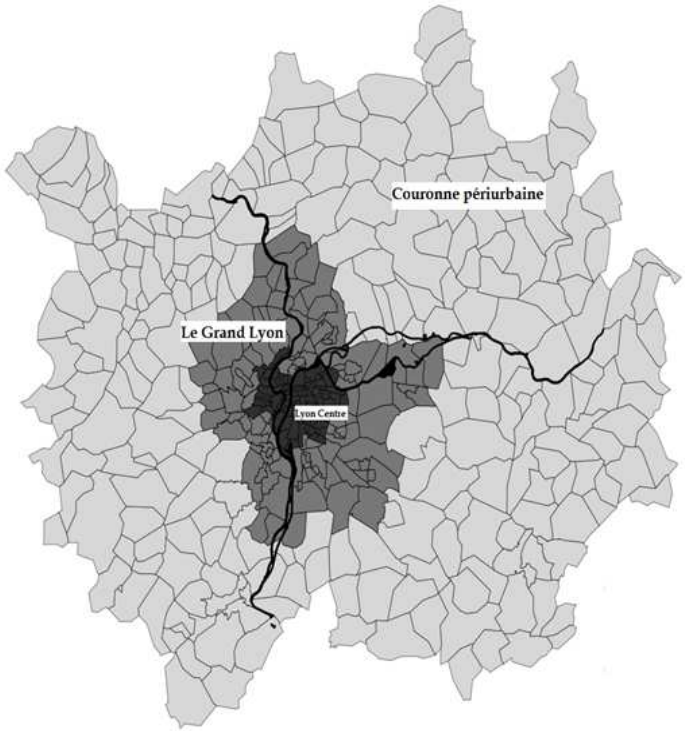
Outline

1. Introduction
- Maps, Population, Economic Activities, ICT, Rhone-Alpes Region

2. City Challenges
- Greater Lyon: Energy and GHG Issues
- Local Agenda 21

3. Smart City Projects
- Mobility Projets: **Optimod'Lyon**
- Smart Grids: **Watt et Moi**
- A more integrated project: **Lyon Smart Community**
  - Hikari building complex
  - Sunmoov', electric vehicle carsharing
  - Home energy (and water) consumption management
  - Community Management System

1. INTRODUCTION (1/4)



Rhone-Alpes Region

http://media1.benoot.com/img/aggrandir.jpg

Source : L. Bouzouina

Lyon - Greater Lyon - Urban area of Lyon

1. INTRODUCTION (2/4)

	Lyon	Greater Lyon	Rhone-Alpes Region
No inhabitants (millions)	0.5 (2011)	1.4 (2010)	6.4 (2012)
City extension (km^2)	48	534	44 000
Population density (hab/km^2)	10 260	1 850	144 (2012)
GDP / per capita income (€)		43 000	30 513 (2008)
Employment rate (%)	71 (2009)	71 (2009)	65 (2007)
Poverty rate (%)*	15 (9-21)		12 (2010)

* Poverty line = 60% of the median income, 977 € in 2011

1. INTRODUCTION (3/4)

	Greater Lyon	Rhone-Alpes Region
Main economic activities (%)*	(2004)	
Health & social serv.	9.8	
Public administration	9.6	
Advisory & assistance services	8.5	
Education	8.4	
Transport	6.4	
ICT baseline		(2013)
Internet (% homes)		71
High/very high speed internet (% homes)		69
Mobile (% homes)		91
Smartphone		48
Type of mobile (% mobile)		
Classic		44
Smartphone		41
No mobile		15

* % of salaried employment

Rhone-Alpes Region

- One 10th of French surface, population, economy
- 2nd region in terms of surface, population, industrial sector, tourism, telecommunication services
- 1st region for:
  - energy production (nuclear and renewable)
  - competitiveness clusters (nanotechnologies, health, biotechnologies, environment, chemistry, digital technology, energy, transports of the future)
- 2nd pole for higher education and research

2. City Challenges (1/2)

Greater Lyon (GL): Energy and GHG Issues

- **Energy consumption**: 2,7 PET per capita; 29% housing, 27% industry, 24% road transport, 20% services sector
  - Source of energy: 33% gas, 28% electricity, 18% diesel (2006)
  - Renewable energy: 73% hydraulic, 14% incineration of hh waste (2009)

- **CO^2**: GL produces 7 M ton, 6 ton/capita, 2% of CO^2 emissions in France
  - Sector: 41% industry and energy, 29% road transp., 17% housing, 13% services sector (2003)
  - Road Transport : 63% (CO^2 emissions) cars, 31% trucks & lorries, 6% bus & motorcycles; 60% of trips by car are < 3 km
  - Housing: 91% (CO^2 emissions) heating; 78% houses emissions, houses < 1975; 83% flats emissions, flats < 1975

- + 150 000 inhabitants in 2030

2. City Challenges (2/2)

Greater Lyon (GL). 1st Local Agenda 21 adopted in 2005, revisited in 2007 (2007-2009), 5 strategic orientations which allow GL to engage in a sustainable development approach and smart city projects:

- **Promote** social cohesion and economic development
  Entrepreneurship, quality of housing, urban renewal
- **Reduce** greenhouse effects (implementation territorial climate plan)
  -20% energy consumption & GHG, renewable energy = 20%
- **Improve** the living environment of the inhabitants
  Waste management, noise pollution, water supply and sanitation
- **Position** as facilitator of sustainable development awareness
  Share best practices on a partnership approach
- **Engage** institutional mobilisation for sustainable development
  Consultation of inhabitants, public procurement according to social & environmental criteria, sustainable development observatory

3. Smart City Projects

Greater Lyon (GL) is engaged in 4 fields

- **New forms of mobility**: mobile applications, new services, carsharing, carpooling
- **Digital services**: mobile applications, housing management, decision support tools (energy management, traffic prediction, etc.), contactless technologies for information
- **Smart grids**: applications for energy management, supply of energy from different sources, new equipments and services compatible with Linky meters
- **Innovation conditions**: GL furnishes necessary infrastructures and conditions to high potential projects, connects stakeholders

3. Smart City Projects

New forms of mobility projects: Optimod'Lyon

- **Opticities project**. 2013-2015, 13m €, co-funded by the European Commission within the 7th Framework Programme (9m €)
  - Aim: "the Optimisation of transport networks through the experimentation of innovative ITS services and strong public /private partnerships"
  - ~15 partners (public, private, research)
  - 6 experimentation cities: Lyon, Birmingham, Madrid, Gothenburg, Wroclaw, Torino

- **Optimod'Lyon**, main objectives:
  - Prediction of traffic for the next hour
  - Implementation of a multimodal urban navigator
  - Implementation of an urban freight navigator and a tool for the optimisation of delivery rounds

- Funding: 7m €, Greater Lyon, private partners, French government ("investments of the future", managed by ADEME)

3. Smart City Projects

Smart grids: **Watt et Moi** (*Watt and Me*)

- Objective: to provide a new technological tool to help residents to be aware of their electricity consumption and to adapt their consumer behaviour
- May 2012-May 2014, experimentation with a panel of 1 000 hhs in Greater Lyon, already equipped with the smart electricity meter Linky, deployed by ERDF*
- North and West of GT: Lyon (4th, 5th, 6th and 9th *arrondissements*) and 3 *communes* (Champagne au Mont-d'Or, Ecully, Saint-Cyr au Mont-d'Or), flats and houses, all types of heating
- Participants of the experiment have access to a secure and free web site: consumption data (kWh, season, month, day, hour), monthly curves of consumption, comparisons, advices
- All data on consumption are coded and the customer is the only "owner" of data.

* Electricité Réseau Distribution France

3. Smart City Projects

Smart grids: **Watt et Moi** (*Watt and Me*)

- **Funding**
  - **Cost?**
  - **According to ERDF*: Linky costs 150-200 € to install, 1-2 €/per hh/month over 10 years, less than the 50 €/year savings that it generates**
  - **175 000 Linky meters already installed in Greater Lyon**

- **Stakeholders**
  - **Principal partners: ERDF*, Grand Lyon Habitat (social housing), PIMMs**, Local Energy Agency (ALE)**
  - **Everyday management, hotline (ERDF, Grand Lyon Habitat)**
  - **PIMMs: follow-up, contacts the participants periodically**

*** Electricité Réseau Distribution France**
**** Point Information Médiation Multiservices**

3. Smart City Projects

Smart grids: **Watt et Moi** (*Watt and Me*)

- Analysis of consumer's behaviour
  - 3 sociological surveys, at the beginning of the experimentation, one-year later, at the end.
  - 1st survey, autumn 2012: participants' interest for the experimentation, the impact on their consumption, 35 residents, round table, personal interviews
  - Results: good acceptance, major implication if looking for savings (consumption, expenditure), web site useful, request for personalized support and exchange comments among participants

- Impacts
  - Overall assessment underway? Further actions?
  - Knowledge on consumer's behaviour

Image: ERDF

3. Smart City Projects

A more integrated project: Lyon Smart Community

- Confluence 2003-20015
  - South of the peninsula, confluence of the Rhone and the Saone rivers, old historical area, industrial district 1960s-1970s.
  - 70 ha. brownfield sites and amenities; relocation of freight port, wholesale market, prison
  - Transport accessibility: inter-city (Perrache railway station, motorway A7), urbain (subway, tram, bus)
  - Downtown surface area x 2, multi-functions
  - Residents x ~2: 7 000 => 15 000 (2020)
  - Jobs x ~4: 7 000 => 27 000 (2020)

Source: Y. Leclerc, Confluence presentation

3. Smart City Projects

http://projets-architecte-urbanisme.fr/images-archi/lyon-confluence-ZAC-plan-amenagement.jpg

3. Smart City Projects

Towards Confluence, view from Perrache railway station

Image: L. Diaz Olvera

3. Smart City Projects

Confluence, near the shopping centre

Images: L. Diaz Olvera

3. Smart City Projects

A more integrated project: Lyon Smart Community

- **Funding and stakeholders**
  - **A partnership between Great Lyon and NEDO***
  - **30 partners (22 French firms): SPLA** Lyon Confluence, ERDF, ADEME, Bouygues Immobilier, Transdev, Grand Lyon, etc.**
  - **Japanese consortium led by the Toshiba group for developing the demonstration project**
  - **Grand Lyon: arranging local partnerships, project organisation and management**
  - **NEDO: 50m €**

*** New Energy and Industrial Technology Development Organisation**
**** Société Publique Locale d'Aménagement**

Partial source: Y. Leclerc, Confluence presentation

3. Smart City Projects

A more integrated project: Lyon Smart Community

- **4 Objectives**

1. Energy efficiency of buildings: +20%
2. Electric vehicle: 80% renewable energy
3. Energy consumption management: +10% of energy savings
4. '20-20-20' European objective in 2020

- **4 Tasks**

1. Positive energy building: Hikari complex
2. Electric vehicles sharing system: Sunmoov'
3. Energy boxes to manage hh energy consumption
4. Community management system

Partial Source: Y. Leclerc, Confluence presentation

3. Smart City Projects

A more integrated project: Lyon Smart Community

1. **Hikari (*Light*) complex: construction of 3 positive energy buildings**

- **Confluence P-lot**
- **Multi-fonction: residential (~30%)/no-residential**
  - **Higashi (*East*) : offices**
  - **Minami *(South)*: housing**
  - **Nishi (*West*): offices, housing, shops**
- **~13000 m², 8 floors**
- **Roof and façade solar panels, BEMS*, HEMS* and energy-saving devices (Japanese technology)**

Image: L. Diaz Olvera

*** Building Energy Monitoring System**
**** Home Energy Monitoring System**

Partial Source: Y. Leclerc, Confluence presentation

3. Smart City Projects

Confluence, P-Plot - Hikari complex

July 2014

Image: L. Diaz Olvera

3. Smart City Projects

A more integrated project: Lyon Smart Community

2. Sunmoov': electric car sharing system

- On-going 2 year experiment
- Reduction of local emissions (reduce use of personal vehicles for local employees and residents)
- Solar energy for charging system
- 6 stations, 30 vehicles
- French & Japanese companies: Transdev (management of sharing service), PSA Peugeot-Citroen and Mitsubishi Motors (vehicle manufacturing), Toshiba (energy management system)

Image: L. Diaz Olvera

Partial Source: Y. Leclerc, Confluence presentation

3. Smart City Projects

A more integrated project: Lyon Smart Community

3. Manage energy consumption: Home Energy Monitoring System (HEMS)

- Energy box to measure energy consumption in each feeder
- Electricity, water and gas meters to measure consumption and estimate cost
- HEMS alerts if consumption is high, energy saving recommendations
- Experimentation site in 2012-2015: Cité Perrache, 275 flats, Grand Lyon Habitat; refurbishment, eco renovation (heating, thermal insulation, window replacement), -70% energy consumption (~290 kWh/m2 => 80 kWh/m2)
- ~200 hhs, installation of energy sensor system, distribution of digital tablets (2014) for energy, water & gas consumption, test period until end 2017
- Education to good practice: how to control water and energy consumption by being informed of its cost when using domestic electrical equipment/appliances

Partial Source: Y. Leclerc, Confluence presentation

3. Smart City Projects

A more integrated project: Lyon Smart Community

4. Creation of a Community Management System (CMS)

- A system able to collect information from sub-projects and provide real time energy generation and consumption data and advice on how to improve energy utilization
- Data collection, processing and restitution
- Creation of a platform for data storage and management for Confluence
- A datacentre with 80 servers
- Real time follow-up of the energy consumptions (buildings, electric cars), and global follow-up of energy production and consumption in Confluence
- Issues/lessons for local and metropolitan levels

Partial Source: Y. Leclerc, Confluence presentation

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Thank you for your attention

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Image: L. Diaz Olvera