# How to design and finance green infrastructures in urban areas to tackle climate change issues?

Taking stock of several European and American cities' projects

**10 – 12th March 2014**
**CIRCLE 2 Final Conference**
**Session: Economics, financial instruments and insurance**

**CDC Climat (France)**
Alexandre Tavin and Alexia Leseur (alexia.leseur@cdcclimat.com)

# Outline

1. Introduction

2. *Why?* Multiple green infrastructure benefits, ways to tackle urban vulnerability

3. *How much ?* Financing green infrastructure projects

4. *How ?* Key success factors and governance of green infrastructure as concluding remarks

- ➢ GI: Green Infrastructure / GIP: Green Infrastructure Project
- ■ <u>Context:</u>
  - • Rapid urban sprawl and related soil sealing effect
  - • French and European contexts:
    - - Grenelle II (2010): biodiversity and ecology-based projects
    - - European Commission (2013): *green infrastructure as a fonctionnal network planed for the production of eco-systemic services*
  - • Deteriorated public finance

- ■ <u>Approach:</u>
  - • What are the benefits of the different kinds of GI?
  - • Can we define the best green infrastructure for adaptation at the urban level?
  - • What are the costs, and how to finance GI ? Is there a unique/best model?
  - • Identifying key success factors in GI projects

- ■ <u>Methodology:</u> *Building on existing studies / Enlighting GI projects*
  - • Literature review
  - • Multifaceted approach: biodiversity, ecology, climatology, economics, sociology, urbanism…
  - • Case studies of international projects (London, Montreal, Peterborough, New York, Paris, Bale, Chicago, Kamen, Lille) chosen for their diversity

- **General benefits, drawing from the literature review**
  - Health and social benefits
    - Public **health** (Van Dillen *et al*, 2012; Takano *et al*., 2002)
    - Proximity to GI is well valorized, (Laille *et al*, 2013)

  - Environmental benefits
    - **Biodiversity** (Cornelis *et al*, 2004; Saümel *et al*, 2010)
    - Against the Urban Heat Island effects (**UHI**) (EPICEA study in France)
    - **Pollution** filtration (Beckett *et al*, 2000; Laille *et al*, 2013)
    - **Temperature modulation** ( Bowler, 2010)
    - Buildings **energy efficiency** ( Chen *et al*, 2008)
    - Better water managment, Kubal *et al*, 2009)
    - Carbon **sequestration** (Davis *et al*, 2011)

  - Economic benefits (not often)
    - Land and **property valuations** (Crompton, 2001; Cho, 2008)
    - **Wood**-**energy** business, urban **agriculture, social activities** (Marchal, 2008; Marien, 2010)
    - Eco-systemic **services** (Boudes, 2010; Rankovic *et al*, 2013)

But actual benefits of a specific green project depend on the species, size, context, location, management, water availability, etc……

| | Urban green corridors | Urban parks & forests | Gardens | Trees and urban linears | Green roofs and walls | Green wastelands |
|---|---|---|---|---|---|---|
| GHG sequestration | | | | | | |
| Water runoffs reduction | | | | | | |
| Air quality improvment | | | | | | |
| Reduction of UHI effects | | | | | | |
| Global costs | | | | | | |

Source : CDC Climat from *Bertrand et al (2012), ICLEI (2012) Laille et al (2013), CABE (2011)*

- Need of specific and local analysis
- Green corridors and urban forests are « the best » for adaptation, but the most difficult to implement, and the most costly!

Costly GI projects, from phase to phase
- Investment costs
- Operating costs
- Lack of self-generated incomes (very rare)

- Case-study 1: <u>Montreal and its *Canopee Action Plan*</u>
  - 300 000 trees
  - 220 M $ / 10 years

- Case-study 2: <u>New-York City and its *One Million Trees* project</u>
  - 1 M Trees
  - 600 M $

- Case-study 3: <u>Lille Green Infrastructure *Trame Verte et Bleue*</u>
  - 250 km of GI
  - 5 M € /year for invest. costs & 7 M € /year in operating costs

Hard to have data, but  : half for investment; half for maintenance

# 3. *How much ?* Financing Green Infrastructures Projects (GIP) 1/3

Innovation
Expertise
Confiance

cdc climat recherche

GROUPE Caisse des Dépôts

➡ A vast majority of public financing schemes, but not dedicated to adaptation => needs of co-benefits

- Local tools: budgets, taxes

- National tools : loans, technical helps, subsidies

- European tools: subsidies & funds (Natura 2000, FEDER, FEADER, LIFE +)

- Emergence and evolution of the European Investment Bank role
  - 2014-2020 budget and since the 06/05/13 communication (COM-2013/249).
  - Applied to GI financing schemes

The big challenge : to leverage private funding

- Case-study 1: UK Park Trusts.
    - Public *trust* /999 years lease
    - 1000 ha and a 1.5 M £ /year of operating costs
    - **Fully funded with commercial rents and concessions**

- Case-study 2: Chicago and its *Green Building Permit Program*
    - Compliance with a *green menu* to speed up permit delivery and reduce costs
    - 400 000 $ /year in tax credit
    - 2008-2012: 60% of newbuildings have green roofs / 40% of renewed ones

- Case-study 3: NYC and crowdfunding
    - 1 M Trees
    - **Crowdfunding by citizens and firms**

- Carbon finance
  - on the reglementary market (eg. Dehli : reforestation in a grassland, as CDM ; Santa Monica : urban forest on the Californian carbon market)
  - on the volontary market ( Perth : try to be carbon neutral by planting trees)

- Green bonds : eg. the Ile de France Council issued green bonds for many projects (among them some about biodiversity)

- GI have numerous benefits, depending of the kind

- Importance of the political support, and the stakeholders' involvment, possible at every step of the GIP:
  - London Assembly's Green Spaces Investigative Commitee
  - Incentive : financial incentive, operational « terms and conditions », legislation

- Land-management and land-rights authority
  - Setting-up an authority, solely dedicated to the identification, funding and acquisition of lots and properties that have been planned as necessary for the GIP
  - Fiscal dispositions and tax incentives

- GI can be costly, and public funding is the norm but levering up private funding scheme is essential
  - For public funding : needs of co-benefits (biodiversity, energy efficiency, …)
  - The levering-up of private funding reinforce the stability and implementation of GIP
  - Rare use of innovative tools like carbon finance, green bonds

- Indicators: before, during and after the GIP
  - Identifying the needs and what already exists (Canopee index, in Montreal)
  - Follow-up of the project (temp and water-runoffs measures in Lille)
  - Track record and results of the GIP, to orient new objectives (consortium in London)
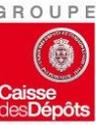
Thank you for your attention.

See our publications on : www.cdcclimat.com

**March 12th 2014**
**CIRCLE 2 Final Conference**
**Session: Economics, financial instruments and insurance**

► **CDC Climat Research (France)**
► Alexia Leseur (alexia.leseur@cdcclimat.com),
► Research Unit Manager on Subnational Climate Policies

# Costs of GI

| | Trame/infrastructure verte | Forêt/parc urbain | Jardin privé/ communautaire | Friches | Arbres | Toits verts |
|---|---|---|---|---|---|---|
| **Coûts de mise en œuvre/investissement initial** | ++++ | +++ à +++++ | + à +++ | 0 à + | + (un arbre) à +++++ (projet urbain) | + à ++ |
| **Coûts de maintenance / an** | ++++ | ++ à ++++ | + à +++ | 0 à + | + à +++ | ++ |
| **Exemple de projet** | Parco Nord (Milan) TVB (Lille Métrop.) | Nene Park Trust (Peterborough) | Potrero Hills (S.F.) | Castelo Sao Jorge (Lisbonne) | Plan d'Action Canopée (Montréal) | Green Building Permit Program (Chicago) |