Exploring complementarity of Life Cycle Thinking and Landscape & Urban Planning towards sustainable urban co-design.


To cite this version:

Ghada Bouillass, Joris Masafont, Maëlle Baronnet, Nathan Bertho, Philomène Blot, et al.. Exploring complementarity of Life Cycle Thinking and Landscape & Urban Planning towards sustainable urban co-design.: Case study: Electric based tricycle technologies for last kilometer delivery. SETAC EUROPE 30th Annual Meeting, May 2020, Virtual, Ireland. hal-02913782

HAL Id: hal-02913782
https://minesparis-psl.hal.science/hal-02913782
Submitted on 10 Aug 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
EXPLORING COMPLEMENTARITY OF LIFE CYCLE THINKING AND LANDSCAPE & URBAN PLANNING TOWARDS SUSTAINABLE URBAN CO-DESIGN

INTRODUCTION & OBJECTIVE

- City logistics is one of the most polluting segments of the transport sector.
- European regulations are pushing further urban access restrictions and promoting a shift to more sustainable solutions.
- Introducing sustainability into communities living conditions and territorial policies requires the consideration of:
  - living environment characteristics,
  - stakeholders’ needs,
  - sustainable technologies with high environmental, social and economic performance.
- To face this challenges, the complementarity of two consistent management approaches have been studied:
  - Life Cycle Assessment (LCA)
  - Landscape and Urban Planning (LUP)

MATERIALS AND METHODS

REAL CASE STUDY

- Study of the complementarity of both LCA and LUP throughout a real case study in the historical city of Nice, South of France.
- Challenges:
  - Complex topography (i.e. narrow streets)
  - High density population
  - Increasing concentration of transportation flows
- Opportunities:
  - Remarkable solar deposit encouraging the use of photovoltaics (PV).
  - Transport policy shift towards electric mobility

TOWARDS THE CONCEPTUALIZATION OF AN INTEGRATED SUSTAINABLE LOGISTIC SERVICE CO-DESIGN:
ELECTRIC BASED TRICYCLE TECHNOLOGIES FOR LAST KILOMETER DELIVERY

STEPS FOR THE SUSTAINABLE CO-DESIGN OF CITY LOGISTIC SERVICES

Identification step

1. LUP application
   - Territorial reading grid based on:
     i) Physical, socio-cultural & economic resources
     ii) Political contest
   - Field visits: urban configuration for logistics
2. LCA application
   - Diesel-power cargo vans vs electricity tricycles: from 285 to 28 gCO₂eq/km in EU
   - EU mix vs PV: from 400 to 22gCO₂eq/kWh

Characterization step

Identified urban logistics hotspots

- Environmental living conditions such as air pollution, noise and urban congestion
- Stakeholders’ needs and concerns (shopkeepers, workers, transport companies, public authorities, etc) → Social hotspots
- Constraints for scheduling and delivery distribution including technology capacity, time, topography and energy required
- Economic performance of electric tricycles & charging infrastructures
- Potential of renewable energy resources in electric mobility applications
- Real-world local solar data, to be explored through Geographical Information Systems for energy use optimization.

RESULTS & DISCUSSION

- Optimization of delivery flows through a Clarke and Wright algorithm for 4 ULP and 1000 deliveries’ points
- ULP integration in the urban metabolism
- Dimensioning of ULP and possible other usages of the platform (such as solar energy-based chargers for public electric vehicles) meeting stakeholders’ needs and improving their living conditions.

DESIGN OF THE ULP AND ITS INTEGRATION IN THE CITY METABOLISM

Identification of delivery flows between the ULP and the delivery points in Nice city

Clarke and Wright Algorithm performed for 4 ULP and 1000 delivery points

ACKNOWLEDGMENTS

AFFILIATION

1. MINES ParisTech-PSL Centre Observation, Impacts, Energie (O.I.E.), France
2. ADEME & Laboratoire de Recherche en Projet de Paysage -ENSP -, France.
3. MINES ParisTech-PSL, 2019 Civil Engineering promotion, France

CONTACT

ghada.bouillass@mines-paristech.fr
jacques.terrasson@mines-paristech.fr
www.mines-paristech.fr
www.ensp.fr
www.paristech.fr