1. Tool: MUSE, towards renewable energies in the city

1.1.   Description of the tool / methodology of the tool

Key-words: energy consumption, renewable energy, urban form, decision support system and geographical information system (GIS)

"This paper describes a decision support tool for urban planners. Numerous research studies show that energy consumed and produced in cities can be related to its morphology. Yet, the urban energy paradox is defined as follows: on the one hand, the densification of cities reduces transportation and buildings consumptions. On the other hand, this densification has a negative impact on urban microclimate and renewable energies potential. The goal of this work is to develop a decision support system for urban planners faced with urban energy paradox. Our research is based on a previous work developed by Luc Adolphe et al. in the SAGACités project. This research led to the development of the geographic information system (GIS) platform called MORPHOLOGIC, which, among other things, evaluates the energy consumption of city blocks. Our goal is to add new features in MORPHOLOGIC: one of them calculates **solar potential** (photovoltaic and thermal), using a simplified model of shadows. The new version of MORPHOLOGIC called MUSE will allow urban planners to evaluate the best urban form to reduce GHG emissions.

1.2.   Outcomes of the tool

The SAGACités project

Luc Adolphe and team (in the SAGACités project for Système d'Aide à la Gestion des Ambiances urbaines), developed a geographic information system (GIS) platform called MORPHOLOGIC based on measurements and numerical model evaluations in urban areas (Adolphe et al. 2002).
The MUSE Platform is an open-source software, based on Java, which has support of a large community of developers and for which many open libraries, for viewing and processing spatial data, exist. The Graphical User Interface (GUI) of MUSE, shown in Figure 1, is composed of modules serving different needs and the GIS module is used to integrate most needed datasets while analyzing the various spatial entities and preparing the input for models. It also allows to store and to visualize the results.

Figure 1: MUSE Geographical User Interface

1.3.   Assessment of the tool

1.3.1. Advantages

This tool allows, among other things, to evaluate the energy consumption from one single to several city blocks taking into account buildings, streets, squares and vegetated areas. It also calculates a set of urban morphological indicators such as compactness, density and contiguity. MORPHOLOGIC allows the intersection of geometric data (buildings footprint, buildings height, length of the streets), topological data (adjacency of buildings, facades, distance to a bus station etc.) and demographic data (population per block). The platform calculates a system of indicators which balance energy, environment and comfort to help out in the urban decision making." (BONHOMME, M. ET AL.)

Figure2: Screen showing a thematic map "land occupation coefficient"

1.4.   Examples

1.5.   References

ADOLPHE, L. ET AL.(2002): SAGACité, Vers un Système d'Aide à la Gestion des Ambiances urbaines
Information about the tool:
Link:
http://geography.ssc.uwo.ca/faculty/gilliland/ISUF%202011%20Full%20Papers/07111220%20Bonhomme_paper.pdf