Ecosystem variability and natural capital evaluations: Massy (France) case study

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The acceleration of biodiversity loss and the uncertainties about the impacts of climate change are threatening the human societies' ability to produce wealth. Measuring the multiple values of all the benefits that we receive from ecosystems is a considerable challenge, which partly explains why these values are systematically undervalued in the economic analyses and often ignored in the decision-making process.

The challenge is to find the balance between biodiversity conservation and resources exploitation for immediate societal needs of the local communities. The two objectives of this study were: (a) an extension of the ecosystem services approach to (semi-)urban areas for better reckoning the greening of our extending cities, and (b) an integration of the carbon storage evaluation into the fully-distributed Multi-Hydro model (hmco.enpc.fr), developed at Ecole des Ponts. These objectives enabling this model to become a more complete tool to help decision makers in achieving trade-offs between management scenarios, either for the current landscape or under future scenarios. It is based on the InVEST Carbon Storage and Sequestration model methodology (www.naturalcapitalproject.org), which estimates the amount of carbon stored in a landscape using maps of land use and stocks in four carbon "pools": aboveground biomass, belowground biomass, soil and dead organic matter.

The Massy case study, a semi urban area of approximately 6 km2 located in the south of Paris (France), was used to analyse the impacts of its urbanisation in terms of carbon storage. This area has been affected by a planned development project called Paris-Saclay, notably with the urbanisation of the activity zone of "la Bonde", currently mostly rural.

The obtained results demonstrate that this new implementation to Multi-Hydro enhances its qualities and capacities as a helpful decision support tool, by taking into account the non-linear interactions between the ecosystem components and the complexity of urban areas over a wide range of space-time scales.