



OCAPI

RESEARCH & ACTION PROGRAM

OPTIMISATION OF CARBON, NITROGEN AND PHOSPHORUS CYCLES IN THE CITY



STUDYING AND SUPPORTING THE EVOLUTION OF URBAN ALIMENTATION/EXCRETION SYSTEMS

OCAPI research & action program was launched in 2014 in France. It aims at **studying the contemporary mutations of urban nutrient flows**, and more specifically, the **management of urban nutrient excretion**.

One century after the generalization of **sewer** systems, OCAPI is one of the first French academic research programs that opens the debate about management options for human urine and feces in the city, and proposes to **explore the potential of urine diversion**.

Scientific partners



TOWARDS SUSTAINABLE MEGACITIES ?

Context

Strain on environmental impacts
CLIMATE CHANGE, EUTROPHICATION

Strain on resources
ENERGY, PHOSPHOROUS



Left : Paris is located in the heart of the river Seine catchment. (M. Petrasco)
Right : Urine use in agriculture in Sweden (near Stockolm, 2006, C. Werner)

OCAPI 1 : 2014 – 2018

New ways to improve sanitation and agricultural production : EXPLORING THE POTENTIAL OF URINE DIVERSION

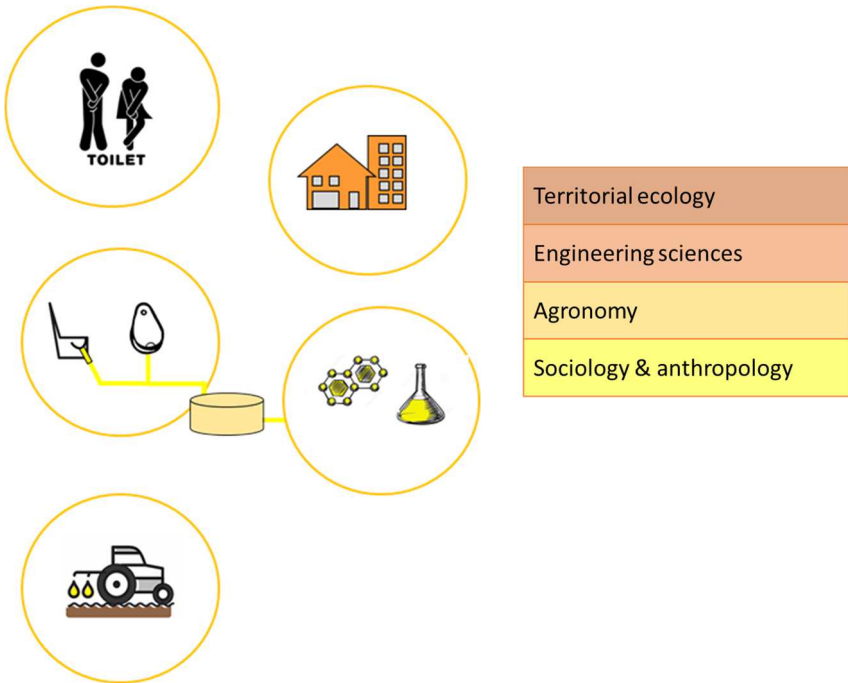
Our goals :

- ➡ Characterize **socio-ecological regimes** of occidental cities, by focusing on alimentation/excretion systems & their sustainability.
- ➡ Analyse socio-ecological trajectories of French cities since the industrial revolution until recent generalisation of the quasi monopolistic trio « flush toilet, sewer, water treatment plant ».

PRINCIPAL CASE STUDY : GREATER PARIS AREA

- ➡ Provide feedback on different sanitation concepts, that are theorized, being developed or already built abroad (Netherlands, Sweden, Germany, etc.) and compare their energy and material flows.
- ➡ Identify hindering and driving forces of implementation of new sanitation techniques in France and support the development of pilot projects in the Greater Paris Area.

A SYSTEMIC APPROACH OF ECOLOGIC SANITATION



OCAPI 2 : 2018 - 2021

Adapting urine diversion strategies to different urban typologies.

➔ **DESIGN**

Developping and comparing the agronomic and environmental performances of different value chains for by-products obtained by urine diversion.

➔ **AGROCAPI**

Understanding contemporary practices, knowledge & imaginaries about excretion and urine valorization.

➔ **ATEA**

IMPLEMENTING URINE DIVERSION in France and beyond

➔ Practice sharing & coordination.

➔ Support of urine diversion stakeholders at a regional, national and international level.

Contact : ocapi@enpc.fr

For more information : www.leesu.fr/ocapi

École des Ponts ParisTech 6/8 av Blaise Pascal 77455 CHAMPS-SUR-MARNE

Fabien ESCULIER Dr., Territorial ecology
Program manager
fabien.esculier@enpc.fr +33 6 75 31 91 54

Marine LEGRAND Dr., Anthropology
Research and practice sharing
marine.legrand@enpc.fr +33 1 64 15 36 36

Tristan MARTIN Phd Student, agronomy
tristan.martin@inra.fr +33 1 30 81 52 16

Florent BRUN Engineer, eco-sanitation
florent.brun@enpc.fr + 33 1 64 15 37 58

Publications

www.leesu.fr/ocapi/bibliotheque/les-productions-docapi/

Esculier, F., Le Noë, J., Barles, S., Billen, G., Créno, B., Garnier, J., Lesavre, J., Petit L. et Tabuchi, J.-P. 2018 **“The biogeochemical imprint of human metabolism in Paris Megacity: a regionalized analysis of a water-agro-food system”**. Journal of Hydrology. DOI : 10.1016/j.jhydrol.2018.02.043

Esculier, F., 2018. **The alimentation/excretion systems of urban territories. Socio-ecological regimes and transitions**. PhD thesis. Paris Est University. (FR)

Brun, F., Delmaire, A., He, Q., Joncoux, S., Bayard, R., Esculier, F., 2017 **Managing mobile dry toilets products : Characterization of practices and impacts**. Research report, Toilettes Du Monde. (FR)

Martin, T, 2017. **Human urine valorization as a source of nitrogen for plants : an experimentation in the greenhouse**. Master thesis, ENPC. (FR)

Smail, A. 2016. **Implementation of a complete treatment and valorization chain for urine at the scale of a building**. Master thesis, ENPC. (FR)

Dechesne M. 2016. **Implementation of a struvite precipitation reactor using human urine**. Internship report. (FR)

He, Q. 2016. **Characterization of sanitation chains based on urban dry toilets**. Master thesis, Angers university. (FR)

Technical and financial partners

