

# METABOLISM STUDIES: MATERIALITY AND RELATIONALITY IN THE ANTHROPOCENE

scientific research symposium  
June 28 to 30, 2022  
LYON (FRANCE)

ENS Lyon  
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An event organized by



STUDIO METABOLISME  
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# **METABOLISM STUDIES: MATERIALITY AND RELATIONALITY IN THE ANTHROPOCENE**

**Scientific research symposium – June 28 to 30, 2022 – Lyon  
(France)**

**Website : [www.metabolismconf.sciencesconf.org](http://www.metabolismconf.sciencesconf.org)**

an event organized by the Studio Métabolisme of the Lyon Urban School and the Labex IMU  
sponsored by ENS Lyon, Université Paris Est Créteil, Lab'Urba, EVS, Institut Convergence PLASCAN – Institut François Rabelais and the University of Lyon





# Argument of the symposium

The Anthropocene period is characterized by an increasing use of materials and energy. The notion of metabolism enables to document this intensification of the materiality of human habitation. It focuses on the cycles of material transformation from a purely material perspective, with an analysis of flows within the whole world. But it also documents matter in its socio-political and symbolic dimensions, including the study of power relations, ideologies and representations that shape it.

The use of the concept of metabolism, which originated in the medical sciences in the 19th century, is growing in the human sciences. Since the work of Abel Wolman, the reappropriation of the concept by ecologists and then by urban studies, industrial and territorial ecology or political ecology has shown a tendency to use the metabolism to work on spatial objects (cities, regions) as well as on flows, circulations and transformations of materials and capital. Metabolism thus constitutes a way of putting the material world in order by integrating the social, political and cultural dynamics that organize it. The definition proposed by Anne Rademacher (2015) is sufficiently general to correspond to the sprawling nature of the notion without neglecting the core of what makes metabolism, i.e. the insistence on circulation (of capital, information, matter) and the interaction of (non-)humans with their environment, understood as "biogeochemical cycles and biophysical processes".

Without excluding input/output or life cycle approaches, which represent the majority of studies on metabolism, the objective of this conference is to propose an inventory of what could be called "alternative approaches" to metabolisms. Sometimes more theoretical or even epistemological than applied, sometimes very exploratory, we wish to propose a reading of metabolisms by their margins. By engaging in a discussion on the plasticity and the heuristic potential of the notion, by encouraging a dialogue, even a confrontation, between various approaches, the idea is to debate the increasing use of this term in different meanings. The idea is to shed light on the notion through a dialogue of specific fields (for example, islands and cities), new methodologies or approaches (for example, around embodiment) or medical advances on metabolism. On an epistemological level, we would like to consider metabolic studies as a possible new field, in the Bourdieusian sense, and to question the term itself: is it a notion or a concept? Can we talk about metabolic studies? Beyond the term itself: what does the interest in metabolisms say about contemporary science?

Many themes, studies and researchers are linked with metabolisms without explicitly claiming it, or perhaps without even knowing the term. Whether it is a question of energy, mobility, biodiversity, matter, water, relations to the environment, food, modelling, health, transformation... All approaches that combine a study of the relationality of a phenomenon with its materiality can feed a reflection on metabolisms. Thus, the organizing committee has chosen not to limit the call to researchers for whom the notion is central and explicitly mobilized. In other words, the idea takes precedence over the name. "Metabolic questioning" goes beyond the explicit study of metabolisms. And there are many ways to enter into a metabolic questioning.

These metabolic questions may concern the epistemology of the notion (use of the organicist metaphor, circulation of the notion within different scientific but also professional fields, semiological or vocabulary issues, etc.); the scalar issues linked to its use (from the plastic nanoparticle to the global dynamics of the market, which "metabolic scales" are relevant, how to move from one to the other? How to define a "metabolic fact?"); on its relationship to complexity (what difference does it make to relational or environmental approaches?); on the way to study it (what methodologies, what field practices?) or to represent it. We can

also question the interest of the notion: is it a tool for thinking about complexity or a weak concept? It is therefore a way to question the science produced by and for metabolism and, in fine, the possibilities and impasses of the use of the notion.

### **Axis 1. What place for politics in metabolic studies?**

The study of the governance of infrastructures and networks, which support the metabolic functioning of territories, is an essential issue in understanding the human construction of anthropocene environments. The dependence of territories on private companies in the fields of water, sanitation, waste or energy raises questions about the real possibilities of public authorities to act on this material reality. As the geographer Claude Raffestin points out, "it is the networks that ensure the control of space and control within space". Moreover, the focus on the efficiency of these networks and technological innovation as "solutions" to ecological problems leads to the marginalization of social and political issues, as well as, potentially, to a consolidation of the weight of private actors in the territorial management, especially urban management. As the biologist Olivier Hamant explains, "the Achilles heel of optimization is that it weakens". This means that sub-optimality is a factor of robustness and adaptability. Thus, the constant search for optimization, for example with the smart cities, may be negative for the inhabitants, human or non-human. As demonstrated by the COVID-19 crisis, the constant search for optimisation in the management of flows that characterises urban worlds questions the relationship between efficiency and vulnerability and the role of metropolises in the "ecological transition".

At various scales (international, national, regional, urban, intra-urban), metabolic issues raise situations of inequality and environmental injustice, particularly with postcolonial, gender and/or class approaches. Indeed, the management of material and energy flows relies on "sacrificed spaces" or "waste spaces" with which the populations that work or inhabit there are often associated, falling under the "out of sight out of mind" principle. This principle is accompanied by processes of invisibilisation, segregation, relegation and domination, at different scales and in different contexts, which can be analysed in the framework of a metabolic approach. How does the circulation and/or transformation of materials reinforce or mitigate these processes? Moreover, the fact that certain countries that were previously outflows are sending waste back to the countries that emit it makes it necessary to study the social, (geo)political and infrastructural consequences of this future forced internalization.

### **Axis 2. The embodied metabolism. Roles and affects of metabolic operators**

The chlordecone health scandal in the West Indies or the discovery of the environmental consequences of the contraceptive pill are two examples of how bodies and territories resonate. However, the dominant representations of metabolisms generally take the form of flows and do not explicitly address the fact that metabolisms are lived, embodied, represented and felt. Following M. Legrand (2019), we wish to interrogate the entanglements of bodily functionings with those of territories.

First of all, it is necessary to identify who are the "metabolic operators", understood as the human and non-human entities that make the metabolism work. Who "works", professionally or voluntarily, consciously or unconsciously, for the metabolisms? How and why? Dijst (2018) insists on the need to take more account of individuals in the analysis of urban metabolisms: what representations, postures, individual actions and feelings bring materials into or out of a circulation or a transformation? Following M. Ernwein (2019) who defends the idea that

the neoliberal framework makes the plant work, we can also ask which non-human entities contribute to flows related to energy, food or waste. Throughout the metabolic processes, the "metabolic operators" are very diverse: agricultural engineers, multinational water companies, waste reclaimers, plastic-eating bacteria (*Ideonella Sakaiensis*) or bird droppings involved in the dissemination of seeds and fertilizers. All these entities shape metabolisms at the same time as they are shaped by them.

Urban Political Ecology, in asking the question "who gains what and who loses what" (Swyngedouw, 2006) refers to the individual level, also reminding us that metabolic issues are 'life and death' issues (ibid.). Yet the embodiment of metabolisms remains understudied (Doshi, 2016) and anthropocentric. The study of metabolisms has paid little attention to the emotions and viscosity of the metabolic experience, for example in the case of suffering from metabolic work or environmental injustices.

### **Axis 3. Putting metabolisms into a narrative or questioning the political power of ecological imaginaries**

Understanding the functioning of societies through their materiality through the circulation of materials constituted as resources or that have become excreta, or through the actors involved in the infrastructures that underpin metabolism, mobilizes images (input/output, circularity, bodies and organs, etc.) that lead us to consider the imaginary and the narratives, explicit or implicit, of metabolism.

These ways of saying and representing metabolisms produce ways of experiencing the urban environments for individuals, groups and societies. Considering imaginaries and representations allows us to consider all the individuals who depend on metabolism, including those who do not use the concept. We assume that everyone has a representation of the flows that underlie daily life and of the functioning of territories and we wish to question the way in which these flows are imagined, perceived or expressed.

The representation of metabolisms is not just an aesthetic matter: it has strong political, scientific and ecological implications. It offers a way of capturing processes that go beyond us but in which our daily lives are caught up every day. Imaginaries and representations are particularly perceptible in the narratives of metabolism. The words of "Metabolism", "circular economy" or the "ecological relations" are all narratives of the material order of societies. We propose to question the performativity of contemporary narratives and the imaginaries that underlie them, as well as to consider their alternatives.

### **Axis 4. What metabolism means. Epistemological anchors, definitions and uses**

The meanings and uses of the term "metabolism" are very diverse, depending on the discipline or time period. It is these multiple apprehensions of this notion that we propose to address by questioning what metabolism covers and what it allows us to understand.

What is called metabolism? Is it only meant to be a stylistic figure to contextualize the materiality of contemporary societies or is it really a way to describe and to analyze the concrete instantiations of circulation and transformation of matter? In the conceptual space, how is the notion of metabolism positioned in relation to the circular economy, to the concepts of infrastructure or networks, to relational approaches to the environment? In



concrete terms, how can we identify a "metabolic fact"? Who participates at what moment in a metabolism?

What are the challenges of using this type of metaphor, what are its limits and to what extent can the metaphor be fruitful? If medical sciences and biochemistry distinguish several phenomena through metabolism (homeostasis, anabolism, catabolism, metabolic pathways, etc.), how can the social sciences and humanities deepen the metaphor and go beyond the global approach of metabolism to refine the study of the materiality of societies? How to create a "metabolic grammar"? As the interest in the motif of metabolism grows, what power relations are at work in the study and dissemination of the notion? Should we speak of a notion or a concept of metabolism?

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# List of sponsors



## Lyon Urban School

The Lyon Urban School is a "Convergence Institute" program which was created in June 2017 by the Commissariat-General for Investment (CGI) as part of the Investments for the Future project (PIA2). It is led by Michel Lussault, a geographer and professor in urban studies at the École Normale Supérieure de Lyon (ENS de Lyon).

Through its experimental interdisciplinary project for research, doctoral training and the economic, social and cultural promotion of scientific knowledge, the Lyon Urban School is breaking new ground by establishing an emerging field of knowledge and expertise: the Urban Anthropocene.



## Labex IMU - Intelligence des Mondes Urbains

The Laboratory of Excellence - LabEx IMU, winner of the 1st call for "Laboratory of Excellence" projects under the French "Investissements d'Avenir" program, is a research and experimentation facility focused on the city, the urban, metropolization and urbanization. Its mission is to stimulate, produce, capitalize on and promote scientific and technical expertise on past, present and future urban worlds, while contributing to the actions of public authorities and private players.

IMU brings together a wide range of scientific fields (around 530 researchers from 32 teams and laboratories at the University of Lyon, covering 29 different disciplines). It integrates practitioners from local authorities and institutions, companies and competitiveness clusters into its research. IMU's ambition is to create the conditions for collective intelligence in the processes of urbanization and metropolization by ensuring the exercise of radical scientific plurality that opens up new horizons of knowledge and innovation.



## Studio Métabolisme

Created in November 2020, the Studio Métabolisme, dedicated to metabolisms, is led by doctoral and post-doctoral students of the Lyon Urban School. Its objective is to bring together, around the concept of metabolism, a large panel of researchers and young researchers in a dialogue between the exact and experimental sciences, the arts and the humanities and social sciences.

By organizing seminars, study days, workshops and conferences, the Studio's activities are aimed at anyone interested in issues related to the environment and the Anthropocene: students, professionals and engineers included. The scientific bias of the Studio is to show the research being done with the help of sketchnotes, systematic reports, video recordings

and podcasts available at the end of each event.



### **Environnement Ville Société (EVS)**

The research unit UMR 5600 "Environment City Society" (EVS) brings together research communities stemming from a wide range of disciplines from social sciences and humanities. Researchers belong to universities and colleges of the Lyon Saint-Etienne pole.



### **École normale supérieure de Lyon**

The École normale supérieure de Lyon is an elite French public institution that trains professors, researchers, senior civil servants as well as business and political leaders. Students choose their courses and split their time between training and research in sciences and humanities. Built on the tradition of the ENS de Fontenay-Saint-Cloud, founded in 1880, the ENS de Lyon also focuses on educational research. It is a symbol of French Republican meritocracy and it remains committed today to disseminating knowledge to the widest audience and to promoting equal opportunity.



### **Institut Convergence PLASCAN – Institut François Rabelais**

The François Rabelais Institute for Multidisciplinary Cancer Research is built around the cancer biology research carried out by the Centre Léon Bérard (CLB), the Lyon Cancer Research Centre (CRCL) and the LabEx DEVweCAN.

Its aim is to structure a multidisciplinary institute on the site and in the vicinity of the CLB, where researchers from different disciplines and medical oncologists will be able to work together in the field of cancer plasticity and its impact on personalized medicine.

Its objective, through multi and interdisciplinary approaches, is based on the characterisation of each tumour in its environment and the identification of new targets in order to develop new drugs while blocking the development of resistance, relapse and tumour escape. This will provide a long-term response for patients. In order to better understand the medical and socio-economic challenges, human and social sciences will be an integral part of the project to define the current limits of personalised medicine.





### **Lab'Urba**

Lab'URBA is defined mainly by its inclusion in the Paris School of Urban Planning, which was created by the merger of the two main French urban planning institutes.

Lab'URBA's perimeter also includes teacher-researchers who share its values and work on urban issues, notably in the geography department of the Université Paris Est Créteil (UPEC), the Urban Engineering department of the Université Gustave Eiffel (formerly the Université Paris-Est Marne-la-Vallée) and the Ecole des ingénieurs de la Ville de Paris (EIVP).



### **Université de Lyon**

The Université de Lyon is academic community (COMUE – Communauté d'universités et établissements) gathering 11 member and 24 associated institutions in Lyon and Saint-Étienne.



### **Université Paris-Est Créteil**

With its 7 faculties, 8 schools and institutes, 1 observatory and 33 research laboratories, the Université Paris-Est Créteil has been present in all fields of knowledge since 1970.

# Practical information

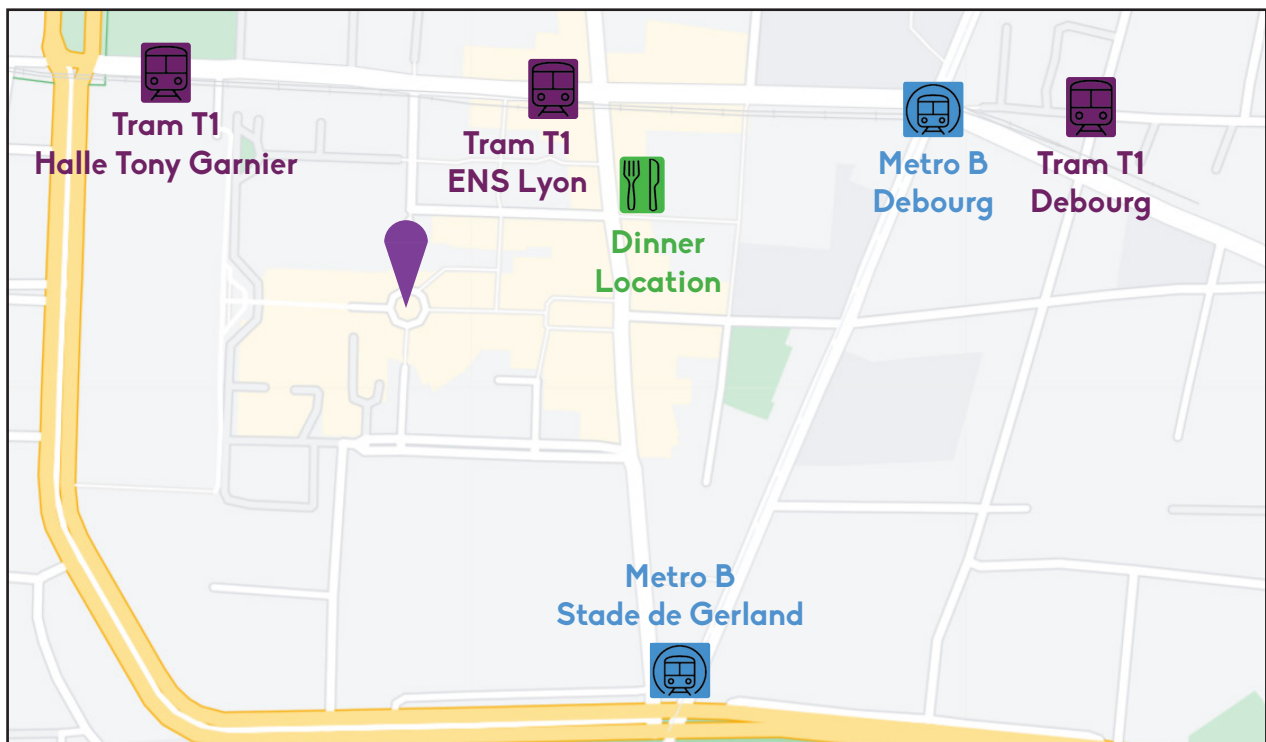
## Location of the conference

The conference will be held in the premises of the [ENS Lyon \(Monod site\)](#).

Place de l'école  
69007 Lyon  
FRANCE

## How to get to the ENS de Lyon (Monod Site) by urban transport

- Metro line B, "Debourg" stop
- Tram T1 or bus C22: stop "ENS Lyon"
- Velov (Self-service cycle rental) parking on the "Place de l'École" square.
- By train and by plane:
  - From Part-Dieu station, Metro line B towards Oullins From Perrache station, Tram T1 towards Debourg
  - From Saint-Exupéry international airport, Rhône Express shuttle to Part-Dieu station
- By car:
  - From the East: South ring road, exit Gerland
  - From the A6: exit at Pont Pasteur



Two rooms will host the sessions:

1. "Salle Place de l'école": 1 Pl. de l'École, 69007 Lyon
2. "Salle R117": 46 allée d'Italie, 69007 Lyon



The two rooms are close to each other (less than a 5 minute walk) but we ask that you remain vigilant in respecting the session times.

### **Lunches**

Lunches will be held at the University Restaurant located at Place de l'Ecole. More information will be provided on site.

### **Metabolic walk**

The "metabolic walk" is organized on Wednesday afternoon, June 29. It is an optional event that aims to offer you to participate in a sensitive work experience on the metabolism of Lyon. Several routes will be possible around the conference site and aim to collect sensitive data on the metabolism of the districts crossed and the city of Lyon. The ambition of this project is to participate thereafter in a writing experience based on the impressions collected during this walk which will gather all the participants. After the conference, we will organize writing sessions in groups that will lead to a publication co-signed by all the participants in this project. A booklet will be provided to you at the reception of the conference to present you in detail the different routes.

### **Dinner on wednesday, June 29, 2022**

All registered conference participants are invited to enjoy dinner in the courtyard of L'Autre Monde restaurant starting at 7:45 pm on Wednesday, June 29, 2022.

Vegetarian meals only.

Address of the restaurant:

[L'Autre Monde](#)

231 Rue Marcel Mérieux

69007 Lyon

#### **Contact**

[studio.metabolisme@universite-lyon.fr](mailto:studio.metabolisme@universite-lyon.fr)

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if needed:

Pierre Desvaux : 00 33 6 84 38 53 46

# Program

## DAY 1 - Tuesday, June 28, 2022

09:00-10:00 - Reception

10:00-11:00 - Introduction to the conference

11:00-12h30 - Sessions

- Session 1. More-than-human metabolism (Room "place de l'école")
- Session 2. Grounding metabolism: Soil and agriculture (Room "R117")

12h30-14h00 - Lunch

14h00-16h00 - Sessions

- Session 3. Flows of waste (Room "place de l'école")
- Session 4. Metabolic (de)constructions (Room "R117")

16h00-16h30 - Break

16h30-17h30 - Plenary session (Room "place de l'école") - Anke SCHAFFARTZIK

## DAY 2 - Wednesday, June 29, 2022

08:00-09:00 - Reception

09:00-10:00 - Plenary session (Room "place de l'école") - Aristide ATHANASSIADIS

10h00-10h30 - Break

10:30-12h15 - Sessions

- Session 5. Theoretical considerations on metabolism (Room "place de l'école")
- Session 6. The materiality of food (Room "R117")

12h15-13h30 - Lunch

13h30-14h30 - Plenary session (Room "place de l'école") - Hannah LANDECKER - Inflammatory Remarks: Metabolism, Biomedicine and Social Theory in the 21st Century

14h30-15h00 - Break

15h00-17h30 - Metabolic Walk

From 19:45 - Dinner

## DAY 3 - Thursday, June 30, 2022

08:00-09:00 - Reception

09:00-10:00 - Plenary session (Room "place de l'école") - Sabine BARLES

10h00-10h30 - Break

10:30-12h00 - Sessions

- Session 7. Embodying metabolism (Room "place de l'école")
- Session 8. Expertise and metabolism (Room "R117")

12h00-13h30 - Lunch

13h30-15h00 - Sessions

- Session 9. Depicting metabolism (Room "place de l'école")
- Session 10. Metabolic politics (Room "R117")

15h00-15h30 - Break

15h30-17h00 - Plenary session (Room "place de l'école") - Michel LUSSAULT & Studio Métabolisme (conclusive speech)



# Detailed program by session

DAY 1 - Tuesday, June 28, 2022

## Session 1. More-than-human metabolism

11:00-12:30 - Room "Place de l'école"

### **Technomolecular metabolism in a Mexican coastal city**

Raúl Acosta (1)

(1) Institute of Social and Cultural Anthropology - LMU Munich - Germany

Puerto Vallarta is a small city located between a forest-covered mountain range and the Pacific ocean. This makes it a meeting point for multiple animal and plant species. In response to seasonal infestations of mosquitos - and their threat of diseases like dengue, zika or chikungunya - local authorities spray heavy doses of insecticides all over the city. Other chemical compounds are also frequently used in the city and its surrounding areas, like agricultural pesticides, cleaning liquids, varnish and paint, whose combined repercussions are poorly understood in the emerging urban chemoscapes. Concerns about the effects of some of these compounds - for example by hospitals, civil society organizations or local universities - usually remain focused on a single issue area. While chemical substances are usually approved by federal agencies after reviewing studies of their individual effects, I argue here that cities may provide a sort of "living laboratory" for an improved appreciation of their overlapping repercussions. The technomolecular is understood here as the technological and scientifically based manipulation of biochemical microscopic materials. The study of urban metabolism has recently been reappraised as a useful approach to study the effects of industrial production and its derived substances - mostly toxic pollutants - in order to improve urban design towards a sustainable future. This contribution sketches the idea of focusing on technomolecular metabolism in order to better understand and shed light on entangled biochemical exposures and their afterlives.

### **Metabolizing Ethnography. Aquaponics and the Anthropocene**

Jan Bartsch (1)

(1) University of Marburg - Germany

Food production is increasingly seen as a driver of global ecological crises, insofar as it has a high energy requirement and at the same time emits pollutants into the ground. In view of the current state of crisis and the related uncertainties, food production is moving into the focus of socio-political attention.

Against this background, my PhD Thesis examines socio-technical apparatuses that attempt to use metabolic processes for more sustainable food production. The empirical object of the study is aquaponics, various metabolic cycles in which fish supply nutrients are interconnected with plants through their feces. These cycles will be analyzed on the basis of three theoretical dimensions. The starting point is the debate relating to the Anthropocene, as an offer to examine the complex field of global ecology and the temporalities of more-

than- human assemblages. I do not examine the Anthropocene as a contained theoretical area or a fixed earth epoch, rather I unfold it as a planetary problem horizon that I put in relation to food production.

The second dimension refers to the term metabolism within the web of life (Moore 2015), which allows to re-interpret the human-environment relationship as entangled with politics, power and care relations. For this purpose, a concept is being developed that tries to capture metabolic processes in two ways. On the one hand, as an empirical term, because food production and aquaponics are a place of compression of various metabolic processes. On the other hand, metabolism serves as a theoretical perspective that draws attention to the economic and political aspects of more-than-human

assemblages, thus going beyond depoliticized input-output analyses such as Material Flow Analysis (MFA), which is used in some areas of urban studies. Therefore, I try to tap into the hitherto hardly illuminated possibilities of employing the rather theoretical concept (or metaphor) of metabolism to ethnographically informed analysis. The third dimension deals with the ethnographic site of the research, the metabolic apparatus, an aquaponic farm located in Bremen, Germany. For this purpose, apparatuses are understood as discursive-material relations that are constituted by their "intraactivity" (Barad 2007). By describing the metabolism of the aquaponic apparatus, I will illustrate to what extent re-conceptualizations of labor, power, care and response-ability (Haraway 2008) are necessary in order to obtain an inclusive understanding of more-than-human food production.

Through the ethnographic analysis of metabolic apparatuses, the contradictions imposed by the Anthropocene can be examined more accurately. The theoretical use of metabolism invites (us) to think with new terms of labor, politics and care while also including the underlying power relations. In this way, alternative visions can be created that oppose the idea of inevitable, apocalyptic crises. These considerations can demonstrate to what extent the ecology of aquaponics is becoming a political one.

## **Nibbling Metaphysics: Thinking Architectural Metabolizations**

Julie Beauté (1)

(1) ENS Ulm - École normale supérieure - Paris - France

Combining philosophical, biological, and architectural analyzes, I propose in this paper to link architecture and ecology by considering buildings in terms of edibility, within an evolutionary history. It aims to develop a "nibbling metaphysics" (a metaphysics of nibbling-that also nibbles dualist metaphysics) that leads to highlighting the architectural metabolizations involved in any building. In this framework, the term "metabolization" will not be used as a metaphor-a metaphor found in many functionalist and reductive analyses of urban metabolisms. On the contrary, inspired by the literary method of surface reading (Best and Marcus, 2009), I will try to understand the term "metabolism" in its literary sense.

Drawing from new materialisms (Whatmore, 2006; Coole and Frost, 2010) and microbiopolitics (Paxson, 2008; Helmreich, 2009; Hird, 2009; Lorimer, 2016), the nibbling metaphysics that I present here to analyze architecture refers to the more than human agency of matter (Bennett, 2010). Indeed, multiple agents, human and non-human, biotic and abiotic, actively participate in the architectural dynamics and are, therefore, of crucial importance in the becoming of architectural buildings. Concrete devours sand, tiles suck the sun, rain gnaws at roofs, lichens lick stones, bacteria nibble metals, plants eat minerals, mice chew walls, etc. Eating and being eaten (Plumwood, 2013) drive the relational ontology at the heart of architectural evolution. Beyond metaphors, the edibility of architecture allows us

to account, in a concrete, non-dualistic and complex way, for the mobile, constructive, and destructive ecologies working on infrastructures. With this nibbling metaphysics, the stake is to show that architecture is based on metabolic entanglements (Tsing, 2015) that have the effect of producing new arrangements (Deleuze and Guattari, 1980), at multiple scales of time and space. These metabolizations-concrete and entangled processes of transformation-lead us to reject the vocabulary of the resource: this vocabulary tends to refer to an imaginary of management that alienates our relation to environments and living beings, according to a capitalist logic of the market, where things are extracted from the world to become isolated, inert and exchangeable resources (Plumwood, 2002; Vidalou, 2017). Instead of associating territories with costs and benefits, and architectures with inputs and outputs of energy and materials, metabolic entanglements allow us to account for the circulation of waste (Till, 2013) and embodied surpluses (Cooper, 2008) of architecture.

The nibbling metaphysics challenges conceptions of "frozen architectures" found in modern urbanism, that tends to ignore the edibility of matter and the concrete metabolic entanglements of buildings. It avoids four chimeras that the metaphor of metabolism particularly carries: the chimera of bioinspiration, the chimera of sustainability, the chimera of safeguarding and the chimera of function (Beauté, 2021). On the contrary, the literal understanding of metabolizations captures the thickness of matter and its agentivity, allowing us to attenuate the dualistic distinction between living organism and inert artifact, and leading us to consider architectural "making" as a process of growth (Ingold, 2013).

### **Playing "a game of cat's cradle" with space: An auto-ethnography of the suburbs around a ring road**

Martina Loi (1)

(1) University of Cagliari - Italy

Suburban highways can be read as boundaries that encircle the city while creating connection between territories, orientation of flows, but also inclusion or exclusion (Addie 2016; Young and Keil 2010).

Yet, major roads, intended as socio-technical assemblage (Amin 2014) of technical, social, political, economic components, could become a source of interstices, and thus terrain for unprecedented urban forms (Phelps and Silva 2018). In these spaces a new urbanity can emerge, one which seeks a new and different relationship with the space and the non-human. In these spaces we can find merged spontaneous residential suburbs, industrial and commercial districts, logistics hubs, and large facilities, all situated together amidst the evolving agricultural fabric.

How to address the complexity of these interstitial spaces in which the hybrid and metabolic nature of the urban is increasingly strong and self-evident (Swyngedouw 1996)? Paradigms that counterpose city and countryside no longer seem adequate, as the ones that counterpose nature and urban (Braun 2005): urban dynamics are so pervasive that the very idea of city no longer satisfies, and indeed risks becoming an ideology (Wachsmuth 2014). Adopting new interpretive paradigms, or avoiding to use one in favor of freer explorations of the urban assemblages, allows us to repoliticize these territories and read them beyond the idea of marginality often associated (Angelo and Wachsmuth 2015; Keil 2019).

Since looking for paradigms and definitions has proven to have its limits, a viable approach could be to gather stories, fragments, and clues that these spaces launch, playing "a game of cat's cradle" (Haraway 2016), weaving the threads provided by space, and giving rise to new creative and critical configuration. In order to do this, it is necessary to leave apart any anthropocentric position and welcome the suggestions that come from those beings

who can no longer be considered passive, but must become active actants of the world we live in (Latour 2019).

I present an experimental and immersive exploration of the peripheral landscape located along the SS 554, the road that closes and limits the metropolitan city of Cagliari (IT), currently invested by post-metropolitan dynamics. The auto-ethnographic narration I want to present, with the support of some visual notes (video, photos, etc.), shows a landscape in which emerges a different relationship with a non-urban and more-than-human nature and environment, a true urban critical zone (Latour and Weibel 2020). The immersion in the space with the body, with the aid of visual devices, permits to bring out some layers of complexity, with the aim not to be exhaustive, but only to welcome the different subjectivities encountered. The result is a creative and contemplative ethno-photographic narration of these edge urbanities made possible by the presence of the infrastructure.



## **Session 2. Grounding metabolism: Soil and agriculture**

11:00-12:30 - Room R117

### **Testing the concept of socio-ecological metabolism through the practice of interdisciplinarity: The case of agricultural modernization in Brittany (1850-2020).**

Clémence Gadenne-Rosfelder (1), Julia Le Noë (2)

(1) École des Hautes Études en Sciences Sociales [EHESS] - France

(2) ENS - Département de Géosciences de l'ENS Ulm - France

The agricultural history of Brittany from the mid-19th century to the present day has traditionally been written from the perspective of political and social history. Few academic works highlight the change in land use and animal specialization of the region. Developed from the research seminar "Matérialités historiques", this paper presents an interdisciplinary work focusing on the socio-ecological functioning of Brittany, with the aim of decentring and broadening the narrative of the region. This change of perspective makes it possible to highlight new metabolic operators, whose organisation is shaped by economic interests and power relations. We will show that the modernization of agriculture involves not only human social groups, but also nitrogen and carbon flows that circulate through other actors such as pigs, denitrifying bacteria and the water of Breton estuaries. Linking agricultural history and territorial biogeochemistry makes it possible to highlight the Breton social, political and cultural dynamics that frame the organisation of the material world. This analysis of the agricultural trajectory of Brittany carries strong epistemological stakes: it encourages to forge the socio-ecological metabolism as a "solid" eco-marxist concept, structured by the analysis of material fluxes in their social - materialization of agri-food production relationships - and biophysical - considering the biological and physical processes involved in the transformations of agricultural ecosystems - duality. The centrality of material fluxes to this conceptual framework leads us to consider metabolism as a relational - actors are defined through the relationships they maintain - and processual - these relationships appear as becoming - ontology, with strong implications for apprehending future strategies of socio-ecological transformations in Brittany, which we will outline in the conclusion of this presentation.

### **When regulation asks farmers to recycle organic waste: politics and flows of farming systems in the organic waste metabolism**

Simon Joxe (1)(2)

(1) Université du Mans - France

(2) Laboratoire ESO - France

The purpose of this research is to shed light on the transformations of organic waste chains from the perspective of farmers through an analysis of territorial metabolism of three different territories in Pays de la Loire (France) region: Les Mauges, île d'Yeu, Sablé-sur-Sarthe.

In France, legislation on organic waste management is adapting to European directives and has been evolving since 2000. A wide variety of actors are involved depending on their type (households, industrialists, farmers, local authorities) or activity (cultivation, livestock farming, agri-food, sanitation). By 2024, a newly enacted French law will regulate the generalization for all waste producers to sort organic waste at its source, with an emphasis on households.

This new regulation echoes the strategies of Pays de la Loire's region which aim to drive present organic waste chains toward more "circular" economic practices. This idea of circulation of organic matter is territorialized through the study of the relationship between urban and rural territories: the former being responsible for reincorporating the latter's waste into the soil.

From a theoretical perspective, this question of the circulation of biomass flows (agricultural and organic waste) between societies and nature, and between town and countryside is nothing new. It reminds Marx's conceptualization of the "metabolic rift": "a crisis of social-metabolic reproduction" (Foster & Clark, 2018) caused by industrial capitalism. This notion is central to a strand of Urban Political Ecologist which takes the eponymous name of "metabolic rift" according to Newell & Cousins (2014).

Drawing from Bahers & Giacchè (2019) analytical framework on socio-organisational and socio ecological metabolic rift, I study both the relationship between the political economy of organic waste and individual farmers' practices, as well as organic waste flows and the policies that influence them at the scale of each territory. Since the circulation of flows is governed by networks of actors (Broto et al., 2012), it is important to resituate the farmers' practices in their networks, to consider them as components of the governance of flows.

To go further, organic waste in agriculture could help plant nutrition or improve the physical or chemical properties of soils (Jarousseau et al., 2016). Therefore, I look in depth at farmers' practices through interviews using the concept of "metabolism" as a metaphor and in situ observations of the farming community to understand their role in the recycling of nutrients, the storage of carbon in soils and the preservation of ecosystem services (Laurent, 2015).

The hypothesis is that farming systems (technical itineraries and crop succession) as well as farmers' practices play a key role in bifurcating the territorial metabolism of organic waste and closing biomass flows. Concretely, it aims at confronting the flows of organic waste, the practices of the farmers and the strategies of public bodies.

Thus, the analysis consists of a multi-site approach, applying a common framework to three territories (rural, island, agro-industrial) selected for their different volumes and types of organic waste. Based on tools of territorial ecology (Material Flows Analysis, spatialisation and semi-structured interviews) the methodology is designed to reveal contrasts between the organic waste metabolism and farmers' practices.

## **Renarrating soil fertility and the metabolic rift in the Anthropocene via marling and pond restoration**

Seth Gustafson (1)

(1) University College London, Department of Geography, United Kingdom

One of the most well-known narratives of metabolism is Marx's rendering of the metabolic rift. In this telling, Marx relies on the cutting-edge soil science of his day from von Liebig and others to explain how historical political economic changes like the enclosure of the commons and capitalist urbanisation disrupt biophysical connections between the city and the countryside, resulting in long term soil degradation. Factors such as the withering away of the nightsoil industry, the urban migration of rural workers, a decrease in soil fertility, and the rise of cheap domestic lime fertiliser and imported guano from the Americas to the UK play key roles in this account which aims to explain capitalist alienation of humans from the soil and, more broadly, the material bases of life.

Attempts to improve soil fertility in the Anthropocene, however, have a long history that runs alongside Marx's famous narrative. One such conventional effort is the digging and spreading of marl, a common subsurface and carbonate-rich component of soil, otherwise

known as marling. From the medieval period until the mid-19th century and especially after enclosure, farmers in Britain commonly dug large pits for marl in their fields, creating tens of thousands of depressions across the landscape. Soon after, these pits filled with water to become ponds. The advent of the cheap lime and guano beginning in the mid-19th century largely ceased the practice of marling, but its presence is still visible on the landscape in the form of remaining marl ponds. Today, while many of these marl ponds have been filled in by farms, many others persist, albeit usually in a degraded condition.

This paper offers a new historical metabolic narrative of marl ponds. It positions their past and present in relation to already established histories of soil fertility and the metabolic rift as well as current agricultural and conservation practice in three ways. First, it demonstrates that marling, while it was itself a set of human-environmental metabolic relations disrupted at the point at which Marx's narrative begins, it wrongly serves as an unquestioned ersatz pre-history of the metabolic rift despite its widespread and contingent growth as a practice. Secondly, it shows that marling, like most agricultural practices, was done in response to existing political, economic, and biophysical events like enclosure, commodity prices, and soil conditions. Thirdly, it argues for the continued relevance of this metabolic history of marling. In light of their historical erasure from the landscape, current conservation efforts restoring these marl pits for biodiversity gain, and the growing emphasis on bodies of freshwater for climate mitigation, the paper ultimately argues for more metabolic narratives of landscapes in the Anthropocene.

## **Rise and fall of the composting of household waste in the urban region of Paris, France (1940s-1990s). The role of the opposition between material and energy recovery**

Etienne Dufour (1)

(1) UMR Géographie-Cités - Équipe CRIA - France

Organic urban waste (household waste, sewage) became a major issue for industrial cities from the nineteenth century. They had to find and "invent" some ways of dealing with it. The "Great Acceleration" post-1945 accentuated this problem: both mass production and consumption generated growing volumes of residues. Besides dispersion, one solution was erected as the only one credible and is still dominant in most countries: the destruction of these organic residues in incineration plants for solid waste or wastewater treatment plant for sewage. Far from being perfect, incineration and sewage treatment generate multiple nuisances: air pollution, greenhouse gas emissions and... the opening of biogeochemical cycles (nitrogen and phosphorus for instance) and the linearization of territorial and urban metabolisms that takes an important place in global environmental threats.

The story of organic urban wastes' treatment in the Paris area from the end of World War II to the nineties reveals that this technical development and "progress" oriented towards the destruction of organic matter under the guise of hygienics might have taken a radically different path. As part of my doctoral research on biogeochemical policies (i.e. policies of management of biogenic elements essential to life), I examine the range of recycling methods that have resisted or that have been proposed, tested and implemented in these decades of economic growth.

The treatment of household waste in this territorial context represents an excellent example. Post-war, a group of stakeholders (agronomists, doctors, entrepreneurs, city councilors, public engineers...), actively promoted the reuse of organic waste in raw or processed forms (compost) as agricultural fertilizer in the Parisian region. Studying the emergence and decline of this recycling practices, from the fifties to the nineties, helps deconstruct the idea that only incineration can be a viable waste management solution in a huge urban agglomeration. It

allows to reveal the oriented arguments toward "energy recovery" during the seventies and the eighties - after the oil shock - that support fire destruction and conduct to put a brutal end to large material recycling of nutrients. From that period to nowadays, this argument in favor of "renewable" energy production from waste is still central in the way modern societies deal with their colossal amount of organic waste. By this historical investigation, we criticize this idea in order to opens up future perspectives and allows us to re-imagine and institute technical solutions that preserve the equilibrium of biogeochemical cycles.



## Session 3. Flows of waste

14:00-15h30 - Room "Place de l'école"

### **Away from downstream waste management approaches: The heuristics of the metabolic perspective**

Jérémie Cavé (1), Yann-Philippe Tastevin (2)

(1) SciencePo Toulouse - France

(2) CNRS, UMR5193 - France

We discuss here the interest of the metabolic perspective from the point of view of waste management issues. Such issues have long been approached from the perspective of rudology (Gouhier, 2000), a primarily geographic and sociological discourse, or of networked service provision, with an end-of-pipe approach (Coutard, 2010).

We argue that addressing the issue of waste at the post-consumer stage is both an analytical and operational dead end. Trying to solve the equation of a growing mass of residues in a finite and saturated living environment condemns us to failure.

The metabolic approach is a powerful way of overcoming such aporia. By allowing us to reconstruct the dynamics of the flows and stocks of matter and energy linked to human activities, from the extraction and production of resources to their inevitable return, sooner or later, to biogeochemical processes, this approach invites us to consider jointly the downstream processes of waste disposal and the upstream processes of resource extraction (Hird, 2021).

By allowing a shift in perspective, a "zoom out", the metabolic approach makes it possible to acquire a systemic vision whose heuristic potential lies in highlighting this interdependence: the landfills that rise are inseparable from the mines that are dug. And these two mirror phenomena leave their lasting mark on territories (Liboiron, 2021).

Such an exploration reveals the massive issue of "upstream" waste and "sacrificed" areas (Plumwood, 2008). It also reveals their direct connection to our consumption actions: their "hidden footprint" (Porcelijn, 2018; Magalhães, 2021). For all everyday consumer products, the amount of material moved or used upstream is significantly higher than the mass contained in the final product.

Finally, in addition to the upstream part, the metabolic perspective reveals the stock issue. In fact, almost half of the materials entering the economy are neither recycled, incinerated nor buried: they accumulate in buildings, infrastructures and consumer goods. So much so that the mass of anthropogenic artefacts now even exceeds that of living beings (Elhacham et al., 2020). The immense infrastructure stock of the fossil urban economy therefore represents an unprecedented transformation challenge (Bonnet et al., 2021). A challenge then appears: that of dismantling at least part of this "urban mine".

In the light of the case of waste, the approach to metabolism, as a reconstruction of the relations between societies and the materials that enable them to reproduce, appears particularly fruitful. To show the metabolism of our societies is to transgress the principle of occultation that results from the globalisation of economic-industrial processes (Heynen et al., 2006), by transcending an urban/rural partition that has become obsolete. Rather than a pile of factories acting as notoriously inadequate emunctories, will our societies be able to make the metabolic trade-offs that the Anthropocene requires? This is the crucial question that this approach opportunely leads us to formulate.

## **(In)formal waste management practices and networks: The case study of the community "Urbyna" in Nezahualcóyotl, Mexico.**

Géraldine De Neuville (1)

(1) Université Catholique de Louvain - Belgium

The purpose of this paper is to study the practices of an (in)formal community of waste pickers who lives and works in an open-air garbage area of Nezahualcóyotl, within the Metropolitan area of Mexico City. It highlights the importance of recognizing informal practices in the public and private waste management sector and identifying the networks of flows, areas, and actors that are connected to the common resource: the waste. The paper also seeks to integrate the "research by design" as a tool in the process of understanding those (in)formal practices and a way of formalizing and redefining those practices as "commons".

In Mexico City, the gap between the supply of services and the demand for the waste management infrastructures is a current and problematic issue. The first part of the paper exposes those solid waste management problems, highlights the hybrid interaction between formal and informal waste workers, and explains the key role played by the informal community of waste pickers in Nezahualcóyotl. The second part focuses on the socio-economic and environmental impacts of the community regarding the threats of land pressure, new programs of recycling, and lower collected resource. The third part relates the field study. Most of the data are collected through interviews and participatory observations conducted in the community and with (in)formal actors involved in waste management. The study emphasizes the importance of those qualitative data in order to spatialize and map ; all (in)formal actors involved in waste management (who), the types and quantities of valuable materials that are collected (what), and areas where these materials are handled, stored and exchanged (where).

The study concludes by pointing out new potential hotspots where (in)formal actors and high valuable materials flows are interconnected. The paper highlights the benefits of developing new practices within those places and the necessity to develop closer collaborations between informal communities of waste-pickers, local workers, and the authorities to reinforce the waste collection system. Within this process, the "research by design" is considered as a useful tool of mediation. Through the comparison of alternative hotspots and the exploration of their spatial implementation, "research by design" provides a concrete, objective, and prospective basis for the development of commons governance. Furthermore, it helps to formalize the informal sector into programs and spaces that will allow the community to continue benefitting from the resource and places held in common with the authorities.

## **Anthropocene materiality and relationality at Clipperton: A study of the Passion remains on the only coral atoll in the northeast Pacific Ocean**

Anthony Tchekemian (1), Patrick Favro (1)

(1) Université de la Polynésie française - France

Passion Island or Clipperton is currently free of continuous and regular human settlement, but supports a large colony of birds, crabs, rats and plant species. However, the island continues to be subject to anthropogenic interactions. Our participation in the international scientific mission, "Passion 2015", conducted in April 2015, allowed us to focus on the nature of anthropogenic remains (remnants and waste); i.e. their history, dispersion, dynamics, but also their effects on the environment. Overall, the study of the remains on this small uninhabited island provides us with information on all the forms of occupation, management, exchange,

transformation and recovery of the material elements left behind and destined to "disappear". It therefore constitutes an in situ and in vivo laboratory, in continuous time.

The fieldwork allowed 118 remains to be georeferenced and then mapped. In addition, photographs were taken of each of these remains, making a total of 255 photos that could be collected. These data are compared with those collected during previous missions. The interest of this research is also to carry out a follow-up of these remains, through a dynamic approach according to their evolution, displacement (appearance of buried remains, new elements...) in order to understand, interpret, their role, their history according to their presence and origin, up to their evolution, and then to envisage also, for certain, a mode of management with a view to their treatment (in particular the stocks of ammunition abandoned by the American army during the Second World War). This research is also interested in human waste transported by marine currents (mainly plastic) and washed up on the island's coasts. Large areas of waste piles have been identified, such as on the north-east coast.

This study allows us to look at the history, uses, activities on and around the island (phosphate mining, fishing in a fish reserve rich in tuna), or even leisure activities (big game fishing organised in the EEZ, accompanied by visits to the island), human appropriation and even territorial claims. Undoubtedly, the processing of these data has considerable heuristic value for the human and social sciences, such as sister disciplines like history, archaeology, geography, geopolitics, economics, etc. The problem of "remains" is considered not only as a reverse side of production, but also as a research object combining historical, geographical, economic, geopolitical, landscape, environmental, ecological and symbolic dimensions. Thus, this study is an opportunity to think about and debate the effects of the current economic and environmental crises.

## **Seasonal changes in the urban metabolism of Alexandria, Egypt**

Mauricio Estrada (1)

(1) University of Bonn, Germany

Cities have been studied as places which follow a one-directional development, either growing or shrinking; yet, are there not conditions in-between? Whereas urban planning has traditionally conceived cities from this homogenous perspective, studies on urban metabolism have analyzed their stages of resource consumption and waste production as a way to show and quantify their environmental impact. However, such a merely instrumentalist approach to nature (Bakker, 2015) fails to include both how its metabolism enables and disables socioenvironmental conditions (Swyngedouw & Heynen, 2003) and how complexes of infrastructure mediate the every-day life (Graham & McFarlane, 2014). This paper explores seasonal urban changes resulting from the interplay between ecological and socio-economic systems, and their reflection in cities' material flows. It shows that although seasonal city changes are not addressed and are rather taken for granted by urban planning (Jauhiainen & Mönkkönen, 2005) these events reflect crucial and hidden socio-political arrangements in urban settings from which the alteration of the flow of materials is a merely primary outcome. Quantitative as well as qualitative aspects were incorporated into this exploration through mixed research methods in order to analyze more accurately the role of social dynamics as driving forces in the temporal alteration of urban metabolism. The seasonal urban change faced by Alexandria, Egypt every summer was chosen. This selection was based on the dramatic population increase by the Mediterranean coast which results in a seasonal demand overload of utilities associated with several forms of occupancy. Three services were broadly studied: water, electricity, and solid waste. Presumably, Alexandria does not foresee

this change, as these utilities present shortages every summertime. So, the higher temporal demand of ecosystem services and the quality of their hinterlands to provide to Alexandrians and visitors were assessed. Additionally, contrasts between perceptions and figures from different sources might allow to discuss their accuracy. Results showed a permanently low capacity in the city's infrastructure to supply utilities, which summer makes more visible. Urban metabolism beyond an abstract concept of material quantification, is also a reaction process to social patterns of demand and consumption of resources.

## Session 4. Metabolic (de)constructions

14:00-15:30 - Room R117

### **"Building Waste" and "Circular Economy" in Occitania: From sociotechnical waste to political matter! How to understand "ecological transitions" thanks to building materials?**

Audrey Dupont-Camara (1)

(1) Université de Perpignan, France - UMR ART-Dev, France

This communication is extract from PH.D research registered in urban and planning studies but led by a socio-anthropologist, a newcomer in urban or waste management studies. If the topic of this research was first understood in terms of valorization and management of waste from construction, we chose to work on gathering field experiences by questioning who talks, who manages and who uses these wastes in French territories, policies and politics.

Thanks to an ethnographic methodology (Buob, Chevallier, et Gosselain 2019; Lehec 2018), we "followed the waste" (Bahers 2014; Le Meur 2018; Laëtitia Mongeard 2017), more especially from concrete and bitumen, and its transformation to secondary building material in Perpignan. After identifying the sociotechnical system (Akrich and al. 2013) of inert waste management, we inquired the building waste infrastructure's practices, firstly to understand profiles and evolution of inert managers' activities and these of the contracting authorities - recomposing the construction sector practices (Augiseau 2020). In parallel, we observed debates about "building waste" and/or "Circular Economy" in different public arenas (Dobry 2009; Olivier de Sardan 1995; Wojcik 2015) with a multiscale dimension from national to regional (Occitania) and local one (Perpignan). We also met social groups concerned by these materials, especially environmental and social movements such as "Stop Usine Bitume" or "Zero Waste", to apprehend if the topic of waste from construction was central in their action claim. Finally, we reargued the "crossed determinations" between "technics", "social" and "politics" areas defended in sciences studies or anthropology of technics since 1980's (Dodier et Stavrianakis 2018).

If circulation of flows for waste is politic (Garcier, Martinais, et Rocher 2017) with a renewed conception through the paradigm of Circular Economy (Durand and al. 2017), so are also waste (Barles et Bahers 2019; Maccaglia et Cirelli 2019). Building waste and materials do not depart from general range (Bastin 2019; Mongeard 2018) ! Indeed, politics debated of these political objects in terms of "Transition to a Circular Economy" (TCE) with the law "Loi de Transition Énergétique pour la Croissance Verte" in 2015, with quantitative targets of valorization of these waste. Thanks to several policy and planning instruments, Region of Occitanie adjusted and applied this politic of TCE in its territory in order to support change of development model for local economic sectors, such as construction one. In this way, building waste or materials are political objects within the transition to a Circular Economy in construction sector and maybe non-human actors (Ernst et Swyngedouw 2019; Gabriel 2014; Heynen, Kaika, et Swyngedouw 2006; Robbins 2012) of the "ecological transition" - or ecologization of practices - (Ginelli et al. 2020) within this sector.

## **Construction sites, multi metabolic operators**

Lise Serra (1)

(1) Université de la Réunion - France

Cities are built and rebuilt. Construction sites are everywhere in economically dynamic cities but they almost disappear when cities shrink. These construction sites can be seen either, each one as one metabolic operator, or all of them in a same city or in a same territory as a multi metabolic operator. We'll look closer at these two hypothesis in order to understand the role of politics, corporations and inhabitants in these two points of view.

We'll use as case study Saint-Etienne city with construction sites in process : new and renovated office buildings, residential buildings, retails. As a metabolic operator each construction site presents inputs : money, raw materials, engineering, time ; and outputs : lost time for car driver passing by, gas pollution from construction engines, daily news, talks. It also has side effects as builders travel from other cities, political issues.

What if we think of all constructions sites as one metabolic operator ? Traditionally, stakeholders are different from one project to another and there are few joint actions to share material, corporation engagement or to deal jointly with construction sites wastes. But in a specific territory, thinking its transformation as one on going project, could help to minimize negative outputs, better control side effects and maximize positive outputs.

For this presentation, we'll use a multi-disciplinary methodology. We'll use a geographical approach to visualize current construction sites, building industries and main material flows with LCA statistical basis. The political effervescency will be looked at through a press scoping review to better understand what is at stake when building site are thought as metabolic operators. At a one-to-one level we'll use stakeholders interviews to understand their own point of view addressing the city transformation.

## **Materials matter: Extraction, flows and recycling of building materials in the upper Rhône valley**

Hélène Blaszkiewicz (1), Armelle Choplin (1)

(1) University of Geneva - Switzerland

The present communication aims at presenting the early findings of the MatéRhône project, organized between the Universities of Lyon and Geneva, and concerned with the extraction, flows, and recycling of building materials in the upper Rhône valley.

The region investigated by the Swiss team, around Lake Geneva, is marked by several mid-size cities (Martigny, Lausanne, Genève) which seem always under construction. If massive stone extracted in the Alps or in the lake was the basic material in the late 19th century, cement and concrete now dominate real estate and infrastructure building, leading to major transformation of extractive and urban landscapes. The region has known a tremendous population growth in the last twenty years, both in Swiss urban centers and in semi-urban zones and dormitory towns of neighboring Haute-Savoie department where commuters live. The region is strongly integrated from a labor point of view; the MatéRhône project wants to find out if the same is true for building materials used to build housing, office and leisure spaces used by commuters. We thus investigate the materiality of human habitation through the study of extraction sites, flows, and recycling of building materials in this cross-border region, with an attention put on the public-private governance of the construction sector and its places.

Our first findings that we would like to present to the symposium include:

- The mapping of extraction sites linked with building materials around Lake Geneva. It



shows the geographical importance of extraction, and thus of city-building, in the region, and reveals the extent to which the construction sector is an extractive activity. The many holes (quarries, dragging sites) must be linked to the many towers they enable to build. The survey of extraction sites makes visible the relations between sites and the hierarchization of places according to their function in the system.

- The analysis of cross-border flows of building materials. It shows the cross-border integration of flows of building materials, although the major companies are mostly active at the national scale. Companies take advantage of the price differentials between the two countries and construction materials move across borders. To do so, they use various means of transport: trucks, boats.
- The presence of local resistance to the consensus built around concrete. The cities around Lake Geneva were pioneers in the massive use of cement, under the influence of famous architects such as Le Corbusier. New housing projects and infrastructure are still massive users of concrete, but citizens and city-dwellers are increasingly aware of the negative environmental impact of this conventional material. Architects, engineers, and entrepreneurs in the region are thus beginning to take up this debate and imagine alternatives to cement and concrete in building our cities.

### **Analysis of the circulation of material flows on the territory of Grenoble Alpes Métropole: The influence of power relations in the building sector**

Quentin Desvaux (1)(2)(3)

(1) CREG - Grenoble Alpes University - Department of Economics - France

(2) STEEP - INRIA Grenoble-Rhône Alpes - Université Grenoble-Alpes - Laboratoire Jean Kuntzman - France

(3) Grenoble Alpes Métropole - France

Based on the directives of its CODEC, the waste department of Grenoble Alpes Métropole has initiated an ambitious policy aiming to reappropriate waste deposits through the transformation of local production systems. Given the convergence of these territorial issues of governance and change in the industrial system with the global issues of resource scarcity and various forms of pollution, a collaboration has emerged as a CIFRE thesis between Grenoble Alpes Métropole, the CREG laboratory and the STEEP research team. This research work in political economy allows an open disciplinary approach (Figuère et al., 2018) in order to analyze the waste management sectors in the metropolitan area from two complementary approaches: a functional approach that reveals the interdependent relationships between society and its environment through the analysis of flows, and a relational approach to integrate neo-Marxist interpretations of the structure of flows and reflect the historical and social processes responsible for the asymmetries of power (Herbelin, 2018).

The use of the metabolic approach in a previous work for the analysis of the bio-waste sector highlighted the loss of some flows from the territory to a private industrial deconditioning facility (3) whose profitability is based on the concentration of many regional flows. The metabolic approach thus made it possible to reveal a deep contradiction between the willingness of the authority to valorize these wastes in an organic way and the implementation of a non-inclusive sorting obligation at the source. This contradiction is then responsible for the dependency of the territory on this infrastructure. Following the model of this contradiction, the government is currently developing creating a national recycling sector for construction materials that is not very coherent given the lack of infrastructure for the production materials from recycled sources. By ignoring the hierarchy of treatment methods (i.e. first reuse) which are generally supported by local structures, this strategy

of concentration, based on an efficient management of flows and the free collection of waste, promotes the domination of private operators and runs against the challenge of territorialization of the stocks, the responsibility of waste producers and the transformation of the economic system.

This communication aims to provide answers to the following questions: How can the local authority integrate collective and local initiatives for the recovery of waste stocks of the building sector in a context of regulations that favor the logic of (inter)national circulation of flows? What governance should be put in place to encourage the emergence of small infrastructures and to promote their access to waste flows?

By anchoring the metabolic approach in the epistemological framework of political economy, this work aims, on the one hand, to report on the vulnerabilities of the construction waste sector, and on the other hand, to analyze the power relationships that structure this sector. This perspective is a useful addition to the quantitative approaches used in territorial ecology as it focuses on the needs of the stakeholders at the origin of the logic of material flows in a given territory (Bevione, 2021). This analysis of the territory and the interactions between its stakeholders thus questions the interactions between society and the biosphere and becomes part of a process of co-construction of the territory that goes beyond the management of material flows (Debuisson, 2014) in order to legitimize Grenoble Alpes Métropole in its public policy choices.

## DAY 2 - Wednesday, June 29, 2022

### Session 5. Theoretical considerations on metabolism

10:30-12:15 - Room "Place de l'école"

#### Urban metabolic infrastructures: Apprehensions and futures

Jean-Baptiste Bahers (1)

(1) CNRS - UMR ESO - France

At a time when the vulnerability of the major technical and economic networks of globalization has been revealed by the Covid crisis (abandoned airports, empty roads, ships on standby), the political issues surrounding infrastructures must be renewed. Until now, these infrastructures have been calibrated for a paroxysmal circulation of flows and consolidate a socio-ecological regime based on relations of domination over the territories of extraction and waste that we ignore. Depending on the categories of flows, these infrastructures are on the other side of the city ring road in the inner suburbs or at the other end of the world in places abandoned to destruction. Thus, the material footprint of cities cannot be considered on an urban scale alone, as urbanization draws on and consumes a hinterland. Finally, modern policies of ecological transition do not succeed in stopping this spiral of material circulation, or even, on the contrary, we are witnessing a consolidation of the dominant regime of a linearized, extensive and externalized economy. At the same time, opposition is being organized and many struggles are challenging these infrastructures that reproduce inequalities and environmental injustice attempting to question the normal process of extraction, accumulation and elimination of materials and energy by these stigmata of the capitalocene.

There is a vast literature that can shed light on these struggles and issues, that of urban metabolic infrastructures. This literature concerns in particular the currents of Urban political ecology, Social ecology, Industrial ecology, Science and technology studies, Territorial ecology and Political-industrial ecology, as well as the work of the International Resource Panel on infrastructures in transition. Many controversies arise when these different theoretical frameworks are confronted, starting with the futures they hold for them. How are these infrastructures addressed in the metabolic studies literature? What are the controversies? Are they sufficiently politicized, spatialized and socialized in this scientific space?

We will also discuss, through a few case studies, the policies that govern these urban metabolic infrastructures, and in particular the "futures" that they imagine. These case studies concern the prospective management of organic waste in the Rennes urban area and the urban circular economy policies of Gothenburg and Nantes. How do circular economy injunctions renew or not renew urban infrastructures? What are the frameworks for thinking about the future of urban metabolic infrastructures? Are they in tension on the registers of scale, governance and relocation?

#### Metabolic metaphors. Towards a typology of conceptions of spatial flows

Philippe Vandenbroeck (1)

(1) Newrope, Chair of Architecture and Urban Transformation Institute for Landscape and Urban Studies (LUS), D-Arch, ETH Zürich - Switzerland

Ecological, technological and economic forces are joining forces to lend more weight

to a metabolic perspective in the efforts to shape more sustainable, liveable and resilient cities. However, the enthusiasm of administrators, planners and designers is tempered by the experience of complexity. The metabolic lens makes us face the fact that a city is an enormously complex system. It creates a focal point in which flows, technical disciplines, administrative logics, political discourses, sectoral priorities, and scales of space and time intersect.

In this paper I want to highlight the complexity of this field from a particular angle. I want to show that a metabolically driven governance and design practice can result in very different development models, function of the conception of space upon which that practice is grafted. Space has been thoroughly reconceptualised in the course of the 20th century. A double movement has been made: from an objectifying perspective to an plastic, constructivist perspective, and from a structuring in terms of physical proximity to a structuring in terms of connectivity. These two movements can be placed on top of each other orthogonally, resulting in a typology of four conceptions of space (or "geographies") and associated conceptions of metabolism.

- A "pool table" metabolism appears at the objectivist/proximity intersection. It reflects a conventional engineering (industrial ecology, "circular") logic that pursues systemwide optimisation of efficiency of resource flows (materials, energy) with an eye to realising environmental and economic benefits.
- A "web" metabolism is articulated on the basis of an objectivist concept of space in which networks are recognized as a decisive structuring element. This is a cybernetic conception in which the city appears as a brain (the "smart city").
- A "mosaic" metabolism is embedded in a development model within a biologically, culturally, topographically and infrastructurally determined territory (the "urban bioregion"). It reflects a critique of the conflation of a "classical", Euclidean geography and a neo-liberal economic vision.
- A "narrative" metabolism intersects a critical, constructivist conception of space with a network logic. Here metabolism almost bursts apart. It challenges conceptualization because it is atomized over countless, dynamic and asymmetric networks. The city appears as a generative womb and the "urbanist" as its midwife.

The paper discusses the underlying logic of these four metabolic conceptions in terms of its functional purpose, dominant metaphor, key design and managerial strategies and supporting infrastructural elements. The paper's main aim is to alert the reader to the discursive complexity of a metabolic perspective.

### **A legal approach to social metabolism: Power and consequences**

Benoît Schmaltz (1)

(1) Université Jean Monnet - Saint-Etienne - France

Urban/Territorial metabolism "aims to describe, analyse or even transform the metabolism of territories, elaborating on the analysis of natural and social processes" (Barles, 2014). It improves the understanding of the major environmental issues of our time, the Anthropocene. Our preference for "social" instead of "territorial" metabolism refers to the idea that the deep purpose of the metabolic approach is to ground Society in its inescapable physical roots. Social metabolism is a way to abolish the nature/culture divide in a modern scientific manner, we consider conform to the scientific materialism (Bunge, 1981): energy-matter is the first row of the emergent social house of cards.

The Social Metabolism (González de Molina & Toledo, 2014) combine tangible (material fluxes) and intangible (ideas, conceptions) metabolic processes. Enriched with a systematic theory of the sources of social power (Mann, 1986), it draws a comprehensive understanding

of the biophysical and sociological functioning of societies. Law makes another piece of the interdisciplinary puzzle of social metabolism. Our paper will try and present our work (in progress) about the linkage of

legal theory and social metabolism.

The first step elaborates from the following core concepts: legal subjects exercise subjective rights of property on things and subjective rights of authority on other subjects to develop their legal activity serving their own interests and purposes; the legal technic of the universality allows to formalize the most complex activities of public bodies and enterprises (Schmaltz, 2016). Property as the power of things is the fundamental mechanism of the social "appropriation" (Gonzalez de Molina & Toledo, op. cit.) of material reality and thus the core linkage between Law and Social Metabolism. Universalities formalizing activities (fonds, in French and in our works) can be considered the prominent "dissipative structures" constituting the economy, now fully acknowledged as a thermodynamical (Georgescu-Roegen, 1971) and biophysical process (Hall & Klitgaard, 2012) according to the so called heterodox ecological economics.

Linking this legal theory to biophysical and ecological economics, sociology and sustainability science (de Vries, 2013), this first step allows a theoretical legal formalization of social power involving tangible and intangible metabolic processes with associated inputs, outputs and impacts; in brief, power and consequences in a material reality.

The second step is to investigate the practical implications and the legal technicalities. It is far more complex and implies the cooperation of legal scholars and lawyers from all fields. Taking property as the fundamental mechanism, we can sketch some of the major implications, confronting to other points of view in Common Law (Capra & Mattei, 2015) and continental (Hautereau-Boutonnet, 2021; Vanuxem, 2020) legal scholarship, dealing with what Legal innovation can contribute to this legal approach to social metabolism.

### **Organicism, a constitutive metaphor of the sciences of the city**

Olivier Ratouis (1)(2)

(1) Université Paris Nanterre - France

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With this call for papers, we are pleased to see the metaphor of the living taken seriously in the approach to the urban question.

On the occasion of this colloquium devoted to metabolism, we intend to give all its importance in the field of the sciences of the city to the lexicon which shows a strong presence of the organicist metaphor, sometimes noted but not studied. It seems to us at first sight not to let ourselves be trapped by a solely conceptual approach. The constitution of the specialized vocabulary of the urban has been characterized by numerous borrowings from constituted sciences, sometimes even before the words have been conceptually elaborated (Topalov alii 2010).

It should be noted that recent work has shown that there is no specific research today on the vocabulary of urban planning and the city in the long term (Coudroy de Lille Ratouis 2019). However, the proximity of the vocabulary registers of doctors and urban planners is remarkable: the vocabulary of architects in the first half of the 20th century is similar to that of doctors (Léonard 1978) in the second half of the 19th century. It is therefore not only from the point of view of leading authors that we can understand this dynamic, but through the study and recording of broader discursive practices. It seems here that the diffusion of medical vocabulary goes through hygienism. We intend to show this by examining the discourses of urban planners - men of plans, developers - who introduced it into the analysis

of the city: from the beginnings of human geography to those of French urbanism.

If organicism goes back further and refers to a system of thought that has been bathed, explicitly or not, in organicist metaphor (Schlanger 1996 mentions Hegel as well as Marx), the question concerns the level of analysis: is it a metaphorical level (referring to an awareness of the distance between terms) or a supra-metaphorical level (when metaphor gives way to a concept)? The scientific ambition of the authors leaves little room for doubt.

Here, it appears that the organicist metaphor by its power highlights the extent of the imaginary in the thought of the city. What is at stake in the use of the organic metaphor in the sciences of the city at the beginning of the 20th century? Is it an operative metaphor? Simply operative? We hypothesize that the organic metaphor is a means of grasping urban dynamics; a way of approaching urban time, whose tremors never cease to question contemporaries, all the more so when they set themselves the task of remedying its effects, first of all the overflowing of urban enclosures under the onslaught of a major demographic and spatial expansion, and when they hypothesize a growth that cannot be apprehended in a linear fashion.

We propose here to build on an investigation conducted within the framework of a multidisciplinary partnership between linguists and urban planners within the Labex "Les passés dans le présent" (Université Paris Lumières), which will start in early 2022 and will support previous work.



## Session 6. The materiality of food

10:30-12:15 - Room R117

### **Public space as a metabolic infrastructure: An exploration of the role of street vending in urban access to food**

Louise Guibrunet (1)

(1) Instituto de Geografía, UNAM - Mexico

Cities are environmentally unjust spaces; urban material flows are not distributed equally among residents and across neighbourhoods. Studying urban metabolism at the neighbourhood scale is a means to understand how territorial and social configurations impact social groups' access to material flows within cities. Questions of inequity are particularly important when studying food. The regular provision of accessible and healthy food is determinant to human health and wellbeing - yet, it is still not achieved in many urban neighbourhoods. In addition, food supply contributes to cities' environmental impacts, particularly greenhouse gas emissions and land use. Food has been studied from a variety of perspectives (nutrition, engineering, agronomy) but is relatively under-studied in urban metabolism studies. When they are studied, food flows tend to be estimated based on extrapolation from national datasets and analysed at the urban scale. This approach black boxes the city and thus obscures the intricate relation between food as a material flow, urban territories, and the bodies of urban dwellers.

In this talk, I will present preliminary results from an empirical study undertaken in Azcapotzalco, a municipality in northern Mexico City. Mexico City is characterised by a healthy traditional diet, but which prevalence is decreasing, while Mexico City residents increasingly suffer from obesity and diabetes. In parallel, the city is deeply unequal, both in terms of socio-economic levels among residents and in terms of the quantity and quality of food supply across neighbourhoods (some neighbourhoods being food oases while others are food deserts). Our research focus is to explore the role of street vendors as "metabolic operators" that may provide access to healthy food in under-served neighbourhoods (food deserts), and thus that can play a role in enhancing urban dwellers' health. In parallel, we conceptualise public space (the pavement, parks, and public squares) and street workers' bodies as metabolic infrastructures which allow the transport, display and purchase of food as a material flow.

Through observational fieldwork, we map both mobile and static street vendors selling different types of food (to be prepared at home or to be eaten on site). We identify the street sale of foods that form part of the traditional Mexican diet, which we use as a proxy to identify healthy and sustainable foods (based on Willet et al's 2019 study in The Lancet). By comparing our results with census data on formal food vending venues (supermarkets, shops, and restaurants) we analyse the role of street vending in providing equitable access to healthy food. The results will be presented as a comparison of ten adjacent neighbourhoods which differ in terms of their residents' socio-economic level as well as the density of formal food vending venues. As such, the results will provide insights on the role of street vendors in providing access to healthy and sustainable food to Mexico City residents, and how this role may differ across neighbourhoods.

## **Thinking food relationally: Exploring methodological frameworks towards metabolic readings of urban food systems**

Natacha Quintero González (1)

(1) Chair of Urban Planning - Institute of Urban Planning - BTU Cottbus-Senftenberg - Germany

This contribution reflects on a synergy of methods implemented in two urban planning seminars designed to facilitate the understanding of food as a metabolic process involving multiple materialities, translocal networks and predominantly asymmetric relationships. Through a collection of maps produced by architecture and planning students, I aim to articulate how the use of follow-the-thing approaches, relational perspectives such as systems thinking and ANT, and the notion of urban metabolism can enable the unveiling of hidden socio-spatial relations, socio-material entanglements embodying various forms of injustice, and the global reach of food supply chains. The first seminar focused on the canteen of the Brandenburg University of Technology Cottbus, Germany, and explored its interactions with the university campus, the city of Cottbus and the Lausitz region, as well as its possible role in regionalising its food system. The second seminar looked at conventional foodstuffs, available in large quantities and at low prices in supermarkets, and the status quo of their supply chains. This second seminar had students follow and map the path of products from origin to disposal, uncovering intersections with gender, ecology, land use conflicts, politics, cultural identity, and power relations in the process. Methodological frameworks that include metabolic readings of food systems, relational thinking perspectives, spatial analyses and various mapping techniques provide a way to link (and visualise) the material conditions associated with food, such as people, machines, infrastructures, buildings, urban environments and their surroundings and global hinterlands, with the non-material conditions shaping relationships and interacting with them at different levels.

## **Production and consumption of a place: The example of Gruber brewery in Strasbourg - Koenigshoffen (1855-1959)**

Nicolas Handtschoewercker (1)

(1) Université de Strasbourg - INSA (Institut National des Sciences Appliquées) - France

Could it be social, urban or territorial, metabolism has the wind in its sails. As the number of scientific publications referring to this notion grows, it seems to acquire paradigmatic characteristics while being appropriated by a great variety of fields. It's been established as a comprehension key of material and dynamic interrelationships between the human being and the environment (1). The metabolic perspective is questioning the society-nature interface in its historical modalities, by emphasizing the material and energy basis of our social reality as a set of structuring but often invisible processes. It might therefore allow an other narrative on the contemporary world and its fabrication, including the highlight of its local, material and eventually social expressions.

Through the quantitative or qualitative description of local phenomena, metabolic approach could have the potential of conferring to meta-narratives a certain consistency, revealing their imbrication on different spatial and time scales. Moreover, because it is highlighting the material interdependancies between a living population and its environment, metabolic study is questioning the production of the territory itself. Understood in its total and polysemous nature, as a system of relations which links human and non-human communities to a place, territory seems to acquire a widened significance within the metabolism theory through the affirmation of its material dimension. As Cronon suggests it, the place would then become the interface between human history and a history of changing nature.

In this perspective, the story of the successive transformations of the place that hosted the development and disappearance of Gruber brewery (1855-1959) seems to be a great illustration of the above-mentioned stakes. Gruber was a pioneer in use of bottom-fermentation to produce beer. During the second half of the 19th century, the factory asserted itself as one of the first modern brewery in Alsace by taking advantage of the newly build railway line in order to connect to the growing market. This build entity is currently the only and partial survivor of the real-estate fever that hit the western Strasbourg neighborhood of Koenigshoffen in the 1980s, after the factories' closure. In other words, it nowadays stands as the last witness of this former faubourg brewing past.

Through metabolic study, we will see how the Gruber entity was characterizing a double transformation process of its environment: consumption (raw material, labour power, etc.) and production of it (infrastructures, sociabilities, but also nuisance, pollution, etc.). The most surprising example of this double phenomenon is probably the use of the area's sloping ground: in winter, the workers stored massive amounts of ice in dug cellars, after having them extracted from the lower and previously flooded bottom part. Because they could ice-skate on them on Sundays, those artificially frozen "ponds" were undoubtedly source of joy for the surrounding inhabitants.

Would the decline of industrial production have eventually signified the end of those interdependancies?

Can the metabolic approach report on it?

## DAY 3 - Tuesday, June 30, 2022

### Session 7. Embodying metabolism

10:30-12:00 - Room "Place de l'école"

#### **Crap art - on fecal matter and human metabolism in contemporary bioart**

Adam Bencard (1)

(1) University of Copenhagen - Denmark

Thinking with and through metabolism in our contemporary moment requires (amongst many other things) grappling with our own refuse, with fecal matter. Philosopher Peter Sloterdijk has remarked how the Western cultural propensity to disregard the waste produced by our metabolic processes must come to an end: "Hitherto, refuse was systematically ignored. Only under the sign of modern ecological thinking do we find ourselves forced to become conscious again of our refuse" (Sloterdijk 1983). Or, as anthropologist Nicholas Kawa recently remarked, "the Anthropocene will offer many lessons for humanity, but one of its most jarring is that we simply can't hide from our shit anymore".

This paper examines how a number of contemporary bioartists are taking up this call, engaging with fecal matter as a way to reconfigure and reckoning with what it means to think humans as fundamentally metabolic creatures, embedded within and affecting material structures on a global scale. The article explores three contemporary art works which in different ways are taking up the insights and potentials that working and thinking with fecal matter opens for, exploring its cultural, existential, scientific and critical potential. The works are Kathy High's Kathy as Bowie, Tagny Duff's The Wasteland Project and Art Orienté Objet's May the Pygmy Live in Me.

The paper will argue that in these works, fecal matter - shit - is being reconfigured from cultural taboo and toxic waste to a lively, active matter that contains the capacity to reinvigorate ecosystems. This reconfiguration adds new layers to traditional readings of fecal artworks (such e.g. Italian artist Piero Manzoni 1961 Artist's Shit) which have mostly revolved around the usage of fecal matter as provocative metaphor. In contrast to previous uses of feces in art as a vehicle for provocation and critique of the norms of bourgeois society, and its attendant hyper-hygienic and consumerist structures, in the examined works feces is being viewed as a site from which to trace the metabolic interconnectedness of bodies and their environments. In examining these works, the paper suggests that feces is turning out to be "good to think with", to paraphrase Claude Lévi-Strauss, and that it holds a particular resonance in our Anthropocene moment. The paper thus points to contemporary bioart as a site rich with complex cultural reexaminations of what it means to think humans as metabolisms, a repository of embodied metabolisms and ecological imaginaries.

#### **Historicizing the rhythmic body: Temporality, metabolism and embodiment in Industrial modernity**

Kristin Hussey (1)

(1) Medical Museion and the Novo Nordisk Foundation Center for Basic Metabolic Research (CBMR), University of Copenhagen - Denmark

This paper aims to set a new research agenda for health history which foregrounds

temporality and rhythms as a way of understanding the body in the period surrounding the Second Industrial Revolution. Across the nineteenth century, physicians, physiologists and scientists placed an increasing emphasis on the role of time and cycles in bodily health - from the rising and falling of body temperature, the cyclical nature of infection, the optimal dietary schedule and the developing science of sleep. The rhythmic function of the body was deeply intertwined with metabolic processes like digestion and rest. Both doctors and patients were highly aware of the time-bound nature of health, especially in the period where time itself was becoming standardized.

Writing in the late nineteenth century, physician Joseph Mortimer Granville reflected, "The philosophy of health preservation consists in an intelligent study of natural conditions of repose, and obedience to the laws therein laid down for our guidance, so far as the natural can be harmonized with the artificial". Like many other doctors and scientists of his day, Granville was concerned about the effects of an increasingly frantic world on the "natural" functioning of the human body. The most basic cycles of sleep and wake, feast and fast, seemed to be crumbling in the face of industrialization - bringing with it new pathologies caused by a rhythmic misalignment with far-reaching consequences for the body's metabolic balance.

Inspired by an emergent "metabolic humanities", this paper will attend to the visceral experience of being a body in time in the nineteenth century - surveying a wide variety of issues related to temporality and health. Drawing out the many ways in which the imposition of industrial time affected the body through working schedules, the introduction of electricity, and anxieties around disrupted rhythms - the concept of metabolism acts as a conceptual framing for highlighting everyday bodily practices like sleeping, eating and working. While the exact definition of a "metabolic humanities" is still up for discussion, here I take it as a move to employ concepts from the metabolic sciences within the humanities. In my case, it means employing insights from the contemporary study of circadian rhythms (ie, that shift working causes bodily illness) to the past. I will argue that an attention to rhythmicity through this application of chronobiological perspectives opens up new avenues for considering the relationship of time, the body, and the environment.

## **Microbial Rift: Initial Reflections on Our Lost Microbial Diversity**

Sevgi Mutlu Sirakova (1)

(1) LMU-Rachel Carson Center - Germany

Recent microbiome studies continue to raise concerns about our shrinking microbial diversity and its relation to human health. While adapting to urban lifestyles, we have gradually lost and become increasingly alienated from microbial multispecies relations. This has had profound implications on human wellbeing.

In this article, I propose the notion of a microbial rift to explore how we are made and unmade by the relations we cultivate with other species. By drawing attention to the microbial extinctions that are happening inside us, and their relations to our daily food habits, I will expand the concept of the metabolic rift to include coevolutionary microbial multispecies relations that have been cultivated by traditional food practices. This article is a broad invitation to think with these traditional practices in order to grasp the multispecies aspects of human metabolism, and to thereby move towards localized and applicable alternatives that bridge metabolic and microbial rifts.

# Session 8. Expertise and metabolism

10:30-12:00 - Room R117

## A "metabolic urban planning"? How planners understand and implement the urban metabolism paradigm

Martial Vialleix (1)

(1) UMR Géographie-cités - Université Paris 1 Panthéon-Sorbonne - France

It is well acknowledged that urban planning (UP) has a key role to play in the transition towards sustainability. Moreover, urban metabolism (UM) has gained traction recently. Here, I will consider UM as a paradigm that gathers three strands:

- a scattered research field (Barles & Bahers, 2019);
- a framework to view urban areas in a systemic way;
- a technical object to study cities' footprint, which has experienced a large development since the 2000's in France (Vialleix, 2021).

Since Kennedy & al.'s (2011) review of urban metabolism's integration into urban planning, a lot of scholars have argued that the confluence between UM and UP has a bright future (Giezen & Roemers (2015; Marin & De Meulder, 2018). Concurrently, a lot of those scholars have expressed doubt and disappointment. Ferrão & Fernández (2013) highlight the gap between recent UM research, and its low adoption by urban planners themselves. Di Nardo & al. (2016) acknowledge this gap by stressing the fact that the traditional methodology of UM studies is inappropriate for planners.

Facing this paradox, I argue that a few authors have indeed tried to identify the factors that shape urban planners' (its tools, actors and projects) abilities to think and act in a metabolic way. We also highlight that a lot of the research is only focused on the technical part of this potential confluence. For example, Voskamp & al. (2018) proposed the "SIRUP" tool, focusing on the data accuracy that planners seem to require in order to be able to integrate a metabolic approach. Ferrão & Fernández (2013) and Chrysoulakis & al. (2015) have built quantitative tools that aimed the "decision-making process" as a key stage of the UP project.

All those endeavours are aimed to transform and translate UM into something fit for the practice of UP. However, they do not ask whether this practice already contains some production and management aspects of UM; neither do they try to understand the constraints, rhythms, or codes that shape urban planners' thinking and actions.

This proposal, mainly based on a Phd research currently conducted in France, will try to explore how the sphere of UP is considering UM. To do so, a literature review will analyze how urban areas can be understood through the prism of UM, and in what way UM is currently integrated into planning practice. This review will be broadened to cover grey literature produced by public institutions and corporations, focusing on how this production also broadcasts the UM approach. Semi-structured interviews with planners will also be conducted, focusing on how they understand and implement the UM approach in their day-to-day practice. My purpose here is to:

- give insights about how UP might be able to tackle the issues that become apparent through the UM approach;
- try to understand how this often so-called "new" approach is in fact "already there", assuming that UM issues are partly integrated in different UP tools and ideologies;
- ask whether a "metabolic urban planning", as I call it, constitutes a new model for planning theory and practice (Bourdin & Idt, 2016).



## **Renewal of city-countryside relations and socio-ecological transition: Contributions of a metabolic approach**

Laetitia Verhaeghe (1)

(1) UMR Géographie-Cités - France

An old object of study in geography, history and sociology, the material and energy relations between cities and the countryside (which we abbreviate to city-countryside relations) have been the subject of new interest since the 2000s. Several authors emphasize that the development of city-countryside relations could be one of the possible ways of responding to the challenges of the food transition (Brand et al., 2017 ; Brand, 2015 ; Marty, 2013 ; Sonnino, 2009 ; Steel, 2008), energy transition (Balaye et al., 2018 ; Debizet, 2016 ; Labussière et Nadaï, 2015), and more broadly, socio-ecological transition (Bahers et al., 2019 ; Bahers et Durand, 2018 ; Barles, 2018).

We have invested this perspective by defining cities, countryside, peri-urban and their material and energetic relations through the notion of territorial metabolism - as defined in the interdisciplinary field of territorial ecology (Barles, 2017 ; Buclet, 2015). City-countryside relations refer to the set of material and energy flows established between cities and the countryside as well as the set of social, political and economic links that deploy and orient them. In line with long-term socio-ecological research and studies on territorial socio-ecological trajectories, the socio-ecological transition requires a profound transformation of the territorial metabolism to which town-country relations can a priori contribute. One of the corollaries of this transformation is dematerialisation, i.e. the reduction of resource consumption, the substitution of non-renewable resources by renewable ones and the closing of biogeochemical cycles (Barles, 2017). This posture makes it possible to go beyond the temporal, thematic and disciplinary limits observed in the field of study of material and energy city-countryside relations from the 20th to the 21st century, while associating the different contributions according to the segments, periods and elements studied. It also allows us to go beyond the material and energy accounting, which dominates the study of territorial metabolism, by apprehending the flows as the result of social and ecological processes.

This paper analyses the contributions and possible limitations of this theoretical approach to test the hypothesis of the renewal of city-countryside relations and their contribution to the socio-ecological transition. It is based on a cross-sectional reading of the results of the analysis of three city-countryside relationships concerning food, drinking water and renewable energy flows in France.

We show that this theoretical framework makes it possible to grasp the processes that lead to the establishment of city-countryside relations as well as the constraints that weigh on them and influence their potential to dematerialize the territorial metabolism. This leads us to relativize the scope of public policies on the socio-ecological and inter-territorial transition and to underline the interest of territorial metabolism as a tool to evaluate them. This research work also underlines the links that remain to be woven with research in political science, sociology and territorial economy in order to better grasp all these metabolic dynamics.

## **Metabolism as a theoretical imaginary for an urban experiment: The case of the study "Champs-Élysées - History & Perspectives"**

Etienne Riot (1), Léone-Alix Mazaud (2)(3), Jasmine Léonardon (2)

(1) LVMT-Ecole des Ponts ParisTech, Université Gustave Eiffel - France

(2) PCA-Stream - France

(3) CSI (Centre de Sociologie de l'Innovation) - Mines ParisTech - France

Parisian architecture firm PCA-STREAM has been pursuing a conceptual and reflexive approach and a dialogue with research laboratories, notably the GERPHAU (1). It led them to elaborate on the theoretical concept of "metabolism-city" ("ville-métabolisme"). In PCA's acceptation of it, "metabolism-city" addresses the holistic understanding of urban complexity. It is based on a synergy between practices and knowledges upstream of the design projects, so as to integrate ecological systemic issues into urban practice (Haëntjens, J. & Lemoine, S.; 2015). The fragmentation of urban projects, they argue, prevents urban makers from producing adequate responses in facing Anthropocene (Chiambaretta, P. ; 2018 in D'Arenzio, Younès, ed.; 2018) and global urbanization challenges (Véron, J. ; 2006). This imaginary of urban metabolism seeks to hold this systemic complexity at the very heart of the projects. It urges to conduct them in a constant search for synergy among the various answers proposed. This method was put into practice through a demonstrative project conducted at the scale of the Champs-Élysées avenue (Chiambaretta, P., & Labasse, A., 2019).

By investigating the making of the Champs-Élysées urban study, this paper examines how the imaginary of metabolism performed while being turned into an experiment of urban design for the Champs-Élysée avenue. It shows how it allowed a systemic vision of the project replace a processed one, and what it produced in terms of methodology, reshaping a practice.

The paper first clarifies the specificities of the metabolic metaphor as PCA-STREAM appropriated it for the study, drawing from Sabine Barles' (Barles S. ; 2002) and Nussaume's approaches using the notion of milieu (Nussaume Y. ; 2018). By enlisting urban metabolism as a structuring concept for developing an urban vision applied to an avenue, PCA-STREAM pioneered a new scale of application.

It then investigates the development of the study as a succession of unlocking steps performed by protagonists, both internal to PCA and among the partners involved, for whom this approach was new. The way they translated this imaginary into something that was not an actual project, but a vision projected onto a territory, first destabilizing, turned out very organic. Precisely because it was not about designing a project, the agency had no choice but to turn the imaginary into a methodology. The resulting approach showed two main features. First, it was based on the use and promotion of various sets of data, exploited to produce indicators and metrics that could be crossanalysed. Second, it brought into the study an ecosystem of third parties and experts expected to abound with their knowledge and capacity to engage into collective intelligence processes. Some subjects yet resisted the datification process (Mayer-Schonberger V. & Cukier K. ; 2013).

The paper explores in more detail the way the study dealt with the living world and biodiversity. It acted on the landscape as a milieu (Bercq A.; 2000, 2017) rather than an aesthetic decoration exemplifying an idea of power and domination (Santini C.; 2019) or planning for a specific development of greenery. The ambition was to offer the conditions needed for nature to expand and adapt to its new terrain and uncertainty. By doing so, it demonstrated that, when pushed to its limits, the metabolic approach can go beyond the only rationalization through indicators and measures, allowing for a more emergent project dynamic.

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philosophy, architecture and urban studies, from École Nationale Supérieure d'Architecture de Paris-La Villette: <https://www.gerphau.archi.fr/>

### **Bottom-up, context sensitive, and practice-based Urban Metabolism methodological approach using GIS and Social Network Analysis in Brussels**

Daniel Otero Peña (1), Daniela Perrotti (1), Pierre Vanderstraeten (2)

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Urban metabolism (UM) studies provide valuable insights that can improve resource efficiency in cities and have evolved in recent years by adopting an interdisciplinary and multiscale approach of urban systems (Newell and Cousins, 2015; Castán Broto et al., 2012). Localizing and quantifying urban flows and stocks could be of great value for identifying infrastructure deficiencies and unequal resource accessibility for vulnerable population groups. However, only few studies provide spatially explicit accountings of UM flows (e.g. Wielemaker et al. 2019; Yeow & Cheah, 2019; Smit et al., 2019). Moreover, the integration of refined spatially explicit data from bottom-up, context-sensitive, and practice-based resource collection and management structures can help the development of local planning strategies based on stakeholders involved and socio-ecological dynamics observed (Musango et al., 2020; Perrotti, 2020). This study combines geographical information system (GIS) and social network analysis (SNA) methods to deeply explore a combined top-down and bottom-up analysis to improve UM application in urban and landscape planning. In particular, integrating finer-scale quantitative and qualitative socio-ecological inputs from alternative resource collection and management structures (i.e., different structures led by groups other than government bodies). Brussels, our case study, is a city-region including 19 communes with a population of approximately 1.2 million (30% living at risk of poverty) and a wide diversity of publicly funded alternative resource governance projects (e.g., *contrats de quartiers durables*, among others). First, a GIS analysis of Brussels is presented to highlight (i) resource efficiency hotspots at the city-region scale, and (ii) socio-ecological dynamics at the neighborhood scale. The following spatially-explicit datasets were used in the study: resource flows and their infrastructure (water, energy, and solid waste), open space networks, vulnerable communities, and alternative resource governance projects. Then, we explored the relationship and network structure (Lienert et al., 2013) between ongoing alternative resource governance projects and different stakeholders involved (e.g., government, NGOs, private practices, and civic society). The GIS and SNA analyses are supported by an extensive literature review, collection of primary spatial data and available datasets, field visits, and semi-structured interviews with key stakeholders. This approach allowed highlighting existing alternative resource collection and management structures of urban flows and their links to open space networks at the neighborhood scale. Through the water-energy-waste nexus, the research also contributed to a better understanding of metabolic and productive dynamics of grassroots resource harvesting groups in Brussels. Furthermore, it revealed that considering the nature of the social networks and embedding stakeholders that drive them is key to the successful implementation of resource management projects beyond technical aspects (e.g., as demonstrated in the participatory processes led by the *Etats Généraux de l'Eau à Bruxelles* for the rainwater harvesting management and repurpose of a covered river in the commune of Forest). The findings of this study can inform UM analysts and planning practitioners to formulate and apply landscape infrastructure design strategies (e.g., integrating resource

harvesting ideas into architectural and public space projects) based on a context- and community-specific approach to achieve more resource-efficient and resilient cities.

## Session 9. Depicting metabolism

13:30-15:00 - Room R117

### **Floods, Pollutions, and Urban Metabolism. Perceptions of French and Canadian Scientists**

Mailys Genouel (1)(2)

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Floods can be dramatic in an urban context, because of the vulnerability of certain populations, the diversity and number of urban stakes, and the intensification and increase of the hazards related to stormwater. These floods can also cause major pollutions. Indeed, the overflowing of waterways, the high water depths, and the flow speeds can cause accidents, such as the dispersion of manufacturing, storage, or transport elements containing dangerous substances. Untreated water overflowing out of the sewerage system can also cause pollution (in particular fecal matter). We want to question the construction of these pollutions as a social problem, i.e. a presumed situation that is conceived as a problem in the arenas of public discourse or public action (Hilgartner and Bosk, 1987). We focus on scientist representation and discourse. We aim to understand how scientific networks are structured (or not) around this subject, and how they participate (or not) in the construction of knowledge on these pollutions.

We conducted 30 semi-directive interviews with French and Canadian scientists. We built the sample following (i) a literature review on recent publications, (ii) exploratory exchanges with five scientists from four different disciplines in France and Canada, iii) their case studies and main field, and iv) their disciplines. The interview grid starts with a question about the studied post-2000 floods and then focuses on the possible risks of pollution associated with floods. The survey focuses on the factors and means of acknowledge of these pollutions, but also on the management of these pollutions, in particular by the territorial authorities and the inhabitant populations. We recorded and transcribed the interviews to proceed to discourse analysis, using a mixed-method, between quantitative (content analysis and textometry) and qualitative (by extracting citations) approaches.

Our research offers a systemic perspective on floods by studying water flows and the circulation of other substances than water. The conceptual framework of urban metabolism allows us to integrate the different components of the hydro-social cycle (Linton 2014), namely i) the agentivity of molecules (H<sub>2</sub>O and pollutants), ii) the infrastructures and technology that create different networks (for example water supply, consumption, and treatment), and iii) power relationships and structures of governance. Water and displaced substances outside the metabolic networks, due to flood events, can be experienced and recognized by societies as pollutions. To support this reasoning, we can rely on Mary Douglas' (1966) definition of pollution as substances that are not where they should be. This was the case, for example, in Marseille, in 2021, where the risk of pollution was linked to a disconnection between the metabolic flows of waste evacuation, given the strike of the garbage collectors, and the excessive flows of water because of stormwater. Health can become a topical issue, if dead animals are not evacuated or when it comes to managing large and sudden quantities of waste and sludge. The conceptual framework of urban metabolism allows us to grasp the multiple interpretations of "pollution" and to understand how the scientific community represents these flows as a potential problem, given their impacts on societies, cities, and ecosystems, which experience them very concretely.

## **The Metabolic Metropolis: Mishmash, Mesh-Space, Mismatch**

Nathan Marom (1)

(1) School of Sustainability, Interdisciplinary Center (IDC) Herzliya - Israel

This paper offers a playful and provocative conceptualization of the nature of urban-metropolitan metabolisms from multiple perspectives. It mixes-and-matches several prominent strands of contemporary scholarship on urban-metropolitan regions, their material metabolisms, growth and expansion processes, infrastructural development and governance. These perspectives include: processes of agglomeration and expansion of metropolitan regions seen as planetary urbanization; the urban-metropolitan region as a set of horizontal, vertical, and volumetric spatialities and relationalities; the multi-dimensional "layering" of urban-metropolitan environments through interlacing infrastructural systems; and the growing socio-spatial disparities within and between metropolises due to their unequal political ecologies, leading to environmental and climate injustice at different scales. By tying together and synthesizing these strands, I advance a conceptualization of the metabolic metropolis through the tropes of mishmash, mesh-space, and mismatch.

1. Mishmash is defined in various dictionaries as a "badly organized mixture", "a confused mess", "a collection or mixture of unrelated things", "hodgepodge", "jumble". These definitions capture something of the material substance of urban-metropolitan "agglomerations" (itself a synonym of mishmash). Unlike tidy distinctions of material inputs-outputs, resources-wastes, or tidy images of circular economies and "cradle-to-cradle" systems, mishmash assumes that metabolic processes generally, and at the metropolitan scale in particular, are messy and malleable, mixing together processes of production, consumption, disposal, assemblage, entropy, emission, pollution etc. in complex, conflicting, and uncontrollable ways.
2. Taking visual inspiration from the study of mesh structures, mesh-space is a suggestion to formally envision the urban-metropolitan domain as a multi-dimensional, multi-layered, flexible, nodal, interconnected and growing space-structure. "Mesh" suggests a structural stability and durability of urban agglomerations, unlike the morphable and flowing materiality implied by "mishmash". Rather than prioritize a particular dimension, be it horizontality (e.g. in studies of urban expansion, suburban sprawl, land use conflicts at the urban/rural/natural interface), verticality (e.g. fascination with underground infrastructures, flyovers, skyscrapers, and air domes), or, recently, "volumetric" urbanism, mesh-space sees these dimensions as entangled and equally necessary for understanding metropolitan metabolisms.
3. Mismatch refers to the social-political inequality of metropolitan metabolisms, taking place at scales that do not match administrative and political boundaries, stretching far beyond municipalities, regions, and nations. Following urban political ecology, it also refers to the profound mismatch and disparity between the benefitters and the deprived in metabolic processes, those whose material-environmental needs and demands are met and enhanced and those who suffer and diminish as a result. Such metabolic inequities at the metropolitan scale exist between humans and other-than-humans, and between geographic areas (e.g. urban/peri-urban/rural), social groups (racial, ethnic, class etc.), and communities. Here, I suggest articulating metabolic disparities and distinctions through Pierre Bourdieu's triangulation of physical, social, and symbolic space - namely, how environmental goods and bads are distributed unequally based on one's position in a social hierarchy, as well as the symbolic categorizations of society and space alike.
4. Finally, I suggest studying metropolitan metabolisms through a practical approach of mix-and-match that corresponds with the diverse and divergent epistemological-



methodological approaches for seeing and sensing urban-metropolitan environments. These include: remote-sensing the metropolis from outer-space (earth observation, geospatial technologies); the prominent use of geographic information systems (GIS) to represent, research, and manage such environments; the ubiquitous use of sensors in urban spaces and systems to quantify, visualise, and control "smart cities"; and the common seeing (and showing) of everyday environments and embodied metabolisms through the highly personal visual-sensorial experiences of metropolitan residents, as captured in infinite images on social media platforms.

I demonstrate these different dimensions briefly in the context of the Tel Aviv metropolitan region, which for the past few years I have been studying through an interdisciplinary research project. I specifically focus on metabolic processes related to different pollutions (air, water, ground). I also outline a comprehensive research program that bridges additional political-ecological domains, including the "nexus" of energy, water, food, waste, alongside the metabolic dimensions of transportation, mobility, epidemiology (Covid-19) and more, as they work out through the scales of community, city, metropolitan region, extending beyond Israel's official borders into Palestinian territories, the Eastern Mediterranean, and all the way to the planetary scale.

### **The organic matter of a household: A tale of shared digestion**

Marine Legrand (1)

(1) Laboratoire Eau, Environnement, Systèmes Urbains, Ecole des Ponts ParisTech - France

Kitchen gardens, composting, chicken houses, dry toilets: all these activities have been developing in recent years at the domestic level in France, as in other Western countries. They form different pieces of a jigsaw puzzle, an unreachable dream: returning to the land... This trend shows a growing interest for a certain autonomy that concerns both organic waste management and food production. This growing interest concerns more precisely, the relations between these two "vital functions": here we use deliberately a physiological analogy to approach the question of domestic metabolism.

In this article, we propose to explore the possibilities of creating a narrative about territorial metabolism at a minimal scale, in a way an elementary scale: that of a house inhabited by some beings forming a household. This exercise follows a first textual experimentation that took as its seat a megalopolis in the making, that of Greater Paris (Legrand, 2019).

A household: beyond the human group that lives here, this minimal habitat is shared with other living beings. Here, we focus our attention on the dense set of nourishing links between them. What does the organic daily life of a household consist of? The investigation is based on an exercise of thick description, an auto-ethnographic one, carried out throughout the past seasons. It aims at making visible the exchanges of materials at the scale of a household in rural contemporary France, located in Limousin, a few miles from the A20 highway. It tells how this household tries to gain autonomy, to operate its modest return to the land, while constantly coming up against the necessities of a globalized supply. The narrative focuses particularly on the different ways in which the productions of each of the bodies forming the household nourish others: by the materials they leave out and do not consume; by the materials they digest for their own account and then deliver to the appetite of the next link; by, finally, the material they deliberately produce.

Such an exercise of putting into stories the circulations of organic matter from one being to another, seeks to break with the system of oblivion, or more exactly of denial which prevails currently as for the management of domestic waste, in particular organic. A system perpetuated by garbage bins and landfills, incineration, centralized sanitation systems,

and which continues in the development of industrial recycling (Hawkins & Muecke, 2002; Monsaingeon, 2017). As a counterpoint we draw on Donna Haraway's (2016, p.316) assertion in her evocation of Chthulucene: "we are all compost". Indeed we seek to make perceptible the continuity between human bodies and those of other living beings, which come to constitute, in a way, the same flesh: a plural flesh forming itself, by sedimentation, a common history. A history which asks, again and again, to be told.

## **Imagining our Food Waste Flows: Comparing Composting Practices in the Guillotière district in Lyon**

Pauline Grieb (1)

(1) Independent researcher - France

Today in most cities around the World, reducing food waste is perceived as a major issue intrinsically linked to addressing global change. It is also perceived as an opportunity and a possible building block for transitioning to more circular urban economies. In addition to reducing our production of waste, composting (varying in industrial intensity) is perceived as a key solution to beneficially managing this waste flow and Lyon is currently a vibrant stage for experimenting different practices. Historically, the Metropole of Lyon has supported and facilitated the installation of wooden composters across the city, run by advocacy groups, condominium groups and neighborhood associations following two different styles (traditional and worm composting). Today, a pilot project of approximately 150 on-street bio-waste collection stations in the 7th arrondissement aims to respond to the ever-growing unanswered demand of citizens for places to deposit their food waste. This study is based on a comparison between the users of these two different composting methods: collective, grassroots composting installations and city-run industrial collection methods. Inspired by Baptiste Morizot's work, the question at the heart of this project is to understand how individuals relate to their food waste and to their composting practice and whether it inspires in them a sense of connection to the natural world. The research will consist in looking at how urban residents visualize the flows which the organic waste they produce undergoes, how their representations may vary between different types of practices and what this might imply for their sense of agency and engagement in local policymaking. The data for this research will come from qualitative semi-structured interviews with users of the different compost collection and treatment methods in the quarter Guillotière, in the 7th Arrondissement of Lyon, specifically addressing different aspects of their composting behavior, how they started composting or why they compost, as well as a drawing exercise aimed at digging deeper to better understand how they relate to their practice and the flows which they become a part of.

## Session 10. Metabolic politics

13:30-15:00 - Room "Place de l'école"

### **Territorial governance of the metabolism. Stakes at play around the creation and recovery of resources in circular economy strategies in the Hauts-de-France region (north of France)**

Sonia Veyssi re (1)

(1) Center for Research on Innovation and Industrial strategies (Lab ISI) - Universit  du Littoral-C te-d'Opale - ADEME (Agence de l'environnement et de la ma trise de l' nergie) - France

The main purpose of this communication proposal is to provide an answer to a research question raised by Buclet (2015) and Bahers and Giacch  (2018) about the "black box" of territorial metabolism. They highlight that territorial metabolism is often understood in terms of mass flow and input-output analysis without paying attention to social dynamics and the conflicts driven by the stakeholders interacting through the flows. However, we hypothesize that in the context where the circular economy becomes an object and a goal of public policies, the ability to transform the territorial metabolism by making it more circular (i.e. reducing the outputs of waste and extend the lifecycle of material, energy and water flows) puts these stakeholders back at the center of the stage.

This proposal aims to address the circular economy projects as a research objects. By circular economy projects, in line with the literature on territorial development (Gumuchian, Pecqueur, 2007), we mean the cooperation of a set of stakeholders, from various fields (public, private, NGOs, citizens) defining a common goal of resource creation or re-valorization, with a view to contributing to territorial development. Thus, resources are material (i.e. natural resources), but also cultural and immaterial objects (i.e. specific skills) appropriated through a collective productive process (K bir, 2006). This occurs through several steps: first, the "uncovering" (Chertow, 2007) of potential resources ; then, the transformation of these potentials into resources used or re-used in a production process, leading to territorial development. In order to study this process, we qualify the nature of the interaction of the governance and the coordination of the stakeholders. The involved stakeholders co-ordinate into the project through several degrees of organizational and institutional proximity (Rallet, Torre, 1995). The governance refers then to the ability of a third party to organize the coordination and create the proximities through several means (strategy, creation of shared norms and rules, animation).

We infer that this particular framework could help to understand the socio-economical stakes behind metabolic flows, with a spot on resource creation. In circular economy projects, the assessment of flows and hidden stocks of a territory could be related to the uncovering of potential resources. Then, the turning of waste and hidden stocks into resources could be an attempt to re-circularize the metabolism. We will confront the projects carried by the port-city of Dunkirk and the metropolis of Lille, which have the common feature of presenting in-depth analyses of their metabolism, in order to see how the flows of territorial metabolism can support territorial development and what are the main drivers and barriers for joint-resource governance, as a condition of transition toward circular economy.

## **Reclaiming Mine Sites: Reproducing Colonial Exclusions while Erasing Irreparable Damage**

Karine Vanthuyne (1)

(1) University of Ottawa - Canada

Since the 1990s, mining corporations have responded to denunciations of the detrimental environmental impacts of their operations by rebranding themselves as practitioners of "sustainable development". Early versions of the corporate oxymoron "sustainable mining" only included the economic, not the ecological aspects, of sustainable development's definition. More recent claims of "sustainable mining", however, include them both, with corporate discourses surrounding the reclamation of closing mine sites playing a key role in integrating them. As "former assets" that produced marketable value, mine sites are not only to be given back to locals as "properties" to continue to be used productively; they are also to be cleaned up in order to return them "back to nature". In this paper, I will critically examine corporate discourses and practices of reclamation. As we will see, capitalistic valuations of land are creatively reconciled to environmentalist ones through mobilizing the neoliberal language of entrepreneurship, and its associated concepts of self-realization, flexibility, and open-ended potentialities. Drawing on fieldwork conducted in partnership with a Guatemalan Indigenous organization who challenged the terms of the reclamation process of the Marlin Mine, I will highlight the colonial, paternalistic, and capitalist frontiers logics that corporate, entrepreneurship-focused reclamation perspectives remain fundamentally embedded in. From a corporate point of view, the "locals" are essentially backward-looking "Indians" in dire need to be instructed about how to "properly" care for, and exploit the unlimited potential of, their lands -obscuring in this way, if not neutralizing it, the irreparable environmental contamination that the mine is now leaving behind.

## **Metabolism as a strategy for policy makers: The marginalization of the red brick in Khartoum (Sudan) and Cairo (Egypt)**

Corten Pérez Houis (1)

(1) Université Paris 1 Panthéon-Sorbonne - France

In a context of demographic growth and rapid urbanization of Khartoum and Cairo, the Sudanese and Egyptian red brick supply chains are regularly submitted to a strong technical criticism, especially regarding their environmental consequences (air and soil pollution, deforestation, encroachment on agricultural areas...) (Alam, 2006). Nevertheless, in order to be better understood, these speeches and policies are to be replaced in a more global approach, at the scale of the construction sector and of the planning policies in both capitals. In Northern contexts, building materials have been the subject of many metabolic studies, stressing especially on the energy and waste recycling issues (Mongear, 2017; Augiseau, 2019; Bastin, 2019 ; Bastin, Verdeil, 2020). However, in order to deepen the political aspect of these metabolic systems and extend this methodology to other areas, this presentation proposes to associate it with other theoretical frameworks. The socio-technical analysis (Akrich, 1987; Michelot, Ortsman, 2019) and the more general "material turn" in social sciences (Law, Mol, 1995; Whatmore, 2006; Ingold, 2012) can be articulated to metabolic studies.

Resulting from these debates, some researchers have linked building materials sectors with political, urban and environmental aspects (Myers, 1999 ; Fry, 2014 ; Choplin, 2020 ; Achambault, 2021). Following on from these approaches, the presentation would show that building materials are at the intersection of different sets of policies, affecting each step of the supply chain (production, marketing, building).

This proposal is based on several field surveys (February-March 2020 and April 2021 in Khartoum, February-March and May 2021 in Cairo), during which I conducted about 90 informal and semi-directive interviews with actors at all stages of the sector (producers, workers, site managers, architects, engineers, etc.). I will also rely on a complementary coming field survey in both capitals for my PhD's second year (February-June 2022).

This empiric data is providing a comprehensive view of the supply chains and their functioning, but also details about the speeches of different actors organizing and regulating them. Both case studies are different in many ways (raw material used, localization, level of industrialization, etc.), but are subjected to common marginalization processes.

Although the policies regarding construction sector, housing and urban planning might seem disconnected, I would try to show that they are integrated in a more general and comprehensive vision of the city.

For example, the fight of the Egyptian state against informal areas in Cairo, in which the inhabitants are mainly using red bricks, can be associated to the decrees imposing the use of an expensive natural gas instead of cheap fuel oil in the red brick factories, but also to the increasing influence of the army on cement production. In Khartoum, the criticism of environmental pollution caused by the workshops on the banks of the Nile is to be linked with the predation of public and private actors for this coveted areas.

In other terms, policy makers (mainly public actors, but often relying on private or academic analysis and support) are taking advantage of the metabolic and systemic functioning of the building materials sector in order to promote an urban model based on ideals of modernity and industrialized economy, as opposed to "informal" ways of producing and building.

Therefore, the main goal of this oral communication would be to propose a critical eye on these technical and environmental speeches and policies about the building materials metabolism (production, circulation and use) in Khartoum and Cairo. Thus, it would try to deconstruct these representations and link it to the imaginaries and political strategies on which they actually rely.

### **Who governs the urban metabolism? The weight of public and private partnerships in port-hinterland flows**

Annabelle Duval (1)

(1) Université de Nantes - UMR ESO (6590) - France

In line with the Urban Political Ecology school (Cousins and Newell, 2015), the purpose of this research is to explore the following dualities: urban and non-urban interpreted as port and hinterland relations, and public and private practices in the governance of urban metabolism. In his study of the global history of capitalist uneven development, Brenner (2016) defines hinterlands as spaces of the non-city that are continuously operationalised in support of city- building. These spaces provide urban centers with material for various industrial and service uses, which are in turn metabolised into second nature (secondary resources; waste) and eventually impact the surrounding hinterland back (Cronon, 1992). Ports in their being key logistics hubs, linking consumption to supply territories, make worthy cases to study metabolic flows (Bahers et al., 2020). For this research, I identify ports as the urban or "core" space, and territories providing inputs, both immediate and global, as their hinterland(s).

Swyngedouw (2009) discusses the reconfiguration of the act of governing to a stakeholder-based arrangement of governance, in which non-governmental organisations and experts partake or replace traditional state forms (national or local governments), in enacting environmentally sustainable socio-ecological practices. Port regions sustain a high concentration of (international) private parties, gathering influent actors of the economy:

importers, processors, consumers, distributors (Bahers et al., 2020), and have seen in the past two decades the consolidation of the weight of private actors in their territorial management. I argue further attention must be given to public and private partnerships in port administration and urban management overall, to consider the weight of public power in multi-scale flow governance and better understand decision-making mechanisms behind policies that set up urban metabolism. Moving forward, it is crucial to develop a typology of governance practices, and to map the wide range of political actors that practice and intervene in such settings through a Multi Level Governance approach. "Multi-level" refers to the increased interdependence of governments operating at different territorial levels, and "governance" signals the growing interdependence between governments and nongovernmental actors (Bache & Flinders, 2004).

The present proposal fills in at least two blind spots in the urban metabolism literature: the insufficiency of studies that focus on metabolic relationships between cities and hinterlands (Bahers et al., 2020) specifically in the case of port regions, and the lack of engagement with the institutional and political contexts that shape and are shaped by urban material flows - because of its emphasis on the environmental efficiency of the urban system (Guibrune et al., 2016). And intends to contribute to the shy body of work that constitutes a political approach to material flows research that engages with qualitative and place-based analyses.





