

The nutrition/excretion system of urban areas: socioecological regimes and transitions

Nutrition and excretion are fundamental physiological needs for all human beings. Analysis of their materiality, from the cellular scale up to the great planetary-scale biogeochemical cycles, shows that nutrition and excretion form a system. The focus of our study is the sustainability of the nutrition/excretion systems of urban areas, which we have sought to assess by analysing substance flows.

The most relevant of these substances seems to be nitrogen, so by assessing urban nitrogen flows we can characterise the different possible socioecological regimes and their sustainability. We identify a wide diversity of nutrition/excretion systems depending on the places and eras considered. We propose to distinguish them in terms of their circularity, in other words by the rate at which nitrogen from excreta returns to agricultural land.

Using the Paris urban area as our case study, we show that its nutrition/excretion system became increasingly circular in the 19th century, reaching maximum circularity right at the start of the 20th century, before becoming steadily more linear in the course of the 20th century. In these early years of the 21st century, the nutrition/excretion system of the Paris urban area is essentially linear, and still generates significant pollution at both local and global scales. Its environmental footprint is exacerbated by a diet that is very protein rich, mostly animal in origin, and by the non-consumption of a significant proportion of the food produced. All these factors make it unsustainable. These characteristics are found throughout the Western world and raise questions about the possibility of a socioecological transition to sustainable systems of nutrition and excretion.

Since the 1990s, initially in Sweden, followed by Nordic and German-speaking Europe, awareness has been growing of the role of urine. Urine is responsible for three-quarters of urban nitrogenous excretions and is a safe substance: following a period of storage, it can be used as agricultural fertiliser. This new awareness has been followed by extensive experimentation and research on urine source separation. We show that this is currently the only method in the Western world to have accomplished a return to circular systems of nutrition/excretion.

Urine source separation can be done in multiple ways, depending on circumstances, and conditions in France are favourable to its development, despite the sociotechnical lock-in to mixed sewage management systems. In a forward-looking scenario, we therefore explore the possibility that the Paris urban area could return to, and within a few decades even surpass, the heights of circularity that it attained during the Belle Époque. In that case, alongside a socioecological transition in the other systems – water, energy, transport – the people of this territory could establish a sustainable regime for their system of nutrition/excretion.

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