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Multi-method assessment of household waste management in Geneva regarding sorting and recycling

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ABSTRACT

Policymakers apply various policy instruments to meet the objective of resource conservation in the framework of waste policy. The cantonal waste policy of Geneva implements this objective by focussing on sorting of household waste for recycling. Cantonal and municipal authorities use incentive instruments and a mix of infrastructural and persuasive instruments to develop waste sorting for households. However, they have so far failed to reach the objective of a recovery rate of 50% for household waste in Geneva. This study assesses recycling and sorting practices for household waste in Geneva as basis for the formulation of a new improved strategy. This interdisciplinary assessment combines a policy evaluation of the household waste management system over the period 2002–2013 with a situation analysis of the current household waste management practices through a SWOT analysis by using triangulation as the method of data collection. The results of policy evaluation show the effectiveness of incentive instruments (e.g., incineration tax) in encouraging the Genevan municipalities to implement and improve sorting infrastructures and services. Moreover, they demonstrate that a combination of infrastructural (e.g., collection points) and persuasive (e.g., awareness raising campaigns) instruments is effective for enhancing the Genevan household waste sorting practices under certain conditions. The situation analysis identifies the significant internal and external factors that have a positive or a negative influence on household waste sorting and recycling in Geneva. The outputs of the policy evaluation and situation analysis serve to formulate a strategy that is adapted to local specificities. This strategy highlights the necessity for policymakers to avoid unnecessary duplication of the sorting system among the stakeholders and the importance of national authorities for creating framework conditions to encourage the implementation of recycling sectors.

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1. Introduction

Resource conservation constitutes one of the fundamental purposes of waste management (WM) with the protection of mankind and the environment and aftercare-free waste management (Baccini and Brunner, 2012). It thus constitutes the common objective of waste policies worldwide. As a public policy, waste policy involves the implementation of policy instruments, i.e., concrete measures and tools to achieve overarching goals introduced by a governing body involving the use of state resources (Howlett and Rayner, 2007), or so-called policy resources (Knoepfel et al., 2011). The implementation and utilisation of these state/policy resources (called hereafter public resources) exert an influence on the effects of a policy (Knoepfel et al., 2011). According to the typology of

Knoepfel et al. (2011) and Larrue (2000), four types of environmental policy instruments are applied to achieve a defined objective (e.g., waste recycling): (1) regulatory instruments, i.e., measures of obligation, ban or allocation of various rights for a target group (e.g., landfill ban); (2) incentive instruments, i.e., measures that expose a target group to a “price signal” through a positive or a negative financial payment (e.g., disposal tax); (3) persuasive instruments, i.e., measures based on an information strategy to convince a target group the stakeholders (e.g., awareness raising campaigns for households) and (4) infrastructural instruments, i.e. tangible interventions of a public authority through the direct supply of services (and goods) to a target group (e.g., composting plant operation). Here, a target group constitutes a homogenous group of actors whose the policy is intended to influence their behaviour and/or their condition state in some way. Policymakers can employ a policy instrument alone or in the framework of an instrument mix. Thus, van Beukering et al. (2014) underline the importance of instrument mix design to improve the attractiveness of recycling.

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Since 2002, the waste policy of the Swiss canton of Geneva (hereafter Geneva) has expressed this willingness for resource conservation through the following objective: “to increase significantly the proportion of waste recycling and encourage the population (households and enterprises) to sort” (RCG, 2003a, p. 6). The cantonal authorities measure the achievement of the objectives of waste sorting and recycling through a common indicator: the recovery rate, i.e., waste fraction in% that (1) is collected separately and/or sorted by a sorting facility, and (2) is treated by a material recovery operation (e.g., recycling or organic recovery) or an energy recovery operation. The mixed waste and bulky waste directly incinerated, i.e., without any sorting treatment before their incineration, for its energy recovery are excluded from the recovery rate. The target of current and previous waste management plans (RCG, 2015a, 2009) is to reach a recovery rate of 50%. This target was defined in a context where the Genevan municipal and cantonal authorities have a high operational capacity in waste sorting for household waste but a low operational capacity in waste recycling (RCG, 2003a) except for organic waste. Therefore, they focus their activities mainly on waste sorting objective. Households constitute the main target group which is targeted through awareness and voluntary approaches rather than directives and law enforcement tools by the Genevan authorities (RCG, 2003a). In addition, the Genevan authorities opted against the introduction of a bag tax for households (RCG, 2015a, 2003a, 1998) which constitutes a commonly applied mechanism in other Swiss cantons and municipalities (Hügi et al., 2008; Swiss Confederation, 2014a, 2002). Federal and cantonal authorities indirectly target Genevan households through the Genevan municipalities which hence constitute an intermediate target group to encourage Genevan households to sort. To a lesser extent, the retail sector constitutes another intermediate target group which is addressed by the federal authorities in order to increase waste sorting by Genevan households.

The data from the waste inventories show an increase in the total and per capita quantities of sorted waste by Genevan households (RCG, 2015b) since 2002. Moreover, a study on the composition of the household waste shows a decrease of almost all recoverable waste fractions (e.g., paper, glass, garden waste, iron and aluminium) in the Genevan bins between 2002 and 2011 (RCG, 2012; Villegas, 2013), resulting in an increase of the recovery rate of Genevan households since 2002. However, the recovery rate has stagnated at around 45% since 2009 (RCG, 2015b, 2014), representing a failure to reach the target of 50%. The achievement of this target is important for the Genevan authorities because it would avoid that the federal authorities impose on Geneva the implementation of a garbage tax, which would go against its will (RCG, 2015a). In addition, the recovery rate must continue to increase to 60% until 2025 due to the replacement of the Genevan incineration plant by a new plant with smaller treatment capacity (RCG, 2015a). There is therefore a need to evaluate the household WM practices in Geneva and identify avenues for improvement with regard to waste sorting and recycling.

The aim of this case study is to assess the household WM practices implemented by the cantonal and municipal authorities and formulate a new strategy for resource conservation in regard to the cantonal objective of recycling and sorting with a special focus on waste sorting. The novelty of this interdisciplinary research is that it combines policy evaluation with a situation analysis leading to the development of strategy formulation for policymakers and decision makers. Therefore, the first objective of the study is to evaluate the quantitative impacts of the policy instruments used for the sorting and recycling of household waste through an analysis of the state of the household WM system described by the Material Flow Analysis (MFA) method over the period 2002–2013. The second objective is to obtain a qualitative understanding of the capabilities and limitations of the household WM system in terms of waste sorting and

recycling through SWOT analysis. The outputs of the policy evaluation and situational analysis serve to fulfil the third objective of this study, i.e. to formulate a new strategy on waste sorting and recycling in regard to the specificities of Geneva. This paper is divided as follows. Section 2 describes the study area and the methods of policy evaluation, situation analysis and data collection. Section 3 presents the results of the policy evaluation (first objective) and the situation analysis (second objective). It also provides a strategy formulation aimed at improving waste sorting and recycling of Genevan household waste (third objective) including the implications of these improvements in terms of resources mobilised and desired impacts on the household WM system. The conclusions in Section 4 identify the key points for policymakers in the utilisation of policy instruments in the framework of resource conservation and focus on the scope of the adopted approaches used in this study.

2. Case study description and methods

2.1. Geographic and economic context

Geneva is in the westernmost canton of Switzerland landlocked by French municipalities and at the centre of the France-Vaud-Geneva conurbation (Grand Genève, 2012; Surchat Vial et al., 2010). With a population of over 480,000 inhabitants, Geneva includes 45 municipalities whose 12 urban municipalities cover 80% of the population (RCG, 2015c, 2010). Since the last decade, its population has been characterised by a high turnover and continuous progression due to its dynamic economy mainly based on the tertiary sector (RCG, 2015a, 2015b, 2015d). Geneva constitutes one of the wealthiest regions in the world (Parilla et al., 2015).

2.2. Methods

2.2.1. Policy evaluation

With regard to the sorting and recycling objectives targeting households, the policy evaluation aims to measure the extent of the impacts of the different policy instruments used by the cantonal and municipal authorities on different target groups over the period 2002–2013. It covers the major waste streams generated by Genevan households as given in Table A.1 in Appendix A (see Supplementary material for all the references to the Appendices) and a non-quantifiable fraction of mixed waste from small enterprises collected by the Genevan municipalities. Thus, the evaluation method focuses on a joint analysis of the development of the waste movements in the WM system at different points in time and the evolution of the resources mobilised by public authorities in the framework of the policy instruments aiming at waste sorting and recycling. This method is realised in three steps as illustrated by Fig. 1.

The first step aims to identify the different types of private and public resources, i.e., infrastructural, financial, cognitive, organisational and legal resources (Knoepfel et al., 2011), used in the framework of household WM in Geneva. These resources and their combination enable public and private actors to achieve an activity constituting the elements on which policy analysis must focus in accordance with Klok (1995). The public resources are mobilised by public actors through policy instruments employed by the Genevan waste policy as illustrated in Fig. 1, which can be used to regulate private resources. The second step aims to define the material system (Baccini and Brunner, 2012) of the household WM, hereinafter named household WM system, in Geneva. This system is modelled from the results of the first step and waste statistics. The household WM system provides the state of the household WM at the given time, where the public and private resources represent the tangible and intangible elements contained in the structure

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