

Policy Analysis for Better Protection of Receiving Waters during Wet Weather

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Abstract: Although CSOs are expensive infrastructures, which are important to reduce pollution from urban areas during wet weather, they are often not operated effectively. Despite of technical difficulties, major problems in CSO monitoring and performance assessment are caused by non-technical bottlenecks. Through a policy analysis we identified organisational and political problems as the biggest obstacles to the effective operation of CSOs. In addition, we investigated effective measures or incentives to overcome organisational and political obstacles. Our results suggest that a surprisingly high 84% of the CSOs operated by Swiss wastewater associations are monitored. In most cases the information is used to improve operation, but not for better planning or for regulatory performance assessment. The most desirable instrument seem to be legislative performance targets, which is preferred by both wastewater associations and cantonal stakeholders. From a political point of view, the cantonal authorities also consider a transfer of competences from the municipalities to the wastewater associations to be effective, i.e. wastewater associations should operate CSOs instead of municipalities. In contrast, Swiss associations prefer financial incentives, such as a one-off subsidy for the installation of CSO monitoring equipment. Before implementing certain instruments, and in particular regulatory instruments, we highly recommend to assess their impact on overall policy processes and individual stakeholders. In the long term, only the implementation of a carefully balanced, uniform strategy can overcome organizational and political barriers and thus can lead to effective success in water protection.

Keywords: Receiving water protection during wet weather, monitoring, digitization, policy analysis

1. IMPROVEMENTS IN RECEIVING WATER PROTECTION NEED MORE THAN JUST TECHNICAL SOLUTIONS

Wastewater treatment plants (WWTP) are built in such a way that they treat all wastewater during dry weather. In contrast, during wet weather, rainfall runoff by far exceeds the hydraulic capacity of the WWTP and most of it is discharged untreated into rivers and lakes. To better protect receiving waters, combined sewer overflow tanks (CSOs) temporarily store runoff from small and medium-sized rain events. Although CSOs are rather expensive infrastructures, they are often not operated in an optimal way (Dittmer et al. 2015; Hoppe et al. 2016). The non-optimal operation concerns several elements. Firstly, operational data on the storage and overflow behaviour of the systems are often missing. Secondly, where measurement data are available, there is often a lack of understanding of how the data should be handled. For example, they are incorrectly logged, only stored in aggregated form, e.g. daily mean values, or only evaluated for operational aspects, e.g. triggering alarms in the event of malfunctions. Thirdly, for an effective implementation of water protection requirements, not only the operator should know about alarms, but data should also i) be reported periodically to regulators and ii) be processed and archived for future planning purpose. Finally, organisational processes with respect to data sharing and beyond are often not clearly regulated. The most common example is that WWTPs and CSOs are operated by different entities, which do not coordinate their efforts and thus do not operate the entire wastewater system in an optimal way (Rieckermann, Gruber, and Hoppe 2017).



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While all four problems have more or less technical components and can therefore possibly be addressed with technical solutions, they all also have an organisational and political dimension. First, several hurdles on the organizational, legal and personal level can explain why measurement data at the level of WWTPs are missing. Second, different instruments could improve the understanding of the different stakeholders regarding the handling of CSO monitoring data, so that they can benefit from the full value of the data. Third, how exactly organisational processes related to measurement, data treatment and data sharing can be improved remains unclear. In this paper, we identify i) the biggest obstacles to the effective operation of CSOs and ii) investigate effective measures or incentives to overcome organisational and political obstacles.

2. POLICY ANALYSES SHOULD SHOW WHERE THE BIGGEST ORGANISATIONAL AND POLITICAL OBSTACLES ARE

We have applied methodological approaches from the field of public policy analysis, such as surveys, descriptive and concluding statistical methods, and related theories on policy instruments, actors' motivations, and policy processes (Fischer and Maggetti 2017; Fischer and Sciarini 2015). Specifically, we carried out a carefully designed survey and conducted expert interviews to elicit i) the current state of monitoring CSOs in Switzerland, ii) the handling of measurement data and iii) the opinion of cantonal authorities, which regulate receiving water protection during wet weather.

To assess the current state of monitoring CSOs, we first identified all actors in urban drainage practice and categorised them with regard to their functions and competencies. From this we derived wastewater associations as an important group of operators of CSOs in Switzerland and in addition the cantonal authorities as important regulators. In a second step, we designed an online survey for the wastewater associations, in close cooperation with the Swiss Water Association (VSA), where variables assessing technical, political-organizational and individual factors were collected. In a third step, complementary face-to-face interviews were carried out with 23 (out of 26) cantonal authorities. For this purpose, a separate questionnaire was designed based on the online survey. In this way, the same variables can be examined from different stakeholder perspectives.

3. ALTHOUGH BOTH ACTORS WOULD LIKE TO SET SPECIFIC TARGETS, REGULATORY AUTHORITIES ARE CRITICAL OF PERFORMANCE INDICATORS

With 118 evaluable responses from 162 known wastewater associations in Switzerland, the online survey achieved a very good response rate of 73%. As space is restricted, only selected results can be presented in this abstract.

The current state of monitoring CSOs in Switzerland: 98 of 118 wastewater associations in Switzerland operate at least one CSO. In total, the online survey covers 879 CSOs in Switzerland, which means that a surprising 84% of these CSOs are monitored. Furthermore, it is shown that approx. 30% of the wastewater associations do not store operational data with their original high temporal resolution, e.g. minutes, but in aggregated form as hourly or daily average values, which practically destroys the information and no longer corresponds to the state of the art. In addition, 47% do not, or only irregularly, evaluate this data, and 61% do not transfer them to engineering consultants or report performance to a regulator. Regarding the motivation to install measurement technology, we found that 76 % use data primarily for operational purposes (Fig. 1, green bars), less to improve planning (yellow) and least for performance assessment (red).

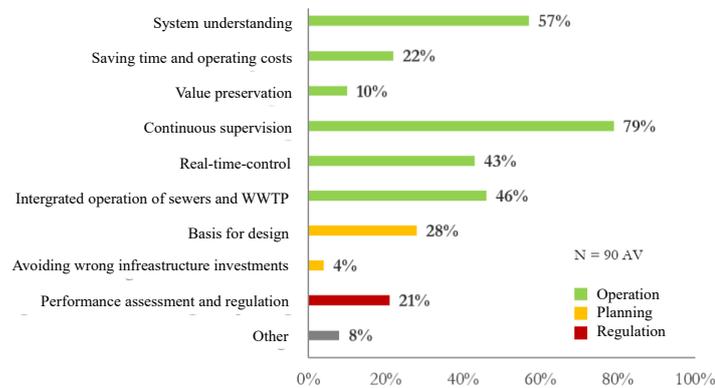


Figure 1. Motivation of wastewater associations (N=90) in Switzerland to use measurement technology in mixed water treatment plants. In order to better exploit the value of the measurement data, they should not only be used for operational optimisation (green), but also as planning bases (yellow) or for success control (red).

Effective measures or incentives to overcome organisational and political obstacles:

A desirable instrument which should aid the use of data in better receiving water protection during wet weather (Table 1) seems to be legislative targets (rank 1). Interestingly, these are preferred by both wastewater associations (AV) and cantonal stakeholders (K). In contrast, the private sector, which could provide specifically-tailored products and services, does not seem to play a large role (rank 9) in Switzerland. From a political point of view, the cantonal authorities also consider a transfer of competences from municipalities to wastewater associations to be effective (rank 2). Specifically, regulators believe that the use of monitoring data only improves if wastewater associations take over the operation of CSOs from the municipal owners. In contrast, associations prefer financial incentives, such as a one-off subsidy for the installation of CSO monitoring equipment. Cantonal authorities

Table 1. Instrument ranking for wastewater associations (AV) and cantonal agencies (K), incl. specific addressee for the implementation of the respective instrument. While targets are rated very positively by both actors, it is surprising that performance indicators are not highly rated by regulators.

Suggested instrument	Rank (AV)	Rank (K)	Who (AV)	Who (K)
Guideline	2	4	B/ K	B
Regulatory requirements (monitoring data)	1	1	B/ K	B
Performance indicators	5	9	VSA	B
Subsidies (Monitoring technology)	3	6	B	K
Subsidies (Data analysis)	5	7	B	K
Better products	9	9		
Tailored services	7	5		
(Further) education	8	3		
Events	7	6	VSA	
Increased regulatory activities	6	8		
Transfer of competences	4	2		
Own suggestions	10			

AV: Wastewater associations, K: Cantonal authorities, B: Federal authorities, VSA: Swiss wastewater association



consider further education and training as very relevant, which is less the case for the associations. It is astonishing that wastewater associations take a rather positive view of performance indicators for a performance review of the CSOs (rank 5), while these take the last place in the cantonal ranking.

Our regression analyses show that the older a wastewater association is, the more likely it is that measurement data from all CSOs will be collected in a SCADA system and archived in a database. This also applies to larger wastewater associations with many municipalities and the presence of a managing director. The more recently a system-wide general drainage plan has been developed and the more recently it was updated, the more likely CSO data will be evaluated on a regular basis, e.g. several times per year or even monthly. This is also the case with an increasing integrated view of the entire wastewater system, i.e. jointly operating sewers and WWTP.

4. CONCLUSIONS

Our research suggests that both wastewater associations and cantonal authorities in Switzerland prefer regulatory instruments to promote the use of monitoring data to better protect receiving waters from urban wet-weather impacts. The first priority for both is the introduction of targets, e.g. number of CSO spills per year, which must be met by the operators. If targets are set, this requires firstly that operators collect measurement data, secondly that these are forwarded to the regulator and thirdly that they are used in performance assessment. Consequently, operators and cantonal authorities are equally involved in the introduction of targets. It is surprising, to say the least, that the associations themselves are in favor of intervention from cantonal or federal government. It is therefore assumed that the wastewater associations lack a trend-setting guideline. A transfer of competences from the municipalities to the wastewater associations is also generally preferred.

A major organizational obstacle lies in the division of the operation of wastewater treatment plants, CSOs and sewerage systems among three different operators which are municipalities, wastewater associations and private individuals. This split of competencies also prevents the integrated operation of sewers and WWTPs (and receiving waters). In our view, before designing certain instruments, and regulatory instruments in particular, we highly recommend to assess their impact on overall policy processes and individual stakeholders.

In the long term, success in water protection can only be achieved if a carefully balanced, uniform and common strategy is developed and implemented. Specifically, there is not much sense in reporting the functioning of the CSOs to regulatory authorities if it is not precisely defined how they are used to monitor success and what happens if performance is unsatisfactory.

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