



Source-Separating Sanitation Systems – the Importance of Policies, People and Organizations



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INTRODUCTION

From a resource recovery and sustainability perspective, there is room for improvements of conventional wastewater management and treatment. In the solid waste sector, demands to increase recycling have led to greater emphasis on source control, with collection of separate waste fractions on household or neighbourhood levels. A similar logic applied to the wastewater sector would suggest that a *higher level of resource recovery, recycling and reuse could be obtained through source separation of different wastewater flowstreams*, Figure 1. In fact, it has been shown that source control is an efficient strategy to decrease complexity and resource intensity within urban water management [1].

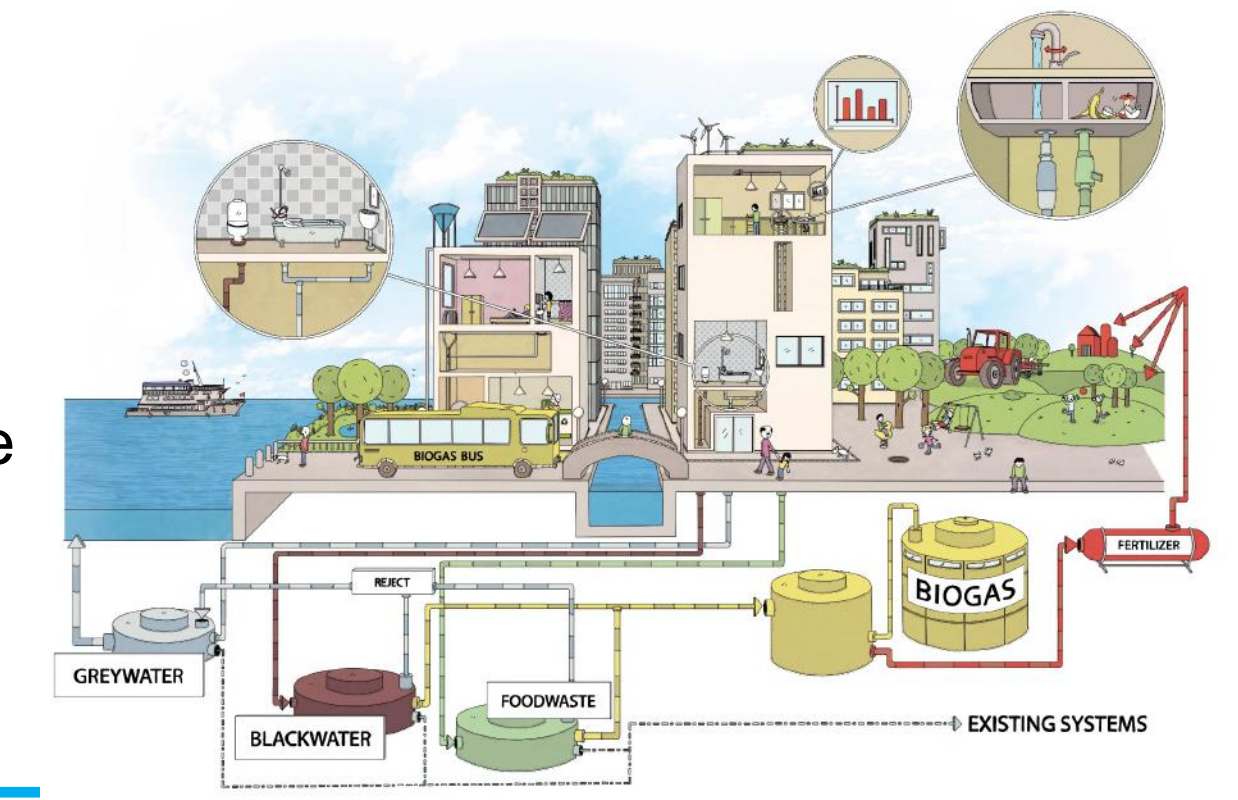


Figure 1 – Visualization of the source-separation wastewater system in Helsingborg, Sweden (source: City of Helsingborg).

H+ in Helsingborg and Stockholm Royal Seaport (SRS) are two urban development projects in Sweden with high sustainability profiles. Both projects have a politically ratified sustainability policy including goals on sustainable wastewater management. In their respective pre-feasibility studies, both projects independently arrived at similar results; source separation of flowstreams provides the highest environmental benefits. However, the planning and implementation processes in Stockholm and Helsingborg have been different in nature. These differences are the focus of this paper.

METHODS

- Assessment of Cooperation between the utility and city actors**
 - Data collection was based on case study methodology [2].
 - Semi-structured interviews were made with actors within the cities of Stockholm and Helsingborg and their respective water utilities. The analysis of the case studies was made using an adapted transition framework based on earlier work by McConville et al. [3] and Storbjörk and Söderberg [4]. The adapted framework includes eight categories considered crucial for transition within the wastewater sector.
- Trickle-down of political decisions into implementation**
 - Decisions regarding source-separating wastewater systems were tracked from formulations in municipal policies, municipal budgets and annual reports from both utilities and city administrations for both projects using the software NVivo. The time span analysed depended on when the original political decision was taken to go for source-separating systems in the respective area (2010 in SRS and 2013 in H+).
- Cost shifts between stakeholders**
 - Costs and revenues shifts in relation to heat, biogas and nutrients were analysed qualitatively in relation to developers, utilities and the society.

RESULTS

- Assessment of Cooperation between the utility and city actors**
 - A documentation of the main actor driving the process for source separation within each development area and where the implementation of source separation stands as of June 2018 is shown in Figures 2 and 3 below. *As can be seen construction has started in H+ whereas in SRS there is still no decision taken to implement source separating wastewater systems within the development area.*
 - An explanation to the difference shown in Figures 2 and 3 can be seen in Figure 4. The Helsingborg city administration and the corresponding water utility are scoring green on the defined criteria, whereas in Stockholm there is a lack of a common vision between the two main stakeholders: the city administration and the water utility. *This lack of a common vision is probably the root cause for the low openness to experimentation and resource availability for source separating wastewater systems within the water utility, and affects the communication between the two stakeholders.*
- Trickle-down of political decisions into implementation**
 - Both H+ and SRS have supportive enabling environment both in national and municipal terms. Both cities have politically ratified policies supporting the implementation of source separating wastewater systems in their respective development area. *In Helsingborg the policy goals in relation to wastewater have influenced the city's actions and trickled down to the utility level. In Stockholm the policy goals are not visible in the same way neither on the city, nor on the utility levels*, Figure 5.
- Cost shifts between stakeholders**
 - The qualitative assessment of costs and revenues/savings for implementation of source-separating systems indicates increased costs both on developer and utility level, but also increased revenues/savings possibilities for both actors, Figure 6. Moreover, Figure 6 shows that the systems provide societal gains, which are not accounted for in a business model for a utility or a developer. With a sustainable development perspective, where optimization of societal gains are desired, it is difficult to see how "simple" business models per each stakeholder can be used.

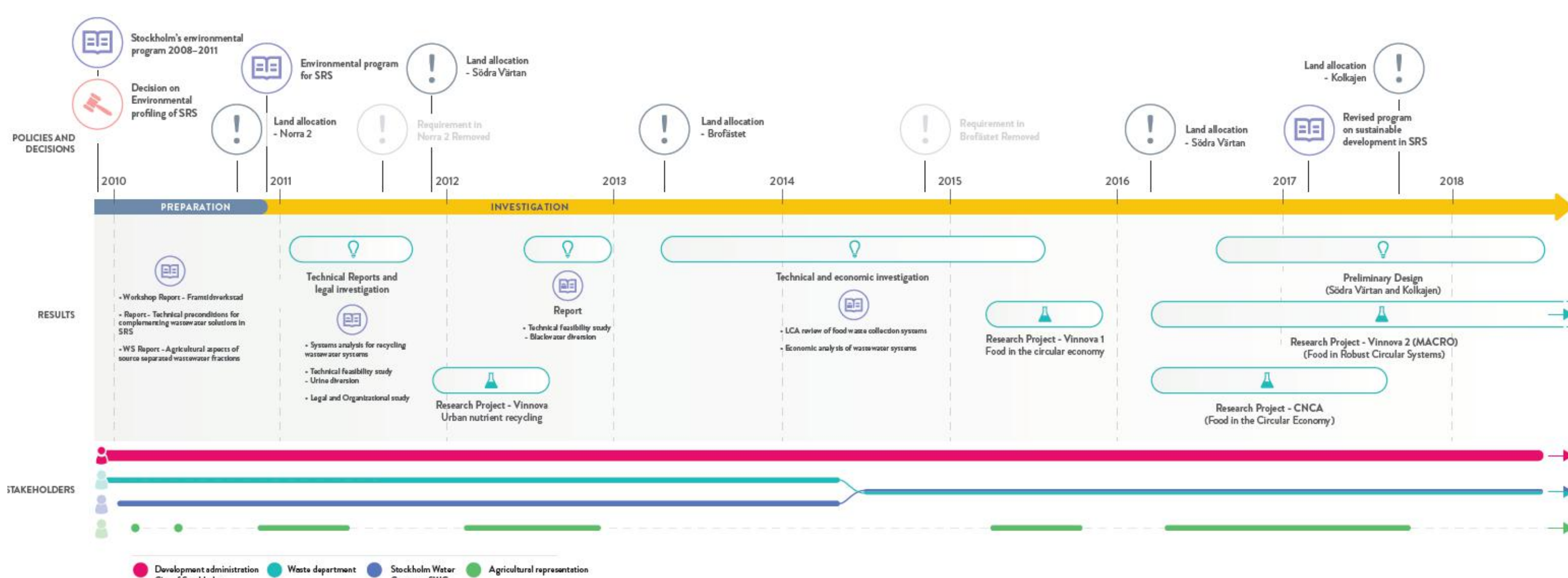


Figure 2 – The implementation process for source-separated wastewater systems in Stockholm Royal Seaport. Note that the investigation process has been ongoing since 2011, during which substantial knowledge generation has taken place. The thickness of the stakeholder lines indicates the strength of their involvement.

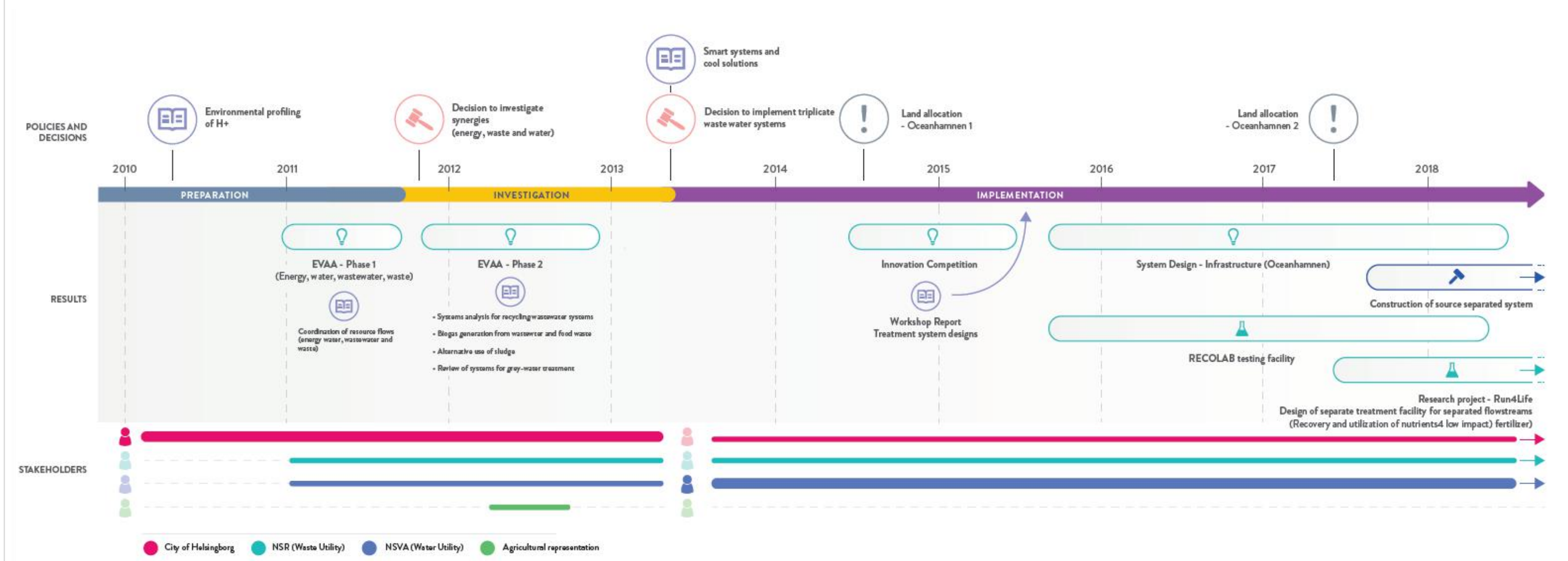


Figure 3 – The implementation process in H+, Helsingborg. Note that the investigation process was short and an implementation decision was taken before having solved all technical issues. Knowledge generation has taken place during the implementation phase. The thickness of the stakeholder lines indicates the strength of their involvement.

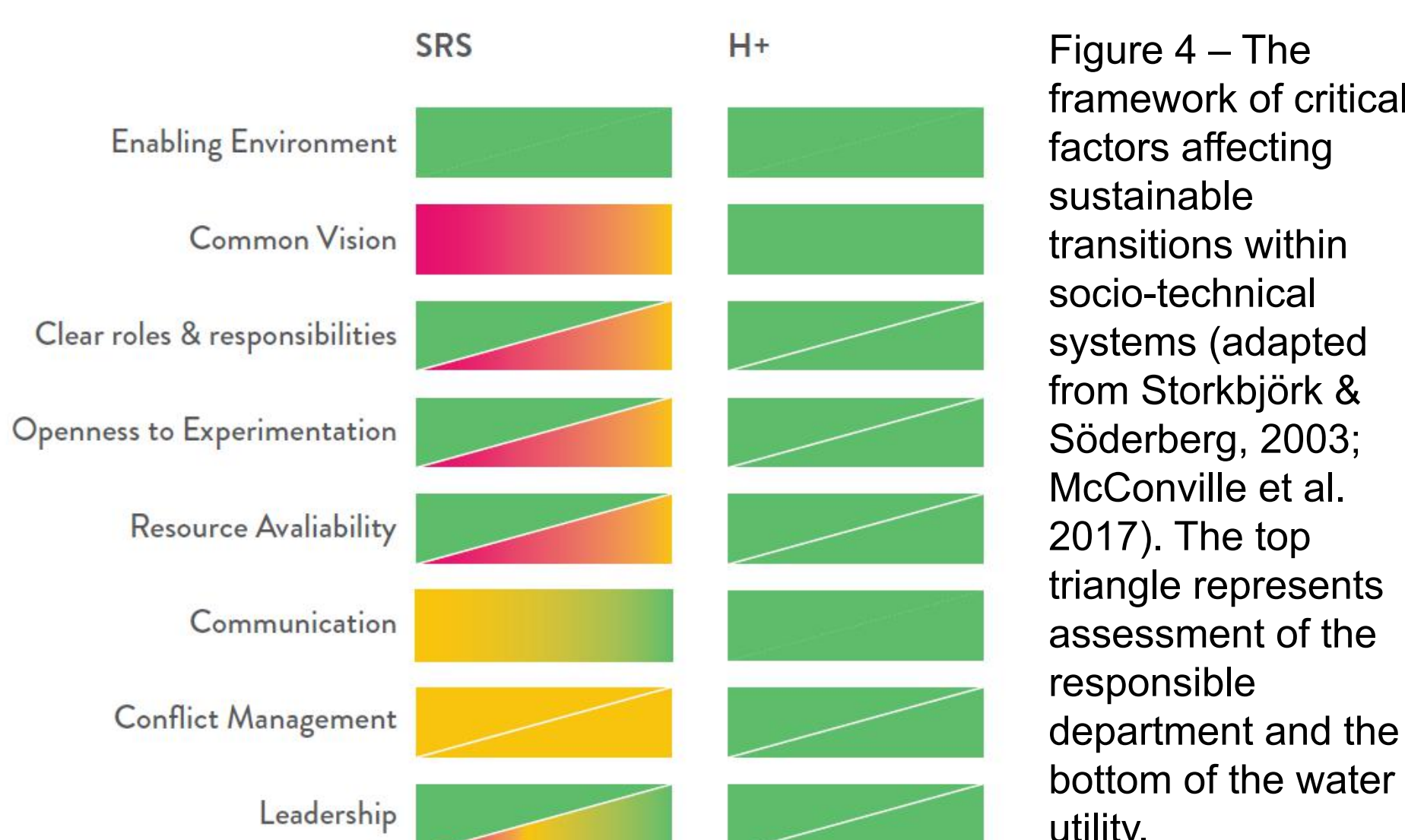


Figure 4 – The framework of critical factors affecting sustainable transitions within socio-technical systems (adapted from Storbjörk & Söderberg, 2003; McConville et al. 2017). The top triangle represents assessment of the responsible department and the bottom of the water utility.

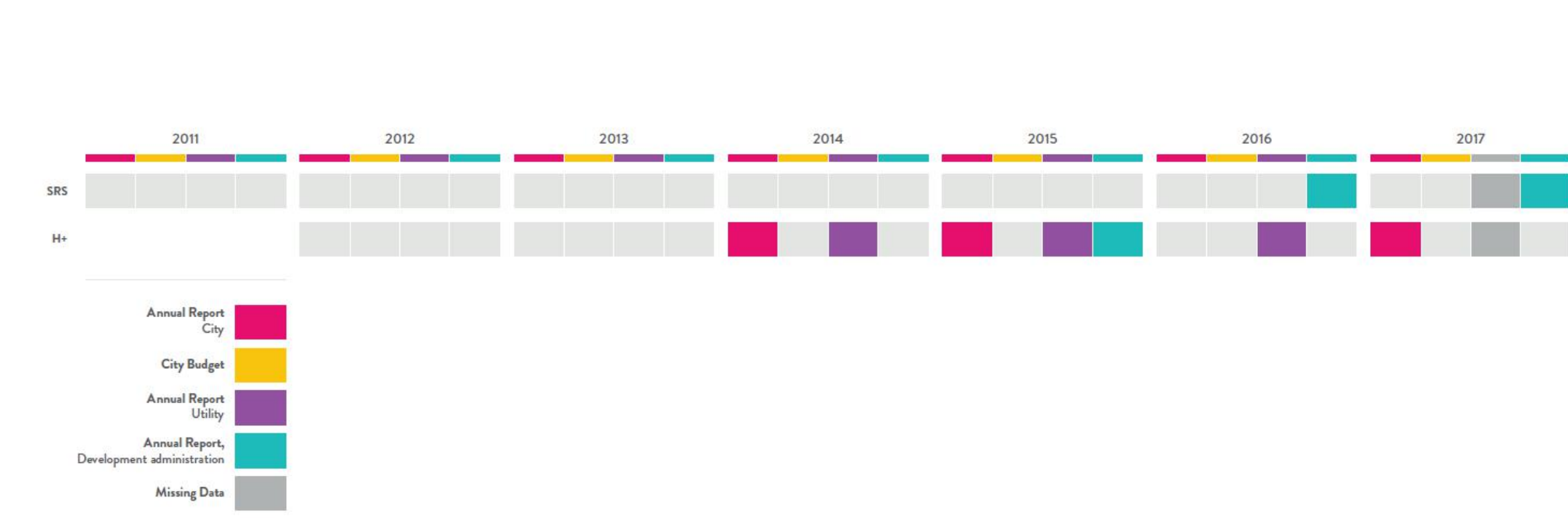


Figure 5 – Trickle-down of political decisions reflected in budgets and annual reports for the cities and its utilities.

	Developers	Utility(-ies)	Society
Biogas	Required additional investment	Separate pipe (food waste) + kitchen waste grinder	Separate pipe (food waste) + kitchen waste grinder
	Revenue / savings	Revenue from increased biogas production. No need for separate organic waste collection system	Decreased investments in the area. Increased renewable energy production
Heat	Required additional investment	Separate pipe (greywater) + heat exchanger	As before
	Revenue / savings	Decreased costs for heating	As before
Nutrients	Required additional investment	Separate pipe (blackwater)	Separate pipe + separate treatment processes
	Revenue / savings	Decreased costs for treatment. Revenue from fertilizers	Decreased discharge of nutrients to the region. Requirement of chemical fertilizers

Figure 6 – A qualitative cost and revenue/savings assessment for different stakeholders.

CONCLUSIONS

- Policies, people and organizations are in place in both cities, yet with different on-the-ground results for source-separating wastewater systems:
 - H+ has moved through the planning phase to implementation of source-separating wastewater systems within a short time-frame. In SRS, after 8 years of investigations there is still no actual implementation decision taken within the water utility.
 - Possible explanatory reason to these differences is that critical factors, such as common vision of the project, resource allocation and openness to experimentation are in place, both at the city administration and the water utility in Helsingborg.
 - In Helsingborg, where source-separated wastewater systems is being implemented it is possible, through annual reports, to trace that the policy decision has trickled down, to the city administration and the utility. In Stockholm, the policy decision cannot be traced in the same way.
- "Simple" business models per stakeholder, e.g. developer or utility, fail to capture societal gains possible with source-separating systems.

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