

Electronic Supplementary Material to “Integrating sustainable stormwater management in urban planning: Ways forward towards institutional change and collaborative action”

Table S1. Overview of perceived challenges for and needs to improve sustainable stormwater planning and management in Sweden, and proposed ways forward through institutional developments

Theme	Experienced challenges	Articulated needed developments	Ways forward (institutional developments)
Making space for water	<ul style="list-style-type: none"> - Stormwater is not an issue firmly established on political agendas. - Physical planning does not consider stormwater from a landscape/ecosystem perspective. - Stormwater management perspectives are integrated too late in the planning process. 	<ul style="list-style-type: none"> - Planning must be based on investigations of watershed scale preconditions. - Risks and needs related to stormwater must be integrated when taking land use decisions. - Planning of stormwater management must be made for larger areas than what is covered by detail plans - Co-benefits of sustainable stormwater management must be addressed. 	<ul style="list-style-type: none"> - Assessments of stormwater risks, needs, and benefits at a watershed level must be made a mandatory step and an obligatory starting point for comprehensive planning. - Planning of stormwater should target areas in the urban landscape rather than areas within detail plans. - The delineation of detail plans should include reservation of space for nature-based solutions aimed at managing stormwater above ground, especially related to future needs.
Designing an organization for sustainable stormwater planning	<ul style="list-style-type: none"> - The sectoral division in municipalities cause silo structures which are not suitable for sustainable stormwater planning. - The storm water issue has no clear affiliation – no division has a mandate to take decisions that affect others. - The sector specific budgets obstruct collaboration. - A culture of referral rather than co-development of plans cause distrust. - Important stakeholders are involved too late in planning processes. 	<ul style="list-style-type: none"> - Stormwater issues and projects require coordination and a clear leadership - The responsibility for different aspects of stormwater planning and management must be clarified. - More actors need to be involved earlier on in planning processes. - Water utilities need to include and improve in-house competence on planning. 	<ul style="list-style-type: none"> - Coordination and leadership of stormwater management should be established at a central municipal management office. - Resources for urban development should be pooled to enable funding for cross-sectoral stormwater projects and measures. - Plans regarding drinking water, sewage, and stormwater should be integrated to avoid misaligned strategic goals.
Ensuring continuation and implementation of stormwater ambitions	<ul style="list-style-type: none"> - Gap between the intention of plans and implemented realities. - Continuation between comprehensive plans, detail plans and building permits is lacking. - Planners see a need for more competence on sustainable stormwater management among implementing actors. - Actors closer to implementation see a need 	<ul style="list-style-type: none"> - More collaboration and co-creation between stakeholders at different levels of the planning process. - Better control if plan intentions are followed in the construction phase and land use over time 	<ul style="list-style-type: none"> - Networks for vertical interaction that facilitate mutual learning and dialogue should be put in place. - Actors from different stages in the vertical planning process should be physically placed in the same building to allow for informal interaction, dialogue which build trustful relations. - The original plan author should follow the process from plan formulation to implementation to ensure persistence and continuity of stormwater plans.

	<p>for an improved competence base among centrally positioned planners.</p> <ul style="list-style-type: none">- Property developers and permit officials are not involved in the design of stormwater plans.- Lack of control regarding whether the plan instructions regarding stormwater are followed in the construction phase and over time		<ul style="list-style-type: none">- Routines for monitoring and evaluation must be institutionalized to follow up the intention of plans. This should come with a mandate and resources for those in charge.- to construction to secure that intentions of plans are fulfilled.
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