

A diagnostic tool for supporting policymaking and stimulating reflexivity on urban resilience

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1 Background

Urban resilience has become a popular notion among urban policymakers and scientists, as a way to deal with the many complex issues that cities face (Wardekker et al., 2010; Leichenko, 2011; Bulkeley & Tuts, 2013; Davoudi et al., 2013; Eraydin & Taşan-Kok, 2013; Ilgen et al., 2019). It has been taken up by individual cities, networks including 100ResilientCities and ICLEI, and international frameworks like the Sustainable Development Goals, Sendai Framework, EU Urban Agenda, UNFCCC Paris Agreement, and UN Habitat III New Urban Agenda.

While it has positive connotations and resonates with local urban agendas, it is not always clear what it means and what factors contribute to resilience. For practitioners, the flexibility of the resilience concept may help its function as a ‘boundary object’, connecting the many fields, sectors and stakeholders involved (Brand & Jax, 2007). However, it can also hinder practice, through lack of clarity and footholds to make resilience manageable and implement it in local plans. People’s views on what resilience means can differ widely, and this strongly impacts who participates in decision-making, how resilience is implemented, and what knowledge is used to facilitate this (Wardekker, in press). Consequently, many choices are made in resilience-planning but these are often left implicit.

We describe a tool that tackles these issues by: (1) distilling principles that provide a comprehensive picture of the different pathways that resilience-building could take, and (2) making explicit and facilitating reflection on the choices embedded in resilience-planning. The tool supports policymakers in making deliberate, transparent and goal-oriented choices on urban resilience.

2 Resilience Diagnostic Tool

The Resilience Diagnostic Tool is step-wise, process-based tool with guiding questions. It can be applied in a workshop setting, with a team of analysts, e.g. local specialists, consultants, or researchers. We developed the elements within these steps based on resilience assessment tools (e.g. Resilience Alliance, 2010; Wardekker et al., 2016) and governance/planning support tools (e.g. Mees et al., 2014; Runhaar et al., 2016). We arrived at four steps, each with guiding questions. See Fig. 1.

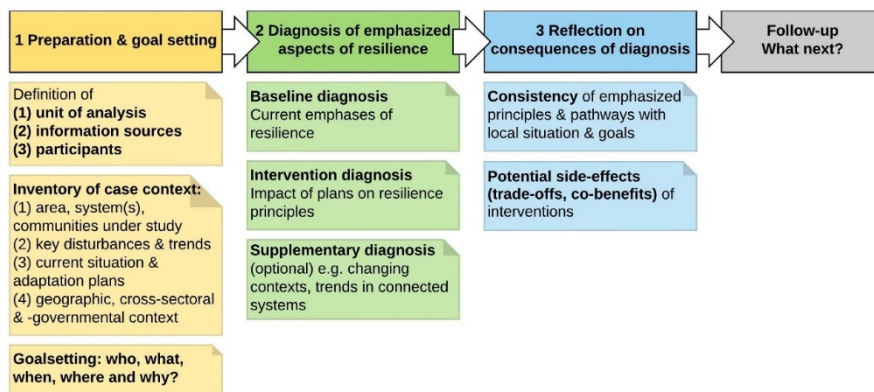


Fig. 1. Steps of the Resilience Diagnostic Tool.

Step 1 reflects on the goals of resilience-building. Basic information is inventoried and an initial reflection is performed on key aspects of the city; threats, strengths and weaknesses, governance context, and other specifics important for local resilience. Finally, the goals are determined: resilience for who, where, what, when and why (cf. Meerow & Newell, 2016)?

Step 2 explores choices made: which aspects of resilience are emphasized? We've developed a framework based on the notion of 'resilience principles'. These describe mechanisms and behaviours that make a city resilient or that help policies and practices improve resilience (Wardekker, 2018; Wardekker et al., 2010, 2016). The framework is multi-layered, working from general notions of resilience to operational principles. See Table 1. The current situation (baseline) and proposed plans for resilience-building are then scored per principle.

Table 1. Multi-layered set of resilience principles. Scoring is guided by a third layer of operational criteria (see Wilk, 2016; Wardekker et al., 2020).

| Pathway (layer 1) | Resilience Principle (layer 2) |
|---|--|
| Plan/Prepare: Foresight & preparedness (ability to spot disturbances, assess their consequences, and plan and act ahead, before disturbances take place, or when early warning signs emerge) | Anticipation & Foresight Preparedness & Planning Homeostasis |
| Absorb: Absorbing disturbances (ability to dynamically cope with disturbances that take place, maintaining desired functions) | Robustness & Buffering Diversity Redundancy |
| Recover: Recovering from disturbances (ability to rapidly recover from disturbances that take place, returning to desired functions) | Flatness High-flux |
| Adapt: Adaptability & change (ability to quickly modify and transform the system, coevolve with disturbances and maintain desired functions into the future) | Learning Flexibility |

Step 3 reflects on consequences of the choices. Scoring results are compared to goal-setting in Step 1: are the resilience principles that the city emphasises the ones most needed for the local situation? Furthermore, the user reflects on the potential side-effects of resilience-plans and choices, including trade-offs and co-benefits (cf. Chelleri et al., 2015). These might occur between for instance different goals, resilience principles, neighbourhoods, time scales, or policy fields.

Step 4. Lastly, follow-up is considered. For instance, gathering more data as input for the tool, doing supplementary analyses on specific sectors or neighbourhoods, or changing resilience plans that don't match the established goals.

3 Case study: flood resilience in Rotterdam

We applied the tool on urban flood resilience in Rotterdam. Rotterdam has been actively working on climate resilience for many years (Wardekker et al., 2010; Brown, 2016; Municipality of Rotterdam, 2016; Wilk, 2016; Igen et al., 2019). We analyzed climate impact studies and water/adaptation plans, interviewed 26 local-regional actors, and conducted two workshops with researchers and policymakers.

Key threats relate to flooding from intense precipitation, cloudbursts, river and sea. Heat and sea level rise are also concerns. Flood protection standards are high and structural flood defenses are in place. The plans approach resilience from a positive view on living with water; vicinity to water is not only a threat but also an opportunity.

The scoring results are shown in Fig. 2. The current situation focuses on anticipation, redundancy, and learning. The plans entail a much broader approach, and strongly improve flatness. This highlighted a paradigm shift in local water management from focusing on water defense to focusing on resilience as integrative lens and public participation. Implementation of this shift is currently taking place.

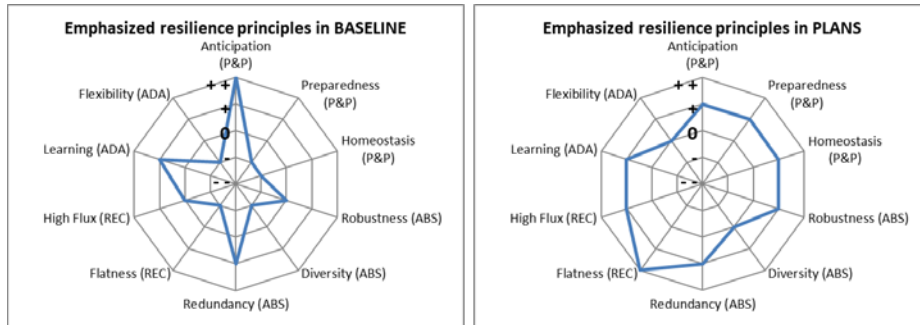


Fig. 2. Diagnosis of the emphases in the baseline (left) and adaptation plans (right) for Rotterdam's flood resilience. The figure shows a highly targeted current situation, whereas the plans take a broad approach (Wardekker et al., 2020).

4 Conclusion

We conclude that the Resilience Diagnostic Tool is useful to structure the diverse facets of urban resilience and provides a practical and locally situated diagnosis of the choices that cities make in promoting these. In particular, it stimulates thinking on resilience-building in terms of choice space and emphases, and their appropriateness to the local situation. This helps scientists and practitioners have a more comprehensive, and reflexive debate, and supports policymakers in making deliberate, transparent and appropriate choices on urban resilience.

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