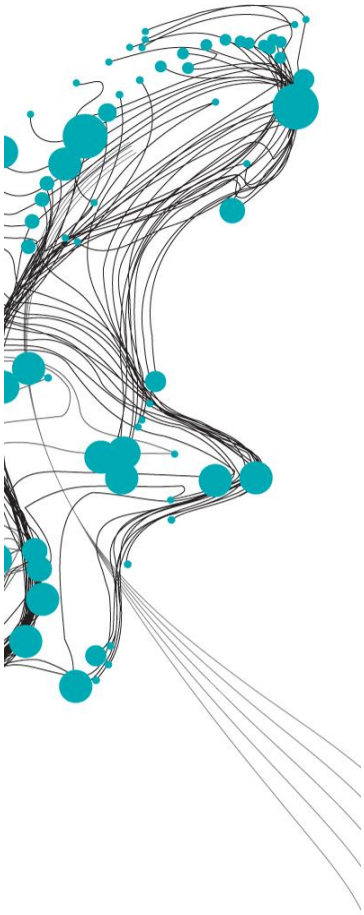
URBAN WATER SECURITY DASHBOARD: CHARACTERISING AND RANKING CITIES



Urban water security is a major concern in the context of urbanisation and climate change. Complex causal mechanisms lead to a certain level of water security, which can be clarified using system thinking. We developed a dashboard of indicators based on the pressure-state-impact-response (PSIR)-framework to give insight in the urban system dynamics. We applied the dashboard to ten cities to capture different characteristics of the water security in these cities and to construct a ranking of water security (table 1).

The highest level of water security was found in wealthy cities in water-abundant environments such as Amsterdam, Toronto, Singapore and Hong Kong. Their security is determined by the ability to mitigate flood risks and the sustainability of hinterland dependencies for water supply. Hong Kong, for example (figure 1a), is under pressure of severe typhoons each year, and depends on water supplies from mainland China. Cities in water scarce environments (Dubai, Lima) tend to overexploit their hinterland before turning to unconventional sources of supply and reduction of water use. Dubai, for example (figure 1b), is located in a water scarce environment but mitigates this pressure by applying energy-consuming desalination technology. Therefore, the water supply is guaranteed so that the city scores well on 'impact', despite large system pressures. In contrast, megacities in emerging economies (Beijing, São Paulo) suffer from insecurity even when located in more favourable environments. Their claim on the available resources is so large that overexploitation and pollution of water resources seems inevitable. The largest insecurity is found in developing countries, with cities such as Nairobi, Lima and Jakarta. Here, the combination of large socio-economic pressures and an inadequate response leads to inappropriate fulfilment of all functions fulfilled by the urban water system.

We show that the essence of urban water security is an appropriate response to system pressures. System pressures can be partly mitigated by an adequate response but the highest level of water security can be obtained in the absence of pressures.

Table 1. Ranking of city by water security index, broken down to sub-indices for pressure, state, impact and response

Rank	City name	WS-index	P-index	S-index	I-index	R-index
1	Amsterdam	82	61	91	88	88
2	Toronto	77	72	86	75	76
3	Singapore	74	67	85	74	68
4	Dubai	60	40	56	66	77
5	Beijing	52	51	48	46	63
6	Hong Kong	50	50	59	52	40
7	Sao Paulo	41	65	39	26	35
8	Nairobi	35	61	23	14	40
9	Lima (Peru)	32	40	17	29	41
10	Jakarta	30	49	11	16	43

Note: scores between 0 (worst) and 100 (best).

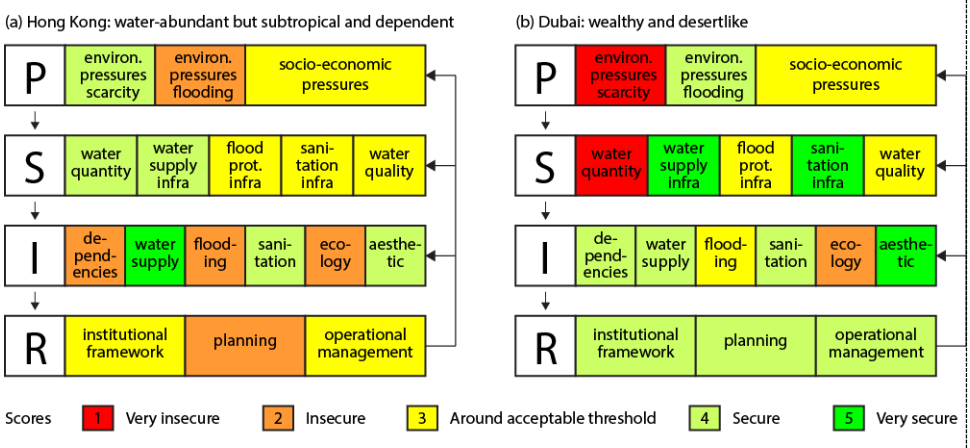


Figure 1: Category-aggregated dashboards of two cities, representing different types of system dynamics

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