

Appendix/Supplementary data

Table 1 SC mitigation strategies in response to the identified SC risks

Suggested Risk Mitigations (from Smart City Proposals)	Mitigation Measures from other Smart City (SC) Cases
Social Risks	
<ul style="list-style-type: none"> • Initiating a structured dialogue process with citizens to increase awareness and promote conflict resolution. • Enhancing project transparency by regularly updating stakeholders (citizens) on the progress of projects. 	<ul style="list-style-type: none"> • Identifying and evaluating the current channels used for citizen awareness to ensure that citizens are informed about the SC projects that are being (or will be) implemented. • Empowering citizens by involving them in designing SC projects (Granier and Kudo, 2016). • Approaching SC development by combining top-down and bottom up strategies (Mora and Deakin, 2019) will result in combining the collective intelligence of all the affected stakeholders.
Institutional Risks	
<ul style="list-style-type: none"> • Realigning organizations and forming commissioning task force committees and SPVs for each SC. SPVs are limited companies led by a full time Chief Executive Officer and have representation from Central Government, State Government, and the Urban Local Body (ULB) that can plan, approve, release funds, implement, and evaluate the SC projects at the city level (Ministry of Urban Development, 2015). SPVs are seen as a potential solution to: a) ensure coordination between different agencies; b) bring financial stability; and c) strengthen partner networks for resource management that could improve the timely implementation of projects. 	<ul style="list-style-type: none"> • Integrating management decisions taken by municipal officers at various levels to ensure accountability (Boykova et al., 2016; Mora et al., 2019). • Developing reporting routines that should not only be seen as a disciplinary strategy but should also trigger learning between and within administrative levels (Fromhold-Eisebith and Eisebith, 2019).

Financial Risks	
<ul style="list-style-type: none"> • Building public-private partnerships for mobilizing funds, steering, and synchronizing the convergence schemes. • Encouraging self-sustainable projects to alleviate this risk. 	<ul style="list-style-type: none"> • Replicating or adapting successful strategies showcased through SCs in India such as Bhopal, which proposed projects that are self-sustaining or revenue generating (Kumar, 2018). • Identifying present and prospective income streams to assure stakeholders about repayment options to ensure financial sustainability of projects (Hartemink, 2016; McClellan et al., 2017).
Partnership and Non-financial Resource Management Risks	
<ul style="list-style-type: none"> • Conducting industry consultations with relevant technology providers at various stages of the project life-cycle to maintain the quality of resources. • Relaxing regulations to engage private sectors and local businesses in non-financial resources supply and management. 	<ul style="list-style-type: none"> • Incorporating regulations and standards into contracts with stakeholders/partners to ensure quality work (Ojo et al., 2014). • Developing novel alliances and a complex division of tasks between local government (ruling general aspects of SC planning), research institutions (offering technology competences), technology providers (setting up SC platforms and infrastructures), and consulting firms that help manage all project/implementation processes (Dameri, 2017; Meier and Portmann, 2017). • Embedding SC processes in wider regional, national, and global settings of infrastructure procurement, regulatory framing and product or service provision (Fromhold-Eisebith, 2017).
Scheduling and Execution Risks	
<ul style="list-style-type: none"> • Implementing plans with phased planning and performance-based payment incentives. • Strategizing projects that can be bulk ordered to one vendor for collective projects. 	<ul style="list-style-type: none"> • Scheduling and Execution risks are more often discussed as an outcome of financial, institutional, and/or resource management risks. Therefore, the implemented mitigation measures are suggested in their respective sections.
Technological Risks	

<ul style="list-style-type: none"> • Upgrading software and hardware up-gradation. • Human resources training and capacity development to better adopt new technologies. • Adopting Open source technology. 	<ul style="list-style-type: none"> • Developing systems that are resistant to cyber-attacks, particularly the critical infrastructure like smart meters (Zanella et al., 2014).
Political Risks	
<ul style="list-style-type: none"> • Increasing the involvement of political parties in the city planning processes. 	<ul style="list-style-type: none"> • Having a strong local government partner as a key strategic player and co-founder can help in better aligning a SC initiative (Hartemink, 2016).

Note: SCP = Smart City Proposal; SC = Smart City; SPV = Special Purpose Vehicle. [↗](#)