

Annexures

Assessing Risks to India's Drinking Water, Sanitation, and Hygiene Systems from Extreme Climate Events

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Annexure 2: Existing central policies for improvement in WASH

- *National Urban Sanitation Policy, 2008*

Launched by **MoHUA** (the erstwhile Ministry of Urban Development) in **2008**, the policy pertains to managing human excrement and the associated public health and environmental impacts. It envisions all Indian cities and towns becoming sanitised, healthy, and liveable by ensuring and sustaining good public health and environmental outcomes for all their citizens (MoUD 2008). The policy focuses especially on the necessity of community-driven initiatives and on providing hygienic and affordable individual toilets for all, focusing on the urban poor and women. It encourages states and the selected cities to formulate state-level sanitation strategies and city sanitation plans, respectively.

- *National Policy on Disaster Management, 2009*

Launched by the **NDMA** in **2009**, the policy provided a more detailed framework for disaster prevention, mitigation, and preparedness (MoHA 2009). It aims to promote disaster resilience at all levels and mainstream disaster management into the development planning process, bringing ULBs and GPs into its ambit (MoHA 2009). Provision of drinking water and sanitation are added to standard operating procedures, which have to be prepared at all levels of governance. Relief camps explicitly state the provision for bathing, sanitation, and drinking water. Drinking water and sanitary facilities are also necessary for regions' recovery and safe development. In its preamble, the policy acknowledges that elderly persons, women (especially women rendered destitute), children (children orphaned on account of disasters), and differently abled persons are more seriously affected by disasters (MoHA 2009).

- *The Right of Children to Free and Compulsory Education Act, 2009*

Adopted by the government in 2009, *The Right of Children to Free and Compulsory Education (RTE) Act* provides a "legally enforceable rights framework with certain time targets that governments must adhere to" (WaterAid, NIRDPR, and UNICEF 2022). In schedule 9, the RTE explains the norms and standards a school building must adhere to, including the provision of drinking water and sanitation facilities. 'A school building has to be an all-weather building comprising at least separate toilets for boys and girls, and safe and adequate drinking water facilities for all children' (Ministry of Law and Justice 2009).

- *National Water Policy, 2012*

The *National Water Policy* enacted by the MoJS (the erstwhile MoWR) in 2012 is an improvement over its earlier versions enacted in 1987 and 2002. The 2012 policy version recognises the problem of water scarcity and reiterates the interdependent nature of surface and groundwater (Wahi 2022). It recognises that water requirements for drinking take precedence over water for other needs and calls for all levels of government to ensure access to a minimum quantity of potable water for essential health and hygiene to all its citizens, which should be available within easy reach of the household (National Human Rights Commission, India 2021).

The policy also articulated for the first time the need to evolve a national framework law as an umbrella statement of general principles governing the exercise of legislative and executive (or devolved) powers by the centre, the states, and local governing bodies. The **Draft National Water Framework Bill** was drafted in 2016 and called for giving every person the right to at least 25 litres of easily accessible potable water per day for health and hygiene. It also acknowledges that women need more water for their particular needs (Rajender 2016).

- *National Policy on Early Childhood Care and Education, 2013*

Drafted by the **Ministry of Women and Child Development** and adopted by the GoI in **2013**, the *National Policy on Early Childhood Care and Education (ECCE)* "integrates services for the holistic development of all children along the continuum, from the prenatal period to six years of age" (Ministry of Women and Child Development 2013). It acknowledges the synergies between the child's emotional, psycho-social, health, and nutrition needs. It mandates all service providers of any kind of ECCE to provide adequate and safe drinking water facilities and adequate and separate child-friendly toilets and hand-washing facilities for girls and boys (ibid.).

- *National Faecal Sludge and Septage Management Policy, 2017*

The MoHUA (the erstwhile MoUD) in **2017** introduced the policy of *National Faecal Sludge and Septage Management Policy*. It expanded the vision of the *National Urban Sanitation Policy* to include improved on-site sanitation services, faecal sludge, and septage management (FSSM) in all cities and towns (Gupta and Rohilla n.d.). The policy calls for state-level guidelines, framework, objectives, timelines, and implementation plan to address septage management. It also aims to mitigate gender-based sanitation insecurity directly related to FSSM, reduce experiences of health burdens and structural violence, and promote the involvement of both genders in the planning and design of sanitation infrastructure (Gupta and Rohilla n.d.).

- *National Health Policy, 2017*

In 2017, the MoH&FW launched the policy to enhance its previous versions from 1983 and 2002. The policy acknowledges that the right to healthcare encompasses issues beyond the health sector, such as sanitation and water availability. It enlists access to safe water and sanitation by 2020 as a cross-sectoral

goal related to health. It also calls for water quality and solid waste management to be crucial areas of focus for urban health policy (MoH&FW 2017). It envisages making health and hygiene major focus areas under the school curriculum.

- *National Disaster Management Plan, 2019*

The 2019 *National Disaster Management Plan* (NDMP) is an updated and revised 2016 plan. The NDMA enacted it to advance the targets established by India under the Sendai Framework for Disaster Risk Reduction (2015–2030), the Sustainable Development Goals (SDGs), and the Paris Agreement on Climate Change (National Disaster Management Authority 2019). The plan underlines the philosophy of DRR as a consequence of sustainable and climate-resilient development. It aims to mainstream disaster risk resilience (DRR) into development planning and acknowledges the risks of climate change on WASH services. The aim is to promote inclusive DRR by increasing the emphasis on social inclusion of ‘*gender-based vulnerabilities, scheduled castes and scheduled tribes (SCs/STs), elderly, children, and persons with disability*’ (National Disaster Management Authority 2019). It calls for incorporating gender-sensitive and equitable approaches in capacity development, covering all aspects of disaster management at the state, district, and local levels. It also lays down a responsibility framework for all levels of government in rural and urban India for 17 disasters, including drought, flood, urban flood, and heat wave. Drinking water and sanitation facilities are fifth on the list of emergency functions for post-disaster response and are indicated as priority sectors in recovery. Creating storage and distribution facilities for drinking water, upgrading and managing existing drainage and stormwater systems, and comprehensive assessment of water availability for drinking are some steps the plan recommends across various stages of controlling floods, droughts, and heat waves.

- *National Education Policy, 2020*

The **MoE** (erstwhile Ministry of Human Resource Development (MoHRD)) launched The *National Education Policy* (NEP) in **2020**. The policy acknowledges climate change and the consequent changes in water and sanitation needs in the country. It also posits that awareness of these issues (including hygiene) is necessary for all students and acknowledges the interdisciplinary nature of problems related to drinking water, sanitation, and hygiene in India. It identifies the provision of working toilets and clean drinking water “*to all schools to ensure that teachers and students, including children of all genders and children with disabilities, receive a safe, inclusive, and effective learning environment and are comfortable and inspired to teach and learn in their schools*” (MoE 2020).

- *Disaster Management Plan of the Department of Drinking Water and Sanitation, 2023*

Drafted by the **DoDW&S in 2023** at the NDMA’s recommendation, the disaster management plan (DMP) provides a framework and guidelines for ensuring the safety of crucial WASH infrastructure and uninterrupted provision of safe WASH services in rural India during and after a disaster. The DMP acknowledges the importance of the JJM and *Swacch Bharat Mission* (explained below) in this context and calls for building longer-term resilience of WASH assets (for water supply, toilets, faecal sludge management, solid and grey water management, and hygiene) and services to reduce their vulnerability

to disasters. It lays down the rules for immediate WASH response to disasters and aims for the creation of an enabling environment (including funding and coordination mechanisms amongst various ministries and subsidiaries at all levels and civil society organisations) across the disaster management cycle – preparedness, response, recovery and reconstruction, and mitigation (MoJS 2023a). Like the NDMP, it echoes the ethos of social inclusion.

Annexure 3: Existing central schemes, missions, and plans for improvement in WASH

- WASH in households

- ***Jal Jeevan Mission***

The DoDW&S launched the JJM in **2019**, intending to provide 55 litres per capita per day (LPCD) of safe drinking water regularly to every rural Indian household, school, and *aanganwadi* centre through a functional household tap connection (FHTC) by 2024 (MoJS 2019b). The scheme, hence, aims to attain SDG 6.1 by 2024. The mission has a total outlay of INR 3.6 lakh crore, which central and state governments bear (MoJS 2019b). The scheme mainstreams community participation in the planning, implementation, management, operation, and maintenance of water supply within the villages through the platform of GPs or village water and sanitation committees (VWSCs). These VWSCs are mandated to have one-third of seats reserved for women. The State Water and Sanitation Mission, which is a society registered under the state or union territory (UT) with the State Chief Secretary as its head, is the organisation responsible for implementing JJM in each state, including the overall planning, strategising, and finalising of the state action plan to provide FHTC to every rural household. As of December 2024, the scheme has provided FHTCs to more than 153 million rural households, covering about 79 per cent of the target population (MoJS 2019a).

- ***Atal Mission for Rejuvenation and Urban Transformation***

The Ministry of Housing and Urban Affairs (MoHUA) launched the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) in 2015. The first phase spanned five years and aimed to provide a universal water supply while significantly improving sewerage coverage in 500 selected AMRUT cities, which account for 60 per cent of India's urban population. In 2021, the mission entered its second five-year phase, with the key objective of securing cities' water through a circular water economy approach. The mission aims to provide universal coverage of water supply through functional taps to all households in all the statutory towns in the country and 100 per cent coverage of sewerage/septage management in 500 cities covered in the first phase of the AMRUT scheme (MoHUA 2021a). The scheme has a financial outlay of INR 2.9 lakh crore, which the centre, states, UTs, and ULBs bear. ULBs develop a city water action plan (CWAP) focusing on recycling/reusing treated sewage, rejuvenating water bodies, and conservation. As of March 2023, 148 lakh new tap connections and 33.42 lakh new sewer connections are proposed, along with increased water treatment and sewage treatment plant capacities of 8,435 million litres per day (MLD) and 2,795 MLD, respectively (MoHUA 2023).

- ***Swachh Bharat Mission (Rural)***

The DoDW&S of the MoJS launched the first phase of the *Swachh Bharat Mission (Rural)* (SBM(R)) in **2014, and it ran up to 2019**. Its objective was to make India open defecation-free (ODF) by providing all households with improved sanitation facilities. In 2019, more than six lakh villages declared ODF (MoJS 2020b). In 2015, the ministry also released the National Guidelines for Menstrual Hygiene Management under the behaviour change component of SBM. The guideline calls for access to knowledge and information, access to safe menstrual absorbents and their safe disposal post-usage, and provision of appropriate WASH infrastructure to preserve the dignity of adolescent girls and women, enabling them to continue their education (MoJS 2015).

In **2020**, the mission entered its second phase of five years to sustain the ODF-free status of villages and move them towards ODF+ status, whereby they safely manage their solid and liquid waste. SBM(R) Phase II also includes a focus on hygiene practices such as the promotion of hand washing with soap, visual cleanliness, minimal littering and stagnant water, menstrual hygiene management, and other hygienic practices depending on the context (e.g., masking and social distancing during the COVID-19 pandemic) (MoJS 2020a). To ensure this, the MoJS has prepared a 10-year Rural Sanitation Strategy (2019–29). SBM(R) Phase II has a financial outlay of INR 1.4 lakh crore, which the centre and states collectively bear, but also draws on funds devolved under the recommendations of the 15th Finance Commission of India (MoJS 2020a). The GPs lead the planning and implementation of the construction. They are responsible for maintaining all solid and liquid waste management infrastructure at the village level, including information, education, and communication (IEC) activities. As of August 2024, about 93 per cent of villages have been declared ODF+ villages (MoJS 2014).

- ***Swachh Bharat Mission (Urban)***

As for its rural counterpart, the first phase of SBM(U) was from **2014 to 2019**. It was launched by the MoHUA in urban areas of the country to make them ODF by providing them with improved sanitation facilities. Phase II of the SBM(U) (**2021–26**) aimed to make all cities of the country ‘garbage-free’ by focusing on sustainable management of solid waste and used water (including faecal sludge) with the help of citizen campaigns. The financial outlay of the scheme is INR 1.4 lakh crore, which includes shares from the centre, states, UTs, ULBs, and the private sector. Grants from the 15th Finance Commission of India can also be leveraged (MoHUA 2021b). As of August 2024, 3,913 cities are ODF+, 1,429 cities are ODF++, and 64 cities are Water+ (MoHUA 2024).

- ***Mission LiFE***

LiFE is an India-led global mass movement introduced by Prime Minister Narendra Modi at the 26th UN Climate Change Conference of Parties (COP26) in Glasgow in November 2021. This mission is curated by NITI Aayog and implemented by the Ministry of Environment, Forest and Climate Change (MoEFCC 2024b; MoEFCC and NITI Aayog 2022).

The main aim of *Mission LiFE* is to nudge citizens towards making environmentally conscious lifestyle choices to safeguard a collective sustainable future to combat climate change. The goal is to engage

at least 1 billion people worldwide in India to take individual and collective action towards environmental protection and conservation from 2022 to 2028. By 2028, the mission aims to make at least 80 per cent of all villages and ULBs environmentally friendly. The major themes of the mission are as follows: (i) save water, (ii) save energy, (iii) adopt sustainable food systems, (iv) adopt healthy lifestyles, (v) reduce e-waste, (vi) reduce waste, and (vii) avoid single-use plastic. The mission provides a non-exhaustive list of 75 actions across these seven *LiFE* themes, which individuals can adopt to contribute to a sustainable future. For example, under-saving water, the list of actions includes adopting the cultivation of less-water-intensive crops such as millets, participating in the recharge of rural water bodies through the *Amrit Sarovar Scheme*, pre-soaking heavy pots and pans before washing them, and reusing wastewater from ACs/ROs for cleaning utensils and watering plants. This mission also contributes directly or indirectly to all SDGs (MoEFCC 2024b; MoEFCC and NITI Aayog 2022).

Mission LiFE aims to approach sustainability in three phases (MoEFCC 2024b):

- Phase 1: Change in demand – encourage people to make meaningful environmental changes daily.
- Phase 2: Change in supply – modify demand to influence market adoption.
- Phase 3: Change in policy – adopt sustainable policies for national and global impact.

In anticipation of World Environment Day, the MoEFCC launched a month-long campaign following the mission's aims from May 5, 2023 to June 5, 2023. During this campaign, events like awareness programmes for recharging rural water bodies and creating rainwater harvesting infrastructure in homes/schools/offices were initiated (MoEFCC 2024a).

Per the *Environment (Protection) Act* of 1986, the Indian government introduced the Green Credit Rules on October 12, 2023. These rules encourage voluntary plantation activities nationwide by awarding green credits and creating a comprehensive land database for afforestation initiatives (MoEFCC 2024a).

- WASH for educational facilities

Alongside JJM, which aims to ensure 55 LPCD of safe drinking water on tap and regularly in every rural school and *aanganwadi* country, the following schemes are operational.

- ***Swachh Bharat Swachh Vidyalaya***

Launched by the **MoE** (erstwhile MoHRD) in **2014**, *Swachh Bharat Swachh Vidyalaya* (SBSV), or Clean India: Clean Schools, was a national mission to provide every school in India with functioning and well-maintained water, sanitation, and hygiene facilities. It emphasised technical and human development components for WASH in schools, reiterating that it was necessary for the country's economic growth (MoE 2014). Technical capacities include gender-separate toilets for boys and girls, menstrual hygiene management facilities, sufficient group hand-washing facilities, daily provision of child-friendly and sustainable safe drinking water, and adequate water for hand washing, school cleaning, food

preparation, and cooking. The human development component includes the creation of an enabling environment in school (such as behaviour change communication or supervision of hand washing of children before the midday meals) and practices of children that can prevent them from WASH-related diseases. The mission called for daily/regular inspection of water and sanitation facilities in the school. Under the initiative of SBSV or Clean India: Clean Schools, about 4.2 lakh toilets (2.2 lakhs for boys and 1.9 lakhs for girls) were constructed or made functional in 2.6 lakh elementary and secondary government schools of India, completing the target of separate toilets for boys and girls in all government schools in the country in 2015 (MoE 2021; PIB 2023).

- **Swachh Vidyalaya Puraskar**

Launched by the **MoE** (the erstwhile MoHRD) in **2016**, the *Swachh Vidyalaya Puraskar (SVP)*, or Clean School Award, aims to honour government, government-aided, and private schools affiliated with central or state education boards that have demonstrated excellence in sanitation and hygiene practices by taking significant steps towards the mandates of the SBSV (MoE 2021; MoHRD 2016). Fifty-two indicators benchmark schools against WASH and COVID-19 protocols, including availability, functionality, and operation and maintenance of WASH facilities (MoHRD 2016; UNICEF 2015). National—and state-level data generated under the SVP is used to prepare school *swachhata* action plans, which stem from the government's commitment to making cleanliness plans in all 76 ministries and departments, including education (MoJS 2017). The MoJS coordinates these plans.

To further standardise these action plans, the MoE launched guidelines called 'Standard Operating Procedure for Sustaining Water, Sanitation, and Hygiene in Schools' in 2021 (MoE 2021). The guidelines acknowledge in chapter 1 that WASH in schools is essential for climate-resilient safe water and basic sanitation services and state that climate-resilient WASH services are necessary for a school's WASH preparedness and disaster response mechanisms. It lays down standard operating procedures for seven areas, including safe handling of drinking water, sanitation, hygiene, waste management, menstrual hygiene management, operation, and maintenance. The guidelines also call for a vulnerability assessment of schools' WASH facilities in the face of disasters (floods, drought, etc.) and recommend the flexibility of WASH education following the socio-economic vulnerabilities of the population (MoE 2021).

- **WASH for health facilities**

WASH services are essential for infection prevention and control (IPC) (UNICEF 2020). Effective IPC can reduce the risk of hospital-acquired infections by at least 30 per cent (UNICEF 2020). Target 3.9 of SDG 3 on healthy lives and well-being aims to reduce disease burden from unsafe water, unsafe sanitation, and lack of hygiene. Reduction in maternal mortality and under-five and neonatal mortality, as envisaged in targets 3.1 and 3.2, are shown to be directly linked to WASH conditions in HCFs. Inadequate WASH provisions in HCFs lead to a disproportionate burden on women and children and impede the country's progress toward universal health coverage.

- ***KAYAKALP initiative***

In 2015, the MoH&FW, GoI, launched the *KAYAKALP* initiative to complement SBM's efforts. The initiative honours public health facilities (up to the level of district hospitals and central government hospitals) across the country with awards based on internal, peer, and external assessments of the following criteria: (i) hospital/facility upkeep, (ii) sanitation and hygiene, (iii) waste management, (iv) infection control, (v) support services, and (vi) hygiene promotion (MoH&FW 2015). The incentive amount varies from INR 50,000 to INR 5,00,000, depending on the performance and size of the facility under consideration. Criteria relevant to WASH are graded under various headers and include the following: provision of a washbasin with a functional tap, soap, and running water at all points of use; water supply of adequate quantity and quality; toilets with running water and functional cisterns; availability of closed drainage systems of adequate gradient, connected to a municipal sewage system or soak pit; implementation of biomedical waste rules, including its storage, segregation, collection, transportation, and disposal; implementation of rules for general waste management and liquid waste management; adequate cleaning of all activity areas and instruments as relevant, including in support facilities such as the laundry and kitchen; and display of IEC material on the importance of hand hygiene, use of toilets, water for sanitation, and SBM (compiled from MoH&FW 2015) The HCFs are also encouraged to motivate the surrounding villages to remain Open Defecation Free (ODF). In the 2022–23 period, over 20,000 Health Care Facilities (HCFs) were nominated for the *KAYAKALP* awards, with the Government of India (GoI) allocating approximately INR 370 crore for these awards (MoH&FW 2023).

- ***Swachh Swasth Sarvatra scheme***

The MoH&FW and the MoJS launched the *Swachh Swasth Sarvatra* (SSS) scheme in 2016 to accelerate the attainment of the SBM's and *KAYAKALP*'s goals. The scheme aims to support Gram Panchayats (GPs) in regions where *KAYAKALP*-awarded Public Health Centres (PHCs) are situated, assisting them in achieving Open Defecation Free (ODF) status. The scheme also aims to award INR 10 lakh to community health centres (CHCs) in ODF blocks to ensure they meet *KAYAKALP* standards. Additionally, training will be provided under SSS to CHC and PHC staff on Water, Sanitation, and Hygiene (WASH) to support capacity building (MoH&FW and Ministry of Drinking Water and Sanitation, 2016)

- ***Labour Room Quality Improvement Initiative (LaQshya)***

The *Labour Room Quality Improvement Initiative (LaQshya)*, launched on 11 December 2017 by the MoH&FW, GOI, aims to reduce maternal and new-born mortality and morbidity and improve the quality of care provided during the delivery and post-partum period. Furthermore, it seeks to provide respectful maternity care to enhance the satisfaction of beneficiaries visiting the health facilities. This initiative recognises and rewards government medical college hospitals, district hospitals, sub-district hospitals (SDHs), and other high-case-load CHCs based on external assessments adhering to the national quality assurance standards checklist for labour room and maternity operation theatres. The checklist focuses on eight areas of concern: (i) service provision, (ii) patient rights, (iii) inputs, (iv) support services, (v) clinical services, (vi) infection control, (vii) quality management, and (viii) outcome. The performance of health facilities in key areas of concern determines the score. Facilities that score 70 per cent or higher in the assessment receive quality

S. No.	Combination for searching Title and Abstracts	Results (duplicates removed/ peer-review/ open-access/ English/)	Link			
15	"Climate" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Low Income"	1	<a 138="" 228="" 291"="" 58="" href="https://www.worldcat.org/search?qt=worldcat&F0=0&F1=0&F2=0&F3=0&F4=0&F5=0&F6=0&F7=0&F8=0&F9=0&F10=0&F11=0&F12=0&F13=0&F14=0&F15=0&F16=0&F17=0&F18=0&F19=0&F20=0&F21=0&F22=0&F23=0&F24=0&F25=0&F26=0&F27=0&F28=0&F29=0&F30=0&F31=0&F32=0&F33=0&F34=0&F35=0&F36=0&F37=0&F38=0&F39=0&F40=0&F41=0&F42=0&F43=0&F44=0&F45=0&F46=0&F47=0&F48=0&F49=0&F50=0&F51=0&F52=0&F53=0&F54=0&F55=0&F56=0&F57=0&F58=0&F59=0&F60=0&F61=0&F62=0&F63=0&F64=0&F65=0&F66=0&F67=0&F68=0&F69=0&F70=0&F71=0&F72=0&F73=0&F74=0&F75=0&F76=0&F77=0&F78=0&F79=0&F80=0&F81=0&F82=0&F83=0&F84=0&F85=0&F86=0&F87=0&F88=0&F89=0&F90=0&F91=0&F92=0&F93=0&F94=0&F95=0&F96=0&F97=0&F98=0&F99=0&F100=0&F101=0&F102=0&F103=0&F104=0&F105=0&F106=0&F107=0&F108=0&F109=0&F110=0&F111=0&F112=0&F113=0&F114=0&F115=0&F116=0&F117=0&F118=0&F119=0&F120=0&F121=0&F122=0&F123=0&F124=0&F125=0&F126=0&F127=0&F128=0&F129=0&F130=0&F131=0&F132=0&F133=0&F134=0&F135=0&F136=0&F137=0&F138=0&F139=0&F140=0&F141=0&F142=0&F143=0&F144=0&F145=0&F146=0&F147=0&F148=0&F149=0&F150=0&F151=0&F152=0&F153=0&F154=0&F155=0&F156=0&F157=0&F158=0&F159=0&F160=0&F161=0&F162=0&F163=0&F164=0&F165=0&F166=0&F167=0&F168=0&F169=0&F170=0&F171=0&F172=0&F173=0&F174=0&F175=0&F176=0&F177=0&F178=0&F179=0&F180=0&F181=0&F182=0&F183=0&F184=0&F185=0&F186=0&F187=0&F188=0&F189=0&F190=0&F191=0&F192=0&F193=0&F194=0&F195=0&F196=0&F197=0&F198=0&F199=0&F200=0&F201=0&F202=0&F203=0&F204=0&F205=0&F206=0&F207=0&F208=0&F209=0&F210=0&F211=0&F212=0&F213=0&F214=0&F215=0&F216=0&F217=0&F218=0&F219=0&F220=0&F221=0&F222=0&F223=0&F224=0&F225=0&F226=0&F227=0&F228=0&F229=0&F230=0&F231=0&F232=0&F233=0&F234=0&F235=0&F236=0&F237=0&F238=0&F239=0&F240=0&F241=0&F242=0&F243=0&F244=0&F245=0&F246=0&F247=0&F248=0&F249=0&F250=0&F251=0&F252=0&F253=0&F254=0&F255=0&F256=0&F257=0&F258=0&F259=0&F260=0&F261=0&F262=0&F263=0&F264=0&F265=0&F266=0&F267=0&F268=0&F269=0&F270=0&F271=0&F272=0&F273=0&F274=0&F275=0&F276=0&F277=0&F278=0&F279=0&F280=0&F281=0&F282=0&F283=0&F284=0&F285=0&F286=0&F287=0&F288=0&F289=0&F290=0&F291=0&F292=0&F293=0&F294=0&F295=0&F296=0&F297=0&F298=0&F299=0&F300=0&F301=0&F302=0&F303=0&F304=0&F305=0&F306=0&F307=0&F308=0&F309=0&F310=0&F311=0&F312=0&F313=0&F314=0&F315=0&F316=0&F317=0&F318=0&F319=0&F320=0&F321=0&F322=0&F323=0&F324=0&F325=0&F326=0&F327=0&F328=0&F329=0&F330=0&F331=0&F332=0&F333=0&F334=0&F335=0&F336=0&F337=0&F338=0&F339=0&F340=0&F341=0&F342=0&F343=0&F344=0&F345=0&F346=0&F347=0&F348=0&F349=0&F350=0&F351=0&F352=0&F353=0&F354=0&F355=0&F356=0&F357=0&F358=0&F359=0&F360=0&F361=0&F362=0&F363=0&F364=0&F365=0&F366=0&F367=0&F368=0&F369=0&F370=0&F371=0&F372=0&F373=0&F374=0&F375=0&F376=0&F377=0&F378=0&F379=0&F380=0&F381=0&F382=0&F383=0&F384=0&F385=0&F386=0&F387=0&F388=0&F389=0&F390=0&F391=0&F392=0&F393=0&F394=0&F395=0&F396=0&F397=0&F398=0&F399=0&F400=0&F401=0&F402=0&F403=0&F404=0&F405=0&F406=0&F407=0&F408=0&F409=0&F410=0&F411=0&F412=0&F413=0&F414=0&F415=0&F416=0&F417=0&F418=0&F419=0&F420=0&F421=0&F422=0&F423=0&F424=0&F425=0&F426=0&F427=0&F428=0&F429=0&F430=0&F431=0&F432=0&F433=0&F434=0&F435=0&F436=0&F437=0&F438=0&F439=0&F440=0&F441=0&F442=0&F443=0&F444=0&F445=0&F446=0&F447=0&F448=0&F449=0&F450=0&F451=0&F452=0&F453=0&F454=0&F455=0&F456=0&F457=0&F458=0&F459=0&F460=0&F461=0&F462=0&F463=0&F464=0&F465=0&F466=0&F467=0&F468=0&F469=0&F470=0&F471=0&F472=0&F473=0&F474=0&F475=0&F476=0&F477=0&F478=0&F479=0&F480=0&F481=0&F482=0&F483=0&F484=0&F485=0&F486=0&F487=0&F488=0&F489=0&F490=0&F491=0&F492=0&F493=0&F494=0&F495=0&F496=0&F497=0&F498=0&F499=0&F500=0&F501=0&F502=0&F503=0&F504=0&F505=0&F506=0&F507=0&F508=0&F509=0&F510=0&F511=0&F512=0&F513=0&F514=0&F515=0&F516=0&F517=0&F518=0&F519=0&F520=0&F521=0&F522=0&F523=0&F524=0&F525=0&F526=0&F527=0&F528=0&F529=0&F530=0&F531=0&F532=0&F533=0&F534=0&F535=0&F536=0&F537=0&F538=0&F539=0&F540=0&F541=0&F542=0&F543=0&F544=0&F545=0&F546=0&F547=0&F548=0&F549=0&F550=0&F551=0&F552=0&F553=0&F554=0&F555=0&F556=0&F557=0&F558=0&F559=0&F560=0&F561=0&F562=0&F563=0&F564=0&F565=0&F566=0&F567=0&F568=0&F569=0&F570=0&F571=0&F572=0&F573=0&F574=0&F575=0&F576=0&F577=0&F578=0&F579=0&F580=0&F581=0&F582=0&F583=0&F584=0&F585=0&F586=0&F587=0&F588=0&F589=0&F590=0&F591=0&F592=0&F593=0&F594=0&F595=0&F596=0&F597=0&F598=0&F599=0&F600=0&F601=0&F602=0&F603=0&F604=0&F605=0&F606=0&F607=0&F608=0&F609=0&F610=0&F611=0&F612=0&F613=0&F614=0&F615=0&F616=0&F617=0&F618=0&F619=0&F620=0&F621=0&F622=0&F623=0&F624=0&F625=0&F626=0&F627=0&F628=0&F629=0&F630=0&F631=0&F632=0&F633=0&F634=0&F635=0&F636=0&F637=0&F638=0&F639=0&F640=0&F641=0&F642=0&F643=0&F644=0&F645=0&F646=0&F647=0&F648=0&F649=0&F650=0&F651=0&F652=0&F653=0&F654=0&F655=0&F656=0&F657=0&F658=0&F659=0&F660=0&F661=0&F662=0&F663=0&F664=0&F665=0&F666=0&F667=0&F668=0&F669=0&F670=0&F671=0&F672=0&F673=0&F674=0&F675=0&F676=0&F677=0&F678=0&F679=0&F680=0&F681=0&F682=0&F683=0&F684=0&F685=0&F686=0&F687=0&F688=0&F689=0&F690=0&F691=0&F692=0&F693=0&F694=0&F695=0&F696=0&F697=0&F698=0&F699=0&F700=0&F701=0&F702=0&F703=0&F704=0&F705=0&F706=0&F707=0&F708=0&F709=0&F710=0&F711=0&F712=0&F713=0&F714=0&F715=0&F716=0&F717=0&F718=0&F719=0&F720=0&F721=0&F722=0&F723=0&F724=0&F725=0&F726=0&F727=0&F728=0&F729=0&F730=0&F731=0&F732=0&F733=0&F734=0&F735=0&F736=0&F737=0&F738=0&F739=0&F740=0&F741=0&F742=0&F743=0&F744=0&F745=0&F746=0&F747=0&F748=0&F749=0&F750=0&F751=0&F752=0&F753=0&F754=0&F755=0&F756=0&F757=0&F758=0&F759=0&F760=0&F761=0&F762=0&F763=0&F764=0&F765=0&F766=0&F767=0&F768=0&F769=0&F770=0&F771=0&F772=0&F773=0&F774=0&F775=0&F776=0&F777=0&F778=0&F779=0&F780=0&F781=0&F782=0&F783=0&F784=0&F785=0&F786=0&F787=0&F788=0&F789=0&F790=0&F791=0&F792=0&F793=0&F794=0&F795=0&F796=0&F797=0&F798=0&F799=0&F800=0&F801=0&F802=0&F803=0&F804=0&F805=0&F806=0&F807=0&F808=0&F809=0&F810=0&F811=0&F812=0&F813=0&F814=0&F815=0&F816=0&F817=0&F818=0&F819=0&F820=0&F821=0&F822=0&F823=0&F824=0&F825=0&F826=0&F827=0&F828=0&F829=0&F830=0&F831=0&F832=0&F833=0&F834=0&F835=0&F836=0&F837=0&F838=0&F839=0&F840=0&F841=0&F842=0&F843=0&F844=0&F845=0&F846=0&F847=0&F848=0&F849=0&F850=0&F851=0&F852=0&F853=0&F854=0&F855=0&F856=0&F857=0&F858=0&F859=0&F860=0&F861=0&F862=0&F863=0&F864=0&F865=0&F866=0&F867=0&F868=0&F869=0&F870=0&F871=0&F872=0&F873=0&F874=0&F875=0&F876=0&F877=0&F878=0&F879=0&F880=0&F881=0&F882=0&F883=0&F884=0&F885=0&F886=0&F887=0&F888=0&F889=0&F890=0&F891=0&F892=0&F893=0&F894=0&F895=0&F896=0&F897=0&F898=0&F899=0&F900=0&F901=0&F902=0&F903=0&F904=0&F905=0&F906=0&F907=0&F908=0&F909=0&F910=0&F911=0&F912=0&F913=0&F914=0&F915=0&F916=0&F917=0&F918=0&F919=0&F920=0&F921=0&F922=0&F923=0&F924=0&F925=0&F926=0&F927=0&F928=0&F929=0&F930=0&F931=0&F932=0&F933=0&F934=0&F935=0&F936=0&F937=0&F938=0&F939=0&F940=0&F941=0&F942=0&F943=0&F944=0&F945=0&F946=0&F947=0&F948=0&F949=0&F950=0&F951=0&F952=0&F953=0&F954=0&F955=0&F956=0&F957=0&F958=0&F959=0&F960=0&F961=0&F962=0&F963=0&F964=0&F965=0&F966=0&F967=0&F968=0&F969=0&F970=0&F971=0&F972=0&F973=0&F974=0&F975=0&F976=0&F977=0&F978=0&F979=0&F980=0&F981=0&F982=0&F983=0&F984=0&F985=0&F986=0&F987=0&F988=0&F989=0&F990=0&F991=0&F992=0&F993=0&F994=0&F995=0&F996=0&F997=0&F998=0&F999=0&F1000=0</td> </tr> <tr> <td data-bbox=">16	"Climate" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Low Income"	0	

S. No.	Combination for searching Title and Abstracts	Results (duplicates removed/ peer-review/ open-access/ English/)	Link
	"Hygiene") AND "Infrastructure" AND "India"		
13	"Climate Change" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "India"	3	https://icm.on.worldcat.org/Search?queryString=63%22Climate%22AND%22DrinkingWater%22OR%22Sanitation%22OR%22Hygiene%22AND%22Infrastructure%22AND%22India%22&lang=en&copy=&content=openAccess
14	"Climate Change" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "India"	0	https://icm.on.worldcat.org/Search?queryString=63%22Climate%22AND%22Assessment%22AND%22DrinkingWater%22OR%22Sanitation%22OR%22Hygiene%22AND%22Infrastructure%22AND%22India%22&lang=en&copy=&content=openAccess
15	"Climate Change" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "India"	2	https://icm.on.worldcat.org/Search?queryString=63%22Climate%22AND%22Vulnerability%22AND%22DrinkingWater%22OR%22Sanitation%22OR%22Hygiene%22AND%22Infrastructure%22AND%22India%22&lang=en&copy=&content=openAccess
16	"Climate" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "India"	16	https://icm.on.worldcat.org/Search?queryString=63%22Climate%22AND%22DrinkingWater%22OR%22Sanitation%22OR%22Hygiene%22AND%22Infrastructure%22AND%22India%22&lang=en&copy=&content=openAccess
17	"Climate" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "India"	0	https://icm.on.worldcat.org/Search?queryString=63%22Climate%22AND%22Assessment%22AND%22DrinkingWater%22OR%22Sanitation%22OR%22Hygiene%22AND%22Infrastructure%22AND%22India%22&lang=en&copy=&content=openAccess
18	"Climate" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "India"	0	https://icm.on.worldcat.org/Search?queryString=63%22Climate%22AND%22Vulnerability%22AND%22DrinkingWater%22OR%22Sanitation%22OR%22Hygiene%22AND%22Infrastructure%22AND%22India%22&lang=en&copy=&content=openAccess
19	"Climate" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "South Asia"	0	https://icm.on.worldcat.org/Search?queryString=63%22Climate%22AND%22DrinkingWater%22OR%22Sanitation%22OR%22Hygiene%22AND%22Infrastructure%22AND%22SouthAsia%22&lang=en&copy=&content=openAccess
20	"Climate" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "South Asia"	0	https://icm.on.worldcat.org/Search?queryString=63%22Climate%22AND%22Assessment%22AND%22DrinkingWater%22OR%22Sanitation%22OR%22Hygiene%22AND%22Infrastructure%22AND%22SouthAsia%22&lang=en&copy=&content=openAccess
21	"Climate" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "South Asia"	0	https://icm.on.worldcat.org/Search?queryString=63%22Climate%22AND%22Vulnerability%22AND%22DrinkingWater%22OR%22Sanitation%22OR%22Hygiene%22AND%22Infrastructure%22AND%22SouthAsia%22&lang=en&copy=&content=openAccess
22	"Climate Risk" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "South Asia"	0	https://icm.on.worldcat.org/Search?queryString=63%22ClimateRisk%22AND%22DrinkingWater%22OR%22Sanitation%22OR%22Hygiene%22AND%22Infrastructure%22AND%22SouthAsia%22&lang=en&copy=&content=openAccess
23	"Climate Risk" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "South Asia"	0	https://icm.on.worldcat.org/Search?queryString=63%22ClimateRisk%22AND%22Assessment%22AND%22DrinkingWater%22OR%22Sanitation%22OR%22Hygiene%22AND%22Infrastructure%22AND%22SouthAsia%22&lang=en&copy=&content=openAccess
24	"Climate Risk" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "South Asia"	0	https://icm.on.worldcat.org/Search?queryString=63%22ClimateRisk%22AND%22Vulnerability%22AND%22DrinkingWater%22OR%22Sanitation%22OR%22Hygiene%22AND%22Infrastructure%22AND%22SouthAsia%22&lang=en&copy=&content=openAccess

S. No.	Combination for searching Title and Abstracts	Results (duplicates removed/ peer-review/ open-access/ English/)	Link
	"Hygiene") AND "Infrastructure" AND "South Asia"		
25	"Climate Change" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "South Asia"	0	https://icrn.on.worldcat.org/search?query=634622Climate+Change%22+AND%22Drinking+water%22+OR%22Sanitation%22+OR%22Hygiene%22+AND%22Infrastructure%22+AND%22South+Asia%22&lang=en&copy=&content=openAccess
26	"Climate Change" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "South Asia"	0	https://icrn.on.worldcat.org/search?query=634622Climate+Change%22+AND%22Assessment%22+AND%22Drinking+water%22+OR%22Sanitation%22+OR%22Hygiene%22+AND%22Infrastructure%22+AND%22South+Asia%22&lang=en&copy=&content=openAccess
27	"Climate Change" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "India"	0	https://icrn.on.worldcat.org/search?query=634622Climate+Change%22+AND%22Vulnerability%22+AND%22Drinking+water%22+OR%22Sanitation%22+OR%22Hygiene%22+AND%22Infrastructure%22+AND%22India%22&lang=en&copy=&content=openAccess

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S. No.	Combination	Number of total results (abstract, title, and keywords; open access)	Link
1	Individual Terminology (combinations)		
1	"Climate" AND ("Drinking water" OR "Sanitation" OR "Hygiene")	272	https://www.sciencedirect.com/search?q=634622Climate%22+AND%22Drinking+water%22+OR%22Sanitation%22+OR%22Hygiene%22&lang=en&copy=&content=openAccess
2	"Climate Risk" AND ("Drinking water" OR "Sanitation" OR "Hygiene")	14	https://www.sciencedirect.com/search?date=2010-2023&q=634622Climate+Risk%22+AND%22Drinking+water%22+OR%22Sanitation%22+OR%22Hygiene%22&lang=en&copy=&content=openAccess
3	"Climate Change" AND ("Drinking water" OR "Sanitation" OR "Hygiene")	173	https://www.sciencedirect.com/search?date=2010-2023&q=634622Climate+Change%22+AND%22Drinking+water%22+OR%22Sanitation%22+OR%22Hygiene%22&lang=en&copy=&content=openAccess
4	"Extreme Event" AND ("Drinking water" OR "Sanitation" OR "Hygiene")	8	https://www.sciencedirect.com/search?date=2010-2023&q=634622Extreme+Event%22+AND%22Drinking+water%22+OR%22Sanitation%22+OR%22Hygiene%22&lang=en&copy=&content=openAccess
5	"Extreme Climate Event" AND ("Drinking water" OR "Sanitation" OR "Hygiene")	3	https://www.sciencedirect.com/search?date=2010-2023&q=634622Extreme+Climate+Event%22+AND%22Drinking+water%22+OR%22Sanitation%22+OR%22Hygiene%22&lang=en&copy=&content=openAccess
6	"Extreme Flood" AND ("Drinking water" OR "Sanitation" OR "Hygiene")	1	https://www.sciencedirect.com/search?date=2010-2023&q=634622Extreme+Flood%22+AND%22Drinking+water%22+OR%22Sanitation%22+OR%22Hygiene%22&lang=en&copy=&content=openAccess
7	"Flood" AND ("Drinking water" OR "Sanitation" OR "Hygiene")	93	https://www.sciencedirect.com/search?q=634622Flood%22+AND%22Drinking+water%22+OR%22Sanitation%22+OR%22Hygiene%22&lang=en&copy=&content=openAccess
8	"Extreme Cyclone" AND ("Drinking water" OR "Sanitation" OR "Hygiene")	0	https://www.sciencedirect.com/search?date=2010-2023&q=634622Extreme+Cyclone%22+AND%22Drinking+water%22+OR%22Sanitation%22+OR%22Hygiene%22&lang=en&copy=&content=openAccess
9	"Cyclone" AND ("Drinking water" OR "Sanitation" OR "Hygiene")	10	https://www.sciencedirect.com/search?date=2010-2023&q=634622Cyclone%22+AND%22Drinking+water%22+OR%22Sanitation%22+OR%22Hygiene%22&lang=en&copy=&content=openAccess
10	"Extreme Drought" AND ("Drinking water" OR "Sanitation" OR "Hygiene")	1	https://www.sciencedirect.com/search?date=2010-2023&q=634622Extreme+Drought%22+AND%22Drinking+water%22+OR%22Sanitation%22+OR%22Hygiene%22&lang=en&copy=&content=openAccess

S. No.	Combination	Number of total results (abstract, title, and keywords; open access)	Link
5	"Climate Risk" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Women"	0	https://www.sciencedirect.com/search?date=2010-2018&qs=ClimateRisk%20AND%20%28DrinkingWater%20OR%20Sanitation%20OR%20Hygiene%29%20AND%20SouthAsia%20AND%20Women%29
6	"Climate Risk" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Women"	0	https://www.sciencedirect.com/search?date=2010-2018&qs=ClimateRisk%20AND%20Assessment%20AND%20%28DrinkingWater%20OR%20Sanitation%20OR%20Hygiene%29%20AND%20SouthAsia%20AND%20Women%29
7	"Climate Change" AND "South Asia" AND "Women" AND ("Drinking water" OR "Sanitation" OR "Hygiene")	0	https://www.sciencedirect.com/search?date=2010-2018&qs=ClimateChange%20AND%20SouthAsia%20AND%20Women%20AND%20%28DrinkingWater%20OR%20Sanitation%20OR%20Hygiene%29
8	"Climate Change" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Women"	0	https://www.sciencedirect.com/search?date=2010-2018&qs=ClimateChange%20AND%20Assessment%20AND%20%28DrinkingWater%20OR%20Sanitation%20OR%20Hygiene%29%20AND%20SouthAsia%20AND%20Women%29
9	"Climate Risk" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Women"	0	https://www.sciencedirect.com/search?date=2010-2018&qs=ClimateRisk%20AND%20%28DrinkingWater%20OR%20Sanitation%20OR%20Hygiene%29%20AND%20India%20AND%20Women%29
10	"Climate Risk" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Women"	0	https://www.sciencedirect.com/search?date=2010-2018&qs=ClimateRisk%20AND%20Assessment%20AND%20%28DrinkingWater%20OR%20Sanitation%20OR%20Hygiene%29%20AND%20India%20AND%20Women%29
11	"Climate Change" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Women"	0	https://www.sciencedirect.com/search?date=2010-2018&qs=ClimateChange%20AND%20%28DrinkingWater%20OR%20Sanitation%20OR%20Hygiene%29%20AND%20India%20AND%20Women%29
12	"Climate Change" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Women"	0	https://www.sciencedirect.com/search?date=2010-2018&qs=ClimateChange%20AND%20Assessment%20AND%20%28DrinkingWater%20OR%20Sanitation%20OR%20Hygiene%29%20AND%20India%20AND%20Women%29
13	"Climate" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Women"	9	https://www.sciencedirect.com/search?date=2010-2018&qs=Climate%20AND%20%28DrinkingWater%20OR%20Sanitation%20OR%20Hygiene%29%20AND%20Women%29
14	"Climate" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Women" AND "Assessment"	1	https://www.sciencedirect.com/search?date=2010-2018&qs=Climate%20AND%20%28DrinkingWater%20OR%20Sanitation%20OR%20Hygiene%29%20AND%20Women%20AND%20Assessment%29
15	"Climate" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Women"	1	https://www.sciencedirect.com/search?date=2010-2018&qs=Climate%20AND%20%28DrinkingWater%20OR%20Sanitation%20OR%20Hygiene%29%20AND%20India%20AND%20Women%29
16	"Climate" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Women"	0	https://www.sciencedirect.com/search?date=2010-2018&qs=Climate%20AND%20Assessment%20AND%20%28DrinkingWater%20OR%20Sanitation%20OR%20Hygiene%29%20AND%20India%20AND%20Women%29
17	"Climate" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Women"	1	https://www.sciencedirect.com/search?date=2010-2018&qs=Climate%20AND%20%28DrinkingWater%20OR%20Sanitation%20OR%20Hygiene%29%20AND%20SouthAsia%20AND%20Women%29
18	"Climate" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Women"	0	https://www.sciencedirect.com/search?date=2010-2018&qs=Climate%20AND%20Assessment%20AND%20%28DrinkingWater%20OR%20Sanitation%20OR%20Hygiene%29%20AND%20SouthAsia%20AND%20Women%29

S. No.	Combination	Number of total results (abstract, title, and keywords; open access)	Link
5	"Climate Risk" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Low Income"	0	https://www.sciencedirect.com/keyword/202386046?query=Climate+Risk+AND+Drinking+water+OR+Sanitation+OR+Hygiene+AND+South+Asia+AND+Low+Income
6	"Climate Risk" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Low Income"	0	https://www.sciencedirect.com/keyword/202386046?query=Climate+Risk+AND+Assessment+AND+Drinking+water+OR+Sanitation+OR+Hygiene+AND+South+Asia+AND+Low+Income
7	"Climate Change" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Low Income"	0	https://www.sciencedirect.com/keyword/202386046?query=Climate+Change+AND+Drinking+water+OR+Sanitation+OR+Hygiene+AND+South+Asia+AND+Low+Income
8	"Climate Change" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Low Income"	0	https://www.sciencedirect.com/keyword/202386046?query=Climate+Change+AND+Assessment+AND+Drinking+water+OR+Sanitation+OR+Hygiene+AND+South+Asia+AND+Low+Income
9	"Climate Risk" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Low Income"	0	https://www.sciencedirect.com/keyword/202386046?query=Climate+Risk+AND+Drinking+water+OR+Sanitation+OR+Hygiene+AND+India+AND+Low+Income
10	"Climate Risk" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Low Income"	0	https://www.sciencedirect.com/keyword/202386046?query=Climate+Risk+AND+Assessment+AND+Drinking+water+OR+Sanitation+OR+Hygiene+AND+India+AND+Low+Income
11	"Climate Change" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Low Income"	0	https://www.sciencedirect.com/keyword/202386046?query=Climate+Change+AND+Drinking+water+OR+Sanitation+OR+Hygiene+AND+India+AND+Low+Income
12	"Climate Change" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Low Income"	0	https://www.sciencedirect.com/keyword/202386046?query=Climate+Change+AND+Assessment+AND+Drinking+water+OR+Sanitation+OR+Hygiene+AND+India+AND+Low+Income
13	"Climate" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Low Income"	9	https://www.sciencedirect.com/keyword/202386046?query=Climate+AND+Drinking+water+OR+Sanitation+OR+Hygiene+AND+Low+Income
14	"Climate" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Low Income" AND "Assessment"	2	https://www.sciencedirect.com/keyword/202386046?query=Climate+AND+Drinking+water+OR+Sanitation+OR+Hygiene+AND+Low+Income+AND+Assessment
15	"Climate" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Low Income"	0	https://www.sciencedirect.com/keyword/202386046?query=Climate+AND+Drinking+water+OR+Sanitation+OR+Hygiene+AND+India+AND+Low+Income
16	"Climate" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Low Income"	0	https://www.sciencedirect.com/keyword/202386046?query=Climate+AND+Assessment+AND+Drinking+water+OR+Sanitation+OR+Hygiene+AND+India+AND+Low+Income
17	"Climate" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Low Income"	0	https://www.sciencedirect.com/keyword/202386046?query=Climate+AND+Drinking+water+OR+Sanitation+OR+Hygiene+AND+South+Asia+AND+Low+Income
18	"Climate" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Low Income"	0	https://www.sciencedirect.com/keyword/202386046?query=Climate+AND+Assessment+AND+Drinking+water+OR+Sanitation+OR+Hygiene+AND+South+Asia+AND+Low+Income

S. No.	Combination	Number of total results (abstract, title, and keywords; open access)	Link
	"Hygiene") AND "South Asia" AND "Low Income"		
19	"Climate" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Low Income"	1	https://www.sciencedirect.com/lookup/https://doi.org/10.1016/j.sbspro.2014.03.001?hl=climate%20AND%20vulnerability%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20low%20income%20AND%20south%20asia&pg=PA103
20	"Climate" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Low Income"	0	https://www.sciencedirect.com/lookup/https://doi.org/10.1016/j.sbspro.2014.03.001?hl=climate%20AND%20vulnerability%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20india%20AND%20low%20income&pg=PA103
21	"Climate" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Low Income"	0	https://www.sciencedirect.com/lookup/https://doi.org/10.1016/j.sbspro.2014.03.001?hl=climate%20AND%20vulnerability%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20south%20asia%20AND%20low%20income&pg=PA103
22	"Climate Change" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Low Income"	1	https://www.sciencedirect.com/lookup/https://doi.org/10.1016/j.sbspro.2014.03.001?hl=climate%20change%20AND%20vulnerability%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20low%20income&pg=PA103
23	"Climate Change" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Low Income"	0	https://www.sciencedirect.com/lookup/https://doi.org/10.1016/j.sbspro.2014.03.001?hl=climate%20change%20AND%20vulnerability%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20india%20AND%20low%20income&pg=PA103
24	"Climate Change" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Low Income"	0	https://www.sciencedirect.com/lookup/https://doi.org/10.1016/j.sbspro.2014.03.001?hl=climate%20change%20AND%20vulnerability%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20south%20asia%20AND%20low%20income&pg=PA103
25	"Climate Risk" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Low Income"	0	https://www.sciencedirect.com/lookup/https://doi.org/10.1016/j.sbspro.2014.03.001?hl=climate%20risk%20AND%20vulnerability%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20low%20income&pg=PA103
26	"Climate Risk" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Low Income"	0	https://www.sciencedirect.com/lookup/https://doi.org/10.1016/j.sbspro.2014.03.001?hl=climate%20risk%20AND%20vulnerability%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20india%20AND%20low%20income&pg=PA103
27	"Climate Risk" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Low Income"	0	https://www.sciencedirect.com/lookup/https://doi.org/10.1016/j.sbspro.2014.03.001?hl=climate%20risk%20AND%20vulnerability%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20south%20asia%20AND%20low%20income&pg=PA103
7	Social Category - Caste		
1	"Climate Risk" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Caste"	0	https://www.sciencedirect.com/lookup/https://doi.org/10.1016/j.sbspro.2014.03.001?hl=climate%20risk%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20caste&pg=PA103
2	"Climate Risk" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Caste"	0	https://www.sciencedirect.com/lookup/https://doi.org/10.1016/j.sbspro.2014.03.001?hl=climate%20risk%20AND%20assessment%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20caste&pg=PA103
3	"Climate Change" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Caste"	0	https://www.sciencedirect.com/lookup/https://doi.org/10.1016/j.sbspro.2014.03.001?hl=climate%20change%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20caste&pg=PA103

S. No.	Combination	Number of total results (abstract, title, and keywords; open access)	Link
18	"Climate" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Caste"	0	https://www.sciencedirect.com/search?date=2010-2018&q=%22Climate%22%20AND%20%22Assessment%22%20AND%20%22Drinking%20water%22%20OR%20%22Sanitation%22%20OR%20%22Hygiene%22%20AND%20%22South%20Asia%22%20AND%20%22Caste%22
19	"Climate" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Caste"	1	https://www.sciencedirect.com/search?date=2010-2018&q=%22Climate%22%20AND%20%22Vulnerability%22%20AND%20%22Drinking%20water%22%20OR%20%22Sanitation%22%20OR%20%22Hygiene%22%20AND%20%22Caste%22
20	"Climate" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Caste"	1	https://www.sciencedirect.com/search?date=2010-2018&q=%22Climate%22%20AND%20%22Vulnerability%22%20AND%20%22Drinking%20water%22%20OR%20%22Sanitation%22%20OR%20%22Hygiene%22%20AND%20%22India%22%20AND%20%22Caste%22
21	"Climate" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Caste"	0	https://www.sciencedirect.com/search?date=2010-2018&q=%22Climate%22%20AND%20%22Vulnerability%22%20AND%20%22Drinking%20water%22%20OR%20%22Sanitation%22%20OR%20%22Hygiene%22%20AND%20%22South%20Asia%22%20AND%20%22Caste%22
22	"Climate Change" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Caste"	0	https://www.sciencedirect.com/search?date=2010-2018&q=%22Climate%22%20AND%20%22Change%22%20AND%20%22Vulnerability%22%20AND%20%22Drinking%20water%22%20OR%20%22Sanitation%22%20OR%20%22Hygiene%22%20AND%20%22Caste%22
23	"Climate Change" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Caste"	0	https://www.sciencedirect.com/search?date=2010-2018&q=%22Climate%22%20AND%20%22Change%22%20AND%20%22Vulnerability%22%20AND%20%22Drinking%20water%22%20OR%20%22Sanitation%22%20OR%20%22Hygiene%22%20AND%20%22India%22%20AND%20%22Caste%22
24	"Climate Change" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Caste"	0	https://www.sciencedirect.com/search?date=2010-2018&q=%22Climate%22%20AND%20%22Change%22%20AND%20%22Vulnerability%22%20AND%20%22Drinking%20water%22%20OR%20%22Sanitation%22%20OR%20%22Hygiene%22%20AND%20%22South%20Asia%22%20AND%20%22Caste%22
25	"Climate Risk" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Caste"	0	https://www.sciencedirect.com/search?date=2010-2018&q=%22Climate%22%20AND%20%22Risk%22%20AND%20%22Vulnerability%22%20AND%20%22Drinking%20water%22%20OR%20%22Sanitation%22%20OR%20%22Hygiene%22%20AND%20%22Caste%22
26	"Climate Risk" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "India" AND "Caste"	0	https://www.sciencedirect.com/search?date=2010-2018&q=%22Climate%22%20AND%20%22Risk%22%20AND%20%22Vulnerability%22%20AND%20%22Drinking%20water%22%20OR%20%22Sanitation%22%20OR%20%22Hygiene%22%20AND%20%22India%22%20AND%20%22Caste%22
27	"Climate Risk" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "South Asia" AND "Caste"	0	https://www.sciencedirect.com/search?date=2010-2018&q=%22Climate%22%20AND%20%22Risk%22%20AND%20%22Vulnerability%22%20AND%20%22Drinking%20water%22%20OR%20%22Sanitation%22%20OR%20%22Hygiene%22%20AND%20%22South%20Asia%22%20AND%20%22Caste%22
8	Sector - Infrastructure		
1	"Climate Risk" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure"	0	https://www.sciencedirect.com/search?date=2010-2018&q=%22Climate%22%20AND%20%22Risk%22%20AND%20%22Drinking%20water%22%20OR%20%22Sanitation%22%20OR%20%22Hygiene%22%20AND%20%22Infrastructure%22
2	"Climate Risk" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure"	0	https://www.sciencedirect.com/search?date=2010-2018&q=%22Climate%22%20AND%20%22Risk%22%20AND%20%22Assessment%22%20AND%20%22Drinking%20water%22%20OR%20%22Sanitation%22%20OR%20%22Hygiene%22%20AND%20%22Infrastructure%22
3	"Climate Risk" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure"	0	https://www.sciencedirect.com/search?date=2010-2018&q=%22Climate%22%20AND%20%22Risk%22%20AND%20%22Vulnerability%22%20AND%20%22Drinking%20water%22%20OR%20%22Sanitation%22%20OR%20%22Hygiene%22%20AND%20%22Infrastructure%22

S. No.	Combination	Number of total results (abstract, title, and keywords; open access)	Link
4	"Climate Change" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure"	31	https://www.sciencedirect.com/keyword?keyword=Climate+Change&subkeyword=Drinking+water%2C+Sanitation%2C+Hygiene&accessType=openAccess&selectAccessTypes=OpenAccess&accessType=OpenAccess
5	"Climate Change" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure"	6	https://www.sciencedirect.com/keyword?keyword=Climate+Change&subkeyword=Assessment&subkeyword=Drinking+water%2C+Sanitation%2C+Hygiene&accessType=openAccess&selectAccessTypes=OpenAccess&accessType=OpenAccess
6	"Climate Change" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure"	10	https://www.sciencedirect.com/keyword?keyword=Climate+Change&subkeyword=Vulnerability&subkeyword=Drinking+water%2C+Sanitation%2C+Hygiene&accessType=openAccess&selectAccessTypes=OpenAccess&accessType=OpenAccess
7	"Climate" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure"	48	https://www.sciencedirect.com/keyword?keyword=Climate&subkeyword=Drinking+water%2C+Sanitation%2C+Hygiene&accessType=openAccess&selectAccessTypes=OpenAccess&accessType=OpenAccess
8	"Climate" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure"	8	https://www.sciencedirect.com/keyword?keyword=Climate&subkeyword=Assessment&subkeyword=Drinking+water%2C+Sanitation%2C+Hygiene&accessType=openAccess&selectAccessTypes=OpenAccess&accessType=OpenAccess
9	"Climate" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure"	15	https://www.sciencedirect.com/keyword?keyword=Climate&subkeyword=Vulnerability&subkeyword=Drinking+water%2C+Sanitation%2C+Hygiene&accessType=openAccess&selectAccessTypes=OpenAccess&accessType=OpenAccess
10	"Climate Risk" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "India"	0	https://www.sciencedirect.com/keyword?keyword=Climate+Risk&subkeyword=Drinking+water%2C+Sanitation%2C+Hygiene&subkeyword=Infrastructure&subkeyword=India&accessType=openAccess&selectAccessTypes=OpenAccess&accessType=OpenAccess
11	"Climate Risk" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "India"	0	https://www.sciencedirect.com/keyword?keyword=Climate+Risk&subkeyword=Assessment&subkeyword=Drinking+water%2C+Sanitation%2C+Hygiene&subkeyword=Infrastructure&subkeyword=India&accessType=openAccess&selectAccessTypes=OpenAccess&accessType=OpenAccess
12	"Climate Risk" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "India"	0	https://www.sciencedirect.com/keyword?keyword=Climate+Risk&subkeyword=Vulnerability&subkeyword=Drinking+water%2C+Sanitation%2C+Hygiene&subkeyword=Infrastructure&subkeyword=India&accessType=openAccess&selectAccessTypes=OpenAccess&accessType=OpenAccess
13	"Climate Change" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "India"	0	https://www.sciencedirect.com/keyword?keyword=Climate+Change&subkeyword=Drinking+water%2C+Sanitation%2C+Hygiene&subkeyword=Infrastructure&subkeyword=India&accessType=openAccess&selectAccessTypes=OpenAccess&accessType=OpenAccess
14	"Climate Change" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "India"	0	https://www.sciencedirect.com/keyword?keyword=Climate+Change&subkeyword=Assessment&subkeyword=Drinking+water%2C+Sanitation%2C+Hygiene&subkeyword=Infrastructure&subkeyword=India&accessType=openAccess&selectAccessTypes=OpenAccess&accessType=OpenAccess
15	"Climate Change" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "India"	1	https://www.sciencedirect.com/keyword?keyword=Climate+Change&subkeyword=Vulnerability&subkeyword=Drinking+water%2C+Sanitation%2C+Hygiene&subkeyword=Infrastructure&subkeyword=India&accessType=openAccess&selectAccessTypes=OpenAccess&accessType=OpenAccess
16	"Climate" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "India"	3	https://www.sciencedirect.com/keyword?keyword=Climate&subkeyword=Drinking+water%2C+Sanitation%2C+Hygiene&subkeyword=Infrastructure&subkeyword=India&accessType=openAccess&selectAccessTypes=OpenAccess&accessType=OpenAccess
17	"Climate" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "India"	0	https://www.sciencedirect.com/keyword?keyword=Climate&subkeyword=Assessment&subkeyword=Drinking+water%2C+Sanitation%2C+Hygiene&subkeyword=Infrastructure&subkeyword=India&accessType=openAccess&selectAccessTypes=OpenAccess&accessType=OpenAccess

S. No.	Combination	Number of total results (abstract, title, and keywords; open access)	Link
	"Hygiene") AND "Infrastructure" AND "India"		
18	"Climate" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "India"	1	https://www.sciencedirect.com/search?date=2024-08-26&qs=climate%20AND%20vulnerability%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20infrastructure%20AND%20india
19	"Climate" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "South Asia"	1	https://www.sciencedirect.com/search?date=2024-08-26&qs=climate%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20infrastructure%20AND%20south%20asia
20	"Climate" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "South Asia"	0	https://www.sciencedirect.com/search?date=2024-08-26&qs=climate%20AND%20assessment%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20infrastructure%20AND%20south%20asia
21	"Climate" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "South Asia"	1	https://www.sciencedirect.com/search?date=2024-08-26&qs=climate%20AND%20vulnerability%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20infrastructure%20AND%20south%20asia
22	"Climate Risk" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "South Asia"	0	https://www.sciencedirect.com/search?date=2024-08-26&qs=climate%20risk%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20infrastructure%20AND%20south%20asia
23	"Climate Risk" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "South Asia"	0	https://www.sciencedirect.com/search?date=2024-08-26&qs=climate%20risk%20AND%20assessment%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20infrastructure%20AND%20south%20asia
24	"Climate Risk" AND "Vulnerability" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "South Asia"	0	https://www.sciencedirect.com/search?date=2024-08-26&qs=climate%20risk%20AND%20vulnerability%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20infrastructure%20AND%20south%20asia
25	"Climate Change" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "South Asia"	1	https://www.sciencedirect.com/search?date=2024-08-26&qs=climate%20change%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20infrastructure%20AND%20south%20asia
26	"Climate Change" AND "Assessment" AND ("Drinking water" OR "Sanitation" OR "Hygiene") AND "Infrastructure" AND "South Asia"	0	https://www.sciencedirect.com/search?date=2024-08-26&qs=climate%20change%20AND%20assessment%20AND%20drinking%20water%20OR%20sanitation%20OR%20hygiene%20AND%20infrastructure%20AND%20south%20asia

We deployed different search strategies for the two, the details of which are as follows:

Search strategy for non-grey literature:

- The first step was identifying **search databases and platforms**. We utilised the following two in the WASH sector.
 - ScienceDirect** is a 25-year-old full-text scientific database provided by the scientific publishing company Elsevier (ScienceDirect 2024). It consists of interdisciplinary and peer-reviewed scholarly literature, which, as of August 2024, consists of a database of about 2,900 peer-reviewed journals, which include 21 million articles and book chapters, 800 open-access journals,

and 3.3 million open-access articles (ScienceDirect 2024). Utilized the ScienceDirect search feature to locate the title and abstract, with the following details:

- Search Index: Keyword (out of 36 available options)
- Search term: Phrases built for search
- Search tools - open access and hide duplicates
- Year of publication - 2010 to 2023
- Type of articles - review and research articles
- Language - English
- Available in - open-access
- **Cisne** - Cisne is the search engine of the Complutense University of Madrid Library, which provides access to more than 3 million printed, audio-visual, and electronic documents through 81 databases (Complutense University of Madrid 2024). The research team had complete access to the account, allowing the use of the Cisne Advanced search feature with the following details:
 - Search Index: Keywords (out of 36 available options).
 - Search term: Phrases built for search
 - Search databases: All multidisciplinary databases (ERIC, JSTOR Arts & Sciences I Collection, JSTOR Arts & Sciences II Collection, JSTOR Business I Collection, JSTOR Mathematics & Statistics Legacy Collection, MEDLINE, Project Muse, ProQuest Central, PsycARTICLES, Sociology Database, WorldCat Dissertations and Theses, and WorldCat.org)
 - Search tools - open access, English, peer-reviewed, and hide duplicates
 - Year of publication - 2010 to 2023
 - Formats - All
 - Available in - libraries around the world

2. The second step involved creating search phrases. We used the PICOST framework to divide the systematic literature review (SLR) objectives into searchable keywords and combinations. We combined the necessary keywords in various arrangements using the Boolean operators 'AND' and 'OR.' The 'OR' operator ensured that each search included at least one of the three areas of WASH (drinking water, sanitation, hygiene). In total, we developed 185 search phrases across eight categories.

Search strategy for grey literature

1. The first step was to identify search platforms. For grey literature, this meant identifying the think tanks and multilateral organisations that had published work aligned with the SLR's objectives. We relied on our collective professional experience and a simple Google search for "climate change and WASH." Research from UNICEF, the World Bank, the Institute for Resource Analysis and Policy (IRAP), Water Aid, and the Centre for Advocacy and Research (CFAR) appeared on the first page of Google search results. It aligned with the authors' intuitive understanding. We scanned the websites of these organisations for work that met the search criteria in the second step. We deployed various strategies for the websites of different organisations.
 - World Bank -We used the World Bank's open knowledge repository to find information on climate change, drinking water, sanitation, and hygiene. The applied filters were:
 - Start year: 2010
 - End year: 2023
 - Supported language: English
 - Topic: Water supply and sanitation
 - Document type: Publications and research
 - Subject: Climate change

- UNICEF - Their 'resources' were scanned for 'publication' using the following criteria:
 - Resource topic: water, sanitation and hygiene
 - Year: 2024, 2023, 2022, 2021, 2020, 2019, 2018, 2017, 2016, 2015, 2014, 2013, 2012, 2011, and 2010
- Institute for Resource Analysis and Policy (IRAP) - Their study and research reports, whose downloadable links were available on the d, scanned the 'publications' section for relevant years.
- Water Aid, India—We scanned the relevant years' publications in Water Aid, India's 'resources' section.

Annexure 5: Results from a systematic review of the literature

- **Non-Grey literature**

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
1	Development of a Generic Domestic Water Security Index and Its Application in Addis Ababa, Ethiopia	(Assefa et al. 2018)	Yonas T. Assefa, Mukand S. Babel, Janez Sušnik and Victor R. Shinde	2018	This paper develops a new domestic water security assessment framework for water supply, sanitation, and hygiene through twelve indicators.
2	Using the sectoral and statistical demand to availability index to assess freshwater scarcity risk and the effect of water resource management	(Yano et al. 2020)	Shinjiro Yano, Masahiro Yamaguchi, Eiji Yokoi, Takuhiro Kanayama, Akihiro Kubota, Daikichi Ogawada, Akiko Matsumura, Martin Gomez-Garcia, Raymond Valiant Ruritan, Taikan Oki	2020	In this study, we propose to compare volumes of available water and demand using a Sectoral and Statistical Demand to Availability (SS-DTA) index. This index is distinctive due to its use of monthly volumes of available and required water, the inclusion of environmental water requirements, and the statistical relevance of the evaluation.
3	Water purification and sanitation infrastructure improvements may reduce the diarrheal burden in remote Nicaragua's marginalised and flood-prone population	(Denslow et al. 2010)	Sheri A Denslow, Jess Edwards, Jennifer Horney, Rodolfo Peña, Daniel Wurzelmann, Douglas Morgan	2010	This study aimed to assess the relationship between water and latrine infrastructure and the prevalence of diarrhoea in this region.

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
4	Effects of Climate Change on Drinking Water Distribution Network Integrity: Predicting Pipe Failure Resulting from Differential Soil Settlement	(Wols, van Daal, and van Thienen 2014)	B.A. Wols, K. van Daal, P. van Thienen	2014	It is a method for predicting pipe failures caused by differential settlement influenced by climate change. The paper implemented a probabilistic model for pipe failure within a geographic information system (GIS) environment.
5	Nature-based solutions in informal settlements: A systematic review of projects in Southeast Asian and Pacific countries	(Wolff, Rauf, and Hamel 2023)	Erich Wolff, Hanna A. Rauf, Perrine Hamel	2023	We analyse grey and academic sources to examine past NbS projects in informal settlements in Southeast Asian and Pacific countries.
6	Learning from Floods—How a Community Develops Future Resilience	(Auliagisni, Wilkinson, and Elkharboutly 2022)	Widi Auliagisni, Suzanne Wilkinson, Mohamed Elkharboutly	2022	This study identifies resilience in practice, focusing on how communities create resilience and develop sustainable river catchment management
7	“We Don’t Drink the Water Here”: The Reproduction of Undrinkable Water for First Nations in Canada	(Baijous and Patrick 2019)	Warrick Baijous, Robert J. Patrick	2019	This paper uses a political ecology approach to identify key factors contributing to the current water problem in many First Nation communities.
8	Quantitative assessment of exposure to faecal contamination in urban environment across nine cities in low-income and lower-middle-income countries and a city in the United States	(Wang et al. 2022)	Yuke Wang, Wolfgang Mairinger, Suraja J. Raj, Habib Yakubu, Casey Siesel, Jamie Green, Sarah Durry, George Joseph, Mahbubur Rahman, Nuhu Amin, Md. Zahidul Hassan, James Wicken, Dany Dourng, Eugene Larbi, Lady Asantewa B. Adomako, Ato Kwamena Senayah, Benjamin Doe, Richard Buamah, Joshua Nii Noye Tetteh-Nortey, Gagandeep Kang, Arun Karthikeyan, Sheela Roy, Joe	2022	Assess and compare the risk of exposure to faecal contamination via multiple pathways in ten cities.

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
			Brown, Bacelar Muneme, Seydina O. Sene, Benedict Tuffuor, Richard K. Mugambe, Najib Lukooya Bateganya, Trevor Surrridge, Grace Mwanza Ndashe, Kunda Ndashe, Radu Ban, Alyse Schrecongost, Christine L. Moe		
9	Linking drought indices to impacts to support drought risk assessment in Liaoning province, China	(Wang et al. 2020)	Yaxu Wang, Juan Lv, Jamie Hannaford, Yicheng Wang, Hongquan Sun, Lucy J. Barker, Miaomiao Ma, Zhicheng Su, Michael Eastman	2020	This study aims to explore the link between drought indices and drought impacts, using Liaoning province (northeast China) as a case study due to its history of drought occurrences
10	Dynamics of pathogens and faecal indicators during riverbank filtration in times of high and low river levels	(Wang, Knabe, et al. 2022)	He Wang, Dustin Knabe, Irina Engelhardt, Bjorn Droste, Hans-Peter Rohns, Christine Stumpp, Johannes Ho, Christian Griebler	2022	In this study, we explored the removal of adenovirus compared with several commonly used bacterial and viral water quality indicators during different river levels.
11	A procedure to support the distribution of drinking water for victims of drought: the case of the Brazilian semi-arid region	(Medeiros et al. 2020)	Jesus E. M. Vieira, Renata A. M. Bandeira, Luiz A. S. Lopes, Orivalde S. Silva Júnior, Marcílio M. Batista Júnior	2020	This paper proposes a procedure for planning water distribution in scenarios developing countries facing drought, following a new logistics approach.
12	Heat stress and inadequate sanitary workplace facilities - an occupational health concern for women?	(Venugopal et al. 2016)	Vidhya Venugopal, Shanmugam Rekha, Krishnamoorthy Manikandan, Perumal Kamalakkannan Latha, Viswanathan Vennila, Nalini Ganesan, Perumal Kumaravel, Stephen Jeremiah Chinnadurai	2016	The study investigated the health implications for women workers exposed to hot work environments and inadequate workplace sanitation facilities.

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
13	Expressing collective voices on children's health: photovoice exploration with mothers of young children from the Indian Sundarbans	(Ghosh et al. 2016)	Upasona Ghosh, Shibaji Bose, Rittika Bramhachari, Sabyasachi Mandal	2016	This study unlocks mothers' voices on their children's health determinants to inform local decision-making on child health issues in the Indian Sundarbans.
14	Environmental temperature and growth faltering in African children: a cross-sectional study	(Tusting et al. 2020)	Lucy S Tusting, John Bradley, Samir Bhatt, Harry S Gibson, Daniel J Weiss, Fiona C Shenton, Steve W Lindsay	2020	A study to assess whether child growth faltering is related to environmental temperature in sub-Saharan Africa.
15	Flooding and emergency room visits for gastrointestinal illness in Massachusetts: a case-crossover study	(Wade et al. 2014)	Timothy J. Wade, Cynthia J. Lin, Jyotsna S. Jagai, Elizabeth D. Hilborn	2014	A case-crossover study investigated the association between flooding and emergency room visits for gastrointestinal illness (ER-GI) in Massachusetts from 2003 through 2007.
16	Urban Ecosystem Services for Resilience Planning and Management in New York City	(McPhearson, Hamstead, and Kremer 2014)	Timon McPhearson, Zoe' A. Hamstead, Peleg Kremer	2014	We review the current state of knowledge about New York City (NYC) urban ecosystem services and how these services are regulated, planned for, and managed.
17	Double Exposures: Future Water Security across Urban Southeast Asia	(Lorenzo and Kinzig 2019)	Theresa E. Lorenzo, Ann P. Kinzig	2019	Using the double exposure framework, analyse the combined effect of economic development and climate change on the future water security of middle-income Southeast Asian countries, focusing on the impact in urban areas.
18	Future drought propagation through the water-energy-food-ecosystem nexus – A Nordic perspective	(Teutschbein et al. 2023)	Claudia Teutschbein, Elise Jonsson, Andrijana Todorovi', Faranak Tootoonchi, Elin Stenfors, Thomas Grabs	2023	This manuscript demonstrates a novel approach to assessing future drought conditions through the lens of the water-energy-food-ecosystem (WEFE) nexus concept
19	Politicisation of water, humanitarian response, and health in Syria as a contributor to the ongoing cholera outbreak	(Tarnas et al. 2023)	Maia C. Tarnas, Nabil Karah, Naser Almhawish, Ibrahim Aladhan, Radwan Alobaid, Aula Abbara	2023	Cholera outbreaks can be prevented entirely in Syria. The ongoing conflict has severely compromised the right to health in the country, as demonstrated by the current situation.

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
20	Valuing the reduction of floods: Public officials versus citizens' preferences	(Spegel 2017)	Elin Spegel	2017	This paper analyses the preferences of public officials and citizens related to the impacts of floods in the Gothenburg region in Sweden
21	Perceptions of workplace heat exposure and adaption behaviours among Chinese construction workers in the context of climate change	(Han et al. 2021)	Shu-Rong Han, Mingru Wei, Zhifeng Wu, Shanshan Duan, Xiangzhe Chen, Jiayuan Yang, Matthew A. Borg, Jinfeng Lin, Chuancheng Wu, Jianjun Xiang	2021	This study aims to investigate the perceptions and adaptation behaviours of heat exposure among construction workers and provide evidence for developing targeted heat adaptation strategies nationally and internationally.
22	Impacts of flood on the health of the Iranian population: Infectious diseases with an emphasis on parasitic infections	(Shokri, Sabzevari, and Hashemi 2020)	Azar Shokri, Sadaf Sabzevari, Seyed Ahmad Hashemi	2020	This review aimed to discuss the potential undesirable outcomes of flooding that occurred in 2019 in Iran
23	Implementation of Water Safety Plan Considering Climatic Disaster Risk Reduction in Bangladesh: A Study on Patuakhali Pourashava Water Supply System	(Shamsuzzoha, Kormoker, and Ghosh 2018)	Md. Shamsuzzoha, Tapos Kormoker, Rajan Chandra Ghosh	2018	This research aims to find out the significant disaster risks which have subsequent impacts on the water supply system
24	Application of deep convolutional networks for improved risk assessments of post-wildfire drinking water contamination	(Schmidt et al. 2023)	Andres Schmidt, Lisa M. Ellsworth, Jenna H. Tilt, Mike Gough	2023	We build on a preceding study and enhance the assessment of maximum contamination exceedance probability predictions by applying deep convolutional neural networks trained with water samples from communities affected by wildfires in California and Oregon
25	Predicting conditional maximum contaminant level exceedance probabilities for drinking water after wildfires with	(Schmidt et al. 2022)	Andres Schmidt, Lisa M. Ellsworth, Jenna H. Tilt, Mike Gough	2022	We developed and tested an approach based on neural network models to spatially predict the conditional probabilities of exceeding maximum contaminant levels for benzene after wildfires.

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
	Bayesian regularised network ensembles				
26	Health consequences of drought in the WHO Eastern Mediterranean Region: hotspot areas and needed actions	(Bellizzi et al. 2020)	Saverio Bellizzi, Chris Lane, Mohamed Elhakim, Pierre Nabeth	2020	We aimed to map hotspot countries and identified key strategic actions for health consequences
27	Building Resilience to Climate Change in Informal Settlements	(Satterthwaite et al. 2020)	David Satterthwaite, Diane Archer, Sarah Colenbrander, David Dodman, Jorgelina Hardoy, Diana Mitlin, Sheela Patel	2020	This paper considers how to build resilience to the impacts of climate change in informal settlements.
28	Including aspects of climate change into water safety planning: A literature review of global experience and case studies from Ethiopian urban supplies	(Rickert et al. 2019)	Bettina Rickert, Harold van den Bergb, Kasa Bekurec, Seble Girmad, Ana Maria de Roda Husman	2019	We reviewed the literature for published guidance and case examples on considering the climate in water safety planning to support future uptake.
29	An Integrated Information System of Climate-Water-Migrations-Conflicts Nexus in the Congo Basin	(Tshimanga et al. 2021)	Raphael M. Tshimanga, Génie-Spirou K. Lutonadio, Nana K. Kabujenda, Christian M. Sondi, Emmanuel-Tsadok N. Mihaha, Jean-Felly K. Ngandu, Landry N. Nkaba, Gerard M. Sankiana, Jules T. Beya, Anaclet M. Kombayi, Lisette M. Bonso, Augustin L. Likenge, Nicole M. Nsambi, Prisca Z. Sumbu, Yuma Bin Yuma, Michel K.	2021	An integrated information system is needed to address the climate-water-migration-conflict nexus in the Congo Basin. It finds its basis in a rigorous and multidisciplinary methodological approach that consists of designing appropriate tools for field surveys and data collection campaigns, data analysis, creating a statistical database, and creating a web interface to make this information system publicly available for users and stakeholders

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
			Bisa, Bernard M. Lututala		
30	Assessment of cascading effects of typhoons on water and sanitation services: A case study of informal settlements in Malabon, Philippines	(Purwar, Sliuzas, and Flacke 2020)	Deepshikha Purwar, Richard Sliuzas, Johannes Flacke	2020	This paper presents a method for unravelling the complexity of cascading effects, which can be applied when documented information on hazardous events is limited.
31	Relative roles of weather variables and change in human population in malaria: comparison over different states of India	(Goswami et al. 2014)	Prashant Goswami, Upadhyaya Suryanarayana Murty, Srinivasa Rao Mutheneni, Swathi Trithala Krishnan	2014	An important question is the relative roles of weather variables (vector abundance) and changes in the host (human) population in the change in disease load.
32	Africa's urban adaptation transition under a 1.5° climate	(Pelling et al. 2018)	Mark Pelling, Hayley Leck, Lorena Pasquini, Idowu Ajibade, Emanuel Osuteye, Susan Parnel, Shuaib Lwasa, Cassidy Johnson, Arabella Fraser, Alejandro Barcena, Soumana Boubacar	2018	The snapshots reveal diverse risks likely to be exacerbated by 1.5 C warming, yet risk responses and institutional transformation to cope with the new challenges still need to be improved. Drawing from insights across parallel policy domains, transitions theory emphasises change has a connection to innovation in relationships between governance actors.
33	Social and environmental risk factors for dengue in Delhi city: A retrospective study	(Telle et al. 2021)	Olivier Telle, Birgit Nikolay, Vikram Kumar, Samuel Benkimoun, Rupali Pal, BN Nagpal, Richard E. Paul	2021	We aimed to identify a novel sanitation strategy to alleviate the burden of dengue through how the dengue virus spreads through the community.
34	A spatial epidemiological analysis of self-rated mental health in the slums of Dhaka	(Gruebner et al. 2011)	Oliver Gruebner, Md Mobarak H Khan, Sven Lautenbach, Daniel Müller, Alexander Kraemer, Tobia Lakes, Patrick Hostert	2011	This paper aims to study self-rated mental health data in several slums of Dhaka, Bangladesh, by accounting for neighbourhood social and physical associations using spatial statistics.

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
35	Mental health in the slums of Dhaka - a geo-epidemiological study	(Gruebner et al. 2012)	Oliver Gruebner, M Mobarak H Khan, Sven Lautenbach, Daniel Müller, Alexander Krämer, Tobia Lakes, Patrick Hostert	2012	Employing a geo-epidemiological approach, this study identified factors that enhance mental well-being in Dhaka's slums. The city accommodates an estimated population of more than 14 million, including 3.4 million slum dwellers.
36	What is the driver behind the spatial pattern of bacillary dysentery in China from 1990 to 2009?	(Xu et al. 2014)	Zhiwei Xu, Wenbiao Hu, Yewu Zhang, Xiaofeng Wang, Shilu Tong, Maigeng Zhou	2014	This study assessed BD's geographic distribution and seasonality in China over the past two decades.
37	Using Stormwater in a Sponge City as a New Wing of Urban Water Supply—A Case Study	(Köster et al. 2023)	Stephan Köster, Greta Hadler, Lea Opitz, Anna Thoms	2023	The concept presented here addresses existing urban neighbourhoods and proposes to collect rainwater from nearby rooftops and treat it in decentral treatment units called “City Water Hubs” (CWH) equipped with modular coupled low-energy technologies to produce various customised “City Water” qualities and store it until it can be used or distributed
38	Environmental Determinants of Cholera Outbreaks in Inland Africa: A Systematic Review of Main Transmission Foci and Propagation Routes	(Rebaudet et al. 2013)	Stanislas Rebaudet, Bertrand Sudre, Benoît Faucher, Renaud Piarroux	2013	
39	Assessment of the implementation of community-led total sanitation, hygiene, and associated factors in Diretiyara district, Eastern Ethiopia	(Rogerson and Rogerson 2019)	Roba Argaw Tessema	2019	This study aims to assess the implementation of community-led total sanitation and hygiene (CLTSH) and the associated factors in Eastern Ethiopia.

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
40	Drinking water vulnerability to climate change and alternatives for adaptation in coastal South and South East Asia	(Hoque et al. 2016)	M. A. Hoque, P. F. D. Scheelbeek, P. Vineis, A. E. Khan, K. M. Ahmed, A. P. Butler	2016	This paper assesses spatial vulnerabilities to the salinisation of drinking water sources due to meteorological variability and climate change along the (ca. 6000 km) coastline of SSE Asia.
41	Impacts and implications of climate change on wastewater systems: A New Zealand perspective	(Hughes et al. 2021)	James Hughes, Katherine Cowper-Heays, Erica Olesson, Rob Bell, Adolf Stroombergen	2021	To understand the significance of climate change impacts on wastewater systems, assess their broad implications, and provide recommendations for decision-makers to mitigate these challenges effectively.
42	The floods of 2022: Economic and health crisis hits Pakistan	(Iqbal et al. 2022)	Maham Iqbal, Azkah Rabbani, Fatima Haq, Sunaina Bhimani	2022	The paper highlights the urgent need to address the devastating impact of Pakistan's flood crisis, exacerbated by climate change. It advocates for actions to alleviate the suffering of affected communities and to prevent future disasters.
43	Strategies for building resilience to hazards in water, sanitation, and hygiene (WASH) systems: The role of public-private partnerships	(Johannessen et al. 2014)	Åse Johannessen, Arno Rosemarin, Frank Thomalla, Åsa Gerger Swartling, Thor Axel Stenström, Gregor Vulturius	2014	Identify strategies for investments by public and private partnerships (PPPs) based on an enhanced understanding of how to improve the resilience of WASH systems to water-related hazards (e.g., floods and water scarcity).
44	Anticipatory decision-making for cholera in Malawi	(Antarpreet Jutla et al. 2023)	Antarpreet Jutla, Moiz Usmani, Kyle D. Brumfield, Komalpreet Singh, Fergus McBean, Amy Potter, Angelica Gutierrez, Samuel Gama, Anwar Huq, Rita R. Colwell	2023	The paper highlights the relationship between climate change and the prevalence of cholera in Malawi, emphasising how climate and weather processes influence the dynamics of <i>Vibrio cholerae</i> , the bacteria responsible for cholera outbreaks. Additionally, it aims to propose a solution to mitigate the burden of cholera by employing predictive intelligence. This method uses mathematical algorithms to combine various data sources, such as earth observations, microbiological information, sociological insights, and weather patterns, to predict cholera outbreaks.

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
45	Drought and water policy in Australia face challenges from water trading and climate change adaptation in the Murray-Darling Basin.	(Kiem 2013)	Anthony S. Kiem	2013	review historical and existing drought and water policies in Australia to assess their effectiveness in enabling adaptation to climate change. Specifically, the paper investigates the social, economic, and environmental costs and benefits of water trading and the limitations of using market-based instruments (MBIs) such as water trading for adapting to drought and water security-related climate change impacts.
46	Health effects of climate change in Africa: A call for improved implementation of prevention measures	(Moyo et al. 2023)	Enos Moyo, Leroy Gore Nhari, Perseverance Moyo, Grant Murewanhema, Tafadzwa Dzinamarira	2023	The paper aims to highlight the significant impact of climate change on Africa, particularly in terms of extreme weather events and their consequences on public health. It seeks to draw attention to the vulnerability of African populations to climate change-related hazards. It emphasises the urgent need for improved strategies to mitigate the health effects of climate change in the region. It likely advocates for enhanced implementation of measures to safeguard access to clean water, sanitation, and healthcare facilities and address mental health disorders arising from natural disasters and extreme weather events.
47	Emerging neglected helminthiasis and determinants of multiple helminth infections in flood-prone township in Myanmar	(Han et al. 2019)	Kay Thwe Han, Khin Thet Wai, Kyin Hla Aye, Khine Wah Kyaw, Wai Phyto Maung and Tin Oo	2019	<ol style="list-style-type: none"> 1. To ascertain the prevalence and determinants of multiple species helminth infections to inform township-level integrated interventions. 2. To discuss emerging evidence of neglected zoonotic helminths and propose strategies for deworming interventions, including the introduction of periodic mopping-up and a selective deworming plan for vulnerable groups.

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
48	Drinking water vulnerability to climate change and alternatives for adaptation in coastal South and South East Asia	(Hoque et al. 2016)	M. A. Hoque, P. F. D. Scheelbeek, P. Vineis, A. E. Khan, K. M. Ahmed & A. P. Butler	2016	This paper assesses spatial vulnerabilities to the salinisation of drinking water sources due to meteorological variability and climate change along the (ca. 6000 km) coastline of SSE Asia.
49	Water and Health Nexus—Land Use Dynamics, Flooding, and Water-Borne Diseases in the Odaw River Basin, Ghana	(Ntajal et al. 2022)	Ntajal, Joshua; Höllermann, Britta; Falkenberg, Timo; Kistemann, Thomas; Evers, Mariele.	2022	Understanding the key drivers influencing the water–health nexus, particularly the exposure to water-borne pathogens and disease risks in the Odaw River catchment within GAMA, is key. Second, it will highlight the suitability of the research approach to integrating multi-level stakeholder participation, spatial analysis, and the modelling of intricate interactions between water and human health.
50	Gauging climate preparedness to inform adaptation needs: local level adaptation in drinking water quality in CA, USA	(Ekstrom, Bedsworth, and Fencf 2016)	Julia A. Ekstrom & Louise Bedsworth & Amanda Fencf	2016	understand the perceptions of resource managers, specifically those working in drinking water utilities in California, regarding climate change, its potential impacts on water quality, and their current adaptation activities.
51	Hydrometeorology and flood pulse dynamics drive diarrheal disease outbreaks and increase vulnerability to climate change in surface-water-dependent populations: A retrospective analysis	(Alexander et al. 2018)	Alexander, Kathleen A; Heaney, Alexandra K; Shaman, Jeffrey	2018	to assess the influence of hydrological dynamics, water quality, and meteorological variability on diarrheal disease cases among children under 5 years old in a flood pulse river-floodplain system, specifically focusing on the Chobe River in northern Botswana. Additionally, the study aims to understand the seasonal patterns of diarrheal disease and identify potential implications of climate change on waterborne diseases in surface-water-dependent populations.

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
52	Analysis of drought conditions and their impacts in a headwater stream in the Central European lower mountain ranges	(Kaule and Frei 2022)	Lisa Kaule & Sven Frei	2022	to predict and analyse potential shifts in the catchment's water balance, estimate periods of hydrological drought conditions and their characteristics
53	The health and well-being effects of drought: assessing multi-stakeholder perspectives through narratives from the UK	(Bryan et al. 2020b)	Kimberly Bryan, Sarah Ward, Liz Roberts, Mathew P. White, Owen Landeg, Tim Taylor & Lindsey McEwen	2020	to assess people's narratives of drought on health and well-being in the UK using a source-receptor-impact framing. The study aims to enhance understanding of the links between drought and health in a developed country, where the risks of water shortages due to climate change are recognised as a critical area for action.
54	Barriers and facilitators to Water, Sanitation, and Hygiene (WaSH) practices in Southern Africa: A scoping review	(Tseole et al. 2022a)	Tseole, Nkeka P; Mindu, Tafadzwa; Chester Kalinda; Chimbari, Moses	2022	Conduct a scoping review of published peer-reviewed articles on barriers and facilitators to water, sanitation, and hygiene (WaSH) practices in Southern Africa.
55	Water, Sanitation, and Hygiene Vulnerability among Rural Areas and Small Towns in South Africa: Exploring the Role of Climate Change, Marginalization, and Inequality	(Abrams et al. 2021)	Amber L. Abrams, Kirsty Carden, Charles Teta and Katinka Wågsæther	2021	Explore the application of WASH vulnerability assessments in the South African context, specifically in small towns and rural areas where access to detailed data on the provision of WASH services is often lacking. In two arid regions in South Africa, one village, HaSinari, is in Limpopo, and Prince Albert is a small town in the southern part of the Western Cape province.

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
56	Identifying (subsurface) anthropogenic heat sources that influence temperature in the drinking water distribution system	(Agudelo-Vera et al. 2017)	Claudia M. Agudelo-Vera, Mirjam Blokker, Henk de Kater, and Rob Lafort	2017	To find a method to identify heat sources and urban characteristics that locally influence the soil temperature at -1.0 m on a small spatial scale.
57	Building Resilience of Urban Slums in Dhaka, Bangladesh.	(Ahmed 2016)	Iftekhar Ahmed	2016	A slum upgrading project targeted at an urban slum settlement called Talab Camp in Dhaka, Bangladesh, from 2012 to 2013. A pilot project implemented by Habitat for Humanity.
58	A review of long-term change in surface water natural organic matter concentration in the northern hemisphere and the implications for drinking water treatment	(Anderson et al. 2023)	Lindsay E. Anderson, Isobel DeMont, Dewey D. Dunnington, Paul Bjorndahl, Dave J. Redden, Michael J. Brophy, Graham A. Gagnon	2023	The paper comprehensively reviews surface water quality responses to decreased sulfate deposition and other browning drivers in the northern hemisphere. It focuses on natural organic matter (NOM) dynamics and identifies the potential impacts of these responses on water treatment infrastructure.
59	Groundwater salinity in the Horn of Africa: Spatial prediction modelling and estimated people at risk	(Araya, Podgorski, and Berg 2023)	Dahyann Araya, Joel Podgorski, Michael Berg	2023	To spatially predict salinity concentrations in groundwater at three thresholds to provide policy-relevant information according to different relevant water quality standards in the Horn of Africa region (Djibouti, Eritrea, Ethiopia, Kenya, and Somalia). The goal is to identify the most vulnerable segments of the population: pregnant women and infants aged 0–12 months in this region.
60	Flood impacts on a water distribution network	(Arrighi et al. 2017)	Chiara Arrighi, Fabio Tarani, Enrico Vicario, and Fabio Castelli	2017	Analysis of the direct and indirect damages on a drinking water supply system caused by riverine flooding.
61	Source area management practices as remediation tool to address groundwater nitrate pollution in drinking supply wells	(Bastani and Harter 2019)	Mehrdad Bastania, Thomas Harter	2019	This paper evaluates the feasibility and long-term impacts of agricultural-managed aquifer recharge (AgMAR) in the source area of public water supply wells. It also creates a numerical model study of nitrates' fate and transport in the Modesto basin.

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
62	Water supply and hydrosocial scarcity in the Rio de Janeiro Metropolitan Area	(Britto, Formiga-Johnsson, and Carneiro 2016)	Ana Lucia Britt, Rosa Maria Formiga Johnsson, Paulo Roberto Ferreira Carneir.	2016	This article analyses the current situation regarding water supply in the Rio de Janeiro Metropolitan Area (RJMA) through the conceptual lenses of hydrosocial scarcity and the human right to water. In addition, it assesses to what extent the availability of bulk water may act as an aggravating factor in this context, especially considering recent water crises.
63	Assessing the Climate Resilience of Community-Managed Water Supplies in Ethiopia and Nepal	(Nijhawan et al. 2022)	Anisha Nijhawan, Guy Howard, Moti Poudel, Maria Pregolato, Yuen Tung Eunice Lo, Anish Ghimire, Manish Baidya, Abraham Geremew, Adrian Flint, and Yohannes Mulugeta	2022	Assess the climate resilience of community-managed water supplies in Ethiopia and Nepal.
64	Resilience in Water Infrastructures: A Review of Challenges and Adoption Strategies	(Pamidimukkala et al. 2021)	Apurva Pamidimukkala, Sharareh Kermanshachi, Nikhitha Adepu, and Elnaz Safapour	2021	The goal is to identify and categorise the challenges related to the resilience of drinking water and wastewater infrastructures and to determine the strategies that most effectively minimise their unintended consequences.
65	The changing characteristics of groundwater sustainability in Pakistan from 2002 to 2016	(Ahmed et al. 2019)	Kamal Ahmed & Shamsuddin Shahid & Mehmet Cüneyd Demirel & Nadeem Nawaz & Najeebullah Khan	2019	The objective is to explore the concept of declining groundwater levels due to overexploitation and climate change impacts, emphasise the need for sustainable management of this valuable resource, and find the main factors affecting groundwater sustainability in Pakistan. Another objective is to map the spatial patterns of groundwater-storage departure and their trends in Pakistan from 2002 to 2016.
66	Groundwater management of highly dynamic karst by assessing baseflow and quick	(Baudement et al. 2017)	Cécile Baudement, Bruno Arfib, Naomi Mazzilli, Johan Jouves, Thierry Lamarque	2017	Characterise groundwater flow in a highly dynamic karst aquifer using a global modelling approach based on rainfall and spring discharge time series.

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
	flow with a rainfall-discharge model		and Yves Guglielmi		
67	Hydrological impacts of dam regulation for hydropower production: The case of Lake Sibinacocha, Southern Peru	(Bello et al. 2023)	Cinthy Bello, Wilson Suarez, Fabian Drenkhan, Fiorella Vega-J´acome	2023	The paper addresses this gap by analysing precipitation and discharge trends using indicators of hydrologic alteration and ecoflow for natural (1965–1987) and altered (1988–2016) flow regime series in the Vilcanota-Urubamba river basin (Southern Peru) to understand the drivers of hydrological change and provide helpful information for future water resource planning.
68	Household drinking water quality and its predictors in flood-prone settings of Northwest Ethiopia: A cross-sectional community-based study	(Birhan et al. 2023)	Tsegaye Adane Birhana, Bikes Destaw Bitewa, Henok Dagnea, Dagnachew Eyachew Amarea, Jember Azanawa, Zewudu Andualema, Awrajaw Dessiea, Gebisa Guyasaa, Alem Getanehb, Ayenew Addisuc, Mengesha Geneta, Garedew Tadege Engdawa, Amensisa Hailu Tesfayea, Tigist Kibret Asmared, Tarekegn Fentie Yimer.	2023	This paper aims to assess household drinking water's physicochemical and bacteriological quality and its contributing factors in flood-prone settlements in the South Gondar Zone, Ethiopia.
69	Experts' understandings of drinking water risk management in a climate change scenario	(Boholm and Prutzer 2017)	Åsa Boholm, Madeleine Prutzer	2017	This paper focuses on one resource of utmost necessity and vulnerability to climate change: the provision of safe drinking water. From a critical perspective on the role of expertise in risk debates, this paper looks at how Swedish experts understand the risk of drinking water in a climate change scenario and how they reason about challenges to risk management and adaptation strategies.

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
70	Assessing the operation rules of a reservoir system based on a detailed modelling chain	(Bruwier et al. 2015)	M. Bruwier, S. Erpicum, M. Piroton, P. Archambeau, and B. J. Dewals	2015	The paper focuses on a system of two large multi-purpose reservoirs in the Vesdre catchment (Belgium), located in the basin of the River Meuse. First, the current operation rules of the reservoirs are analysed. Next, the impacts of the two scenarios are assessed, and enhanced operating rules are proposed in the paper to mitigate these impacts.
71	Risk Assessment of Drinking Water Supply System in the Tidal Inundation Area of Semarang – Indonesia	(Budiyono et al. 2015)	Budiyono, Praba Ginandjar, Lintang Dian Saraswati, Dina Rahayuning Pangestuti, Martini, Sutopo Patria Jati, Zen Rahfiludin	2015	The study aims to assess the risk of contamination in the drinking water supply system in Bandarharjo, an area affected by tidal inundation in Semarang City, Indonesia. It measures and evaluates water quality risks, particularly bacterial, chemical, and physical contamination. The paper assessed the three stages of the drinking water supply system levels: source/provider, distribution, and customer.
72	Assessing the water quality and status of water resources in urban and rural areas of Bhutan	(Chathuranika et al. 2023)	Imiya M. Chathuranika, Erandi Sachinthanie, Phub Zam, Miyuru B. Gunathilake, Denkar Denkar, Nitin Muttill, Amila Abeynayaka, Komali Kantamaneni, Upaka Rathnayake	2023	This paper presents Bhutan's state-of-the-art water resources and the challenges of a sustainable water supply system. It discusses in detail in detail the current water status, drinking water sources and accessibility, factors affecting water quality degradation in urban and rural areas, water treatment methods, and the implementation of sustainable drinking water accessibility with population
73	Development of subsurface drainage systems: Discharge – retention– recharge	(Janine) de Wit et al. 2022)	J.A. (Janine) de Wit, C.J. (Coen) Ritsema, G.A.P.H. (G´e) van den Eertwegh, J.C. (Jos) van Dam, R.P. (Ruud) Bartholomeus	2022	The paper provides insight into the shifting water management strategy in the Netherlands (1950–2020), with the corresponding drainage systems developing from conventional drainage (approx. 1950–1990) to controlled drainage (the 1990s onwards), climate adaptive drainage (2010 onwards) and subirrigation systems (2018 onwards). Furthermore, it provides insight into the effect of subirrigation on

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
					groundwater levels and crop yields based on international literature and measurements of Dutch field pilots.
74	A systemic method for evaluating the potential impacts of floods on network infrastructures	(Eleutério, Hattemer, and Rozan 2013)	Eleutério, J; Hattemer, C; Rozan, A.	2013	Understanding network infrastructures and their operation under exceptional circumstances is fundamental for dealing with flood risks and improving a territory's resilience. This work presents a method for evaluating potential network infrastructure dysfunctions and damage in flood cases.
75	Exploring the socioeconomic determinants of water security in developing regions	(Nkiaka 2022)	Elias Nkiaka	2022	The objectives of this study are twofold: first, to develop a composite water security metric to assess water security at a national scale, and second, to explore the determinants of water security at the same scale in three developing regions: Africa, Asia-Pacific, Latin America, and the Caribbean (LAC).
76	Application of the City Blueprint Approach in Landlocked Asian Countries: A Case Study of Ulaanbaatar, Mongolia	(Munkhsuld et al. 2020)	Enkhuur Munkhsuld, Altansukh Ochir, and Taivanbat Batbold	2020	The paper determines priorities for Integrated Water Resources Management (IWRM). It assesses the governance capacities of different organisations to address IWRM in Ulaanbaatar, the capital of the landlocked Asian country, Mongolia. (Describing the current integrated water management and governance practices in a landlocked Asian country, i.e., Mongolia; (ii) Assessing the urban water management of the capital, i.e., Ulaanbaatar city; and (iii) Reviewing the City Blueprint Approach for its applicability in the context of Mongolia and other Asian landlocked countries)
77	Proposal for a National Blueprint Framework to Monitor Progress on Water-Related Sustainable Development Goals in Europe	(Essex, Koop, and Van Leeuwen 2019)	B. Essex S. H. A. Koop C. J. Van Leeuwen	2019	Developing a proposal for a National Blueprint Framework (NBF) with 24 water-related indicators centred on Sustainable Development Goal 6 (SDG 6) - clean water and sanitation for all, each with a specific target. The NBF is designed to provide a national level of water management monitoring toward the goals for Agenda 2030 and, therefore,

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
					includes indicators for the SDGs and complementary indicators. (Europe case)
78	Water Scarcity Risk Index: A Tool for Strategic Drought Risk Management	(Thomaz et al. 2023)	Fernanda Rocha Thomaz , Marcelo Gomes Miguez, João Gabriel de Souza Ribeiro de Sá, Gabriel Windsor de Moura Alberto and João Pedro Moreira Fontes	2023	The paper presents a new planning and decision-support tool called W-ScaRI("Water Scarcity Risk Index) for monitoring water scarcity situations in a given region(Rio de Janeiro Metropolitan Region (RJMR)).
79	Effects of Climate Change on Water Quality in the Jucar River Basin (Spain)	(Gómez-Martínez et al. 2021)	Gabriel Gómez-Martínez , Lorena Galiano César Paradinas Blázquez, Toni Rubio, Carlos Prado-López , Darío Redolat , Emma Gaitán , María Pedro-Monzonís , Sergio Ferriz-Sánchez, Miguel Añó Soto, Robert Monjo , Miguel Ángel Pérez-Martín and Javier Macián Cervera	2021	This study's main objective is to analyse climate change's impact on water quality in the city of Valencia to increase the resilience of urban supplies according to these impacts on water resources. Thus, the paper shows how several parameters conditioning water quality, such as turbidity and conductivity, behave, analyse their evolution, and provide probable future scenarios using statistical decision-making tools to improve the Valencia water supply system's resilience and better plan future actions and investments.
80	Appraisal of heavy metal pollution in the water resources of Western Uttar Pradesh, India, and associated risks	(Goyal et al. 2022)	V.C. Goyal Omkar Singh Rajesh Singh Kalzang Chhoden Sandeep K. Malyan	2022	This study investigated nine heavy metal (Pb, Cu, Ni, Zn, Cr, Cd, Fe, As, and Mn) contamination in the pond sludge, pond soil, and groundwater at twenty- one villages in Western Uttar Pradesh (India) and provides a sound case for examining the toxic metal accumulation in the terrestrial water bodies.
81	Opportunities for natural infrastructure to improve urban water security in Latin America	(Tellman et al. 2018)	Beth Tellman , Robert I. McDonald, Joshua H. Goldstein, Adrian L. Vog, Martina Florke, Daniel Shemie,	2018	The paper presents a novel methodology for a continental assessment of the potential for watershed conservation activities to improve surface drinking water quality and mitigate riverine and stormwater flood risks in 70 major cities across

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
			Nathan Karres , Kari Vigerstol , Russ Dudley, Rachel Dryden, Bernhard Lehne, Paulo Petry, Fernando Veiga		Latin America. The paper aims to provide decision-relevant, initial screening information across multiple cities to identify specific city-watershed combinations that present water-related risks and potentially attractive opportunities for mitigation via natural infrastructure approaches
82	Socioeconomic impacts of flooding and its coping strategies in Nigeria: Evidence from Dagiri community, Gwagwalada area council of Abuja	(Badamosi et al. 2023)	Abiola Peace Badamosi; Adewale Isaac Olutumise; Obafemi Paul Olukoya; Ademola Adegoroye; Oluyede Adeleke Aturamu	2023	The study assesses the socioeconomic impacts of flooding and coping strategies in the Dagiri community, Gwagwalada area council of Abuja, Nigeria. The specific objectives are to investigate the vulnerable areas to flooding, examine the socio-economic impacts of flooding, and describe coping strategies employed in the study area.
83	What does resilience mean for urban water services?	(Johannessen and Wamsler 2017)	Åse Johannessen and Christine Wamsler	2017	The primary goal of this paper is to investigate how resilience thinking is integrated into urban water practices, aiming to improve our understanding of transitions toward enhanced management and sustainability in urban water services. The paper identifies seven fundamental principles or attributes that need to be considered to add value to understanding and addressing the dynamic dimension of urban water transitions.
84	Intra-seasonal rainfall and piped water revenue variability in rural Africa	(Armstrong et al. 2022)	Andrew Armstrong, Ellen Dyer, Johanna Koehler, Rob Hope	2022	The paper's main objective is to explore the impact of rainfall patterns on water usage and revenue from user payments in rural Africa. The study analyses monthly rainfall data and 4,888 records of rural piped water revenue in Ghana, Rwanda, and Uganda to quantify revenue changes over transitions between dry and wet seasons and understand the dynamics of seasonal revenue variability and its implications for the financial sustainability of rural water supply in Africa.

S. No.	Title of the paper	Citation	Authors	Year of publication	Objectives
85	Sustainability characteristics of drinking water supply in the Netherlands	(van Engelenburg et al. 2021)	Jolijn van Engelenburg, Erik van Slobbe, Adriaan J. Teuling, Remko Uijlenhoet, and Petra Hellegers	2021	The paper aims to identify and establish the sustainability characteristics that describe the Netherlands' local drinking water supply system. The research seeks to analyse the impact of various factors, such as climate change, water quality changes, and increasing demand for drinking water, on its sustainability.
86	Drinking Water Temperature around the Globe: Understanding, Policies, Challenges and Opportunities	(Agudelo-Vera et al. 2020)	Claudia Agudelo-Vera, Stefania Avvedimento, Joby Boxall , Enrico Creaco HenkdeKater, Armando Di Nardo , Aleksandar Djukic, Isabel Douterelo, Katherine E. Fish , Pedro L. Iglesias Rey , Nenad Jacimovic Zoran Kapelan, Javier Martinez Solano Olivier Piller , Carolina Montoya Pachongo , Claudia Quintiliani, Jan Rućka and Mirjam Blokker	2020	This paper critiques and comprehensively summarises the current knowledge, policies, and challenges regarding drinking water temperature research. It presents the findings from a survey of international stakeholders and identifies knowledge gaps, challenges, and opportunities for monitoring and analysis.
87	Climate change vulnerability index for South African aquifers	(Dennis and Dennis 2012)	Ingrid Dennis and Rainier Dennis	2012	Assess the impact of climate change on South Africa's aquifers on a regional scale. It aims to evaluate the potential effects of climate change on groundwater levels, recharge, and groundwater contribution to baseflow. Detailed local-scale studies are needed to quantify the impacts in areas highlighted by the DART index and address the current limitations of the DART methodology in accounting for the effects of adaptation and migration.

*A detailed reference list for this table is at the end of the annexures (Annexure 12).

- Grey literature

S. No.	Title	In-text citation	Organisations	Year of launch	Objectives
1	A study on domestic water security from the aspects of gender, social inequities, and water management practices in Barmer and Jaisalmer districts of Rajasthan, India	(UNICEF and MoJS 2020)	United Nation's Child Fund (UNICEF) and Ministry of Jal Shakti (MoJS)	2020	<ul style="list-style-type: none"> * To map and analyse inequity –gender, caste, tribal, geographic–in access, availability, and adequacy of water for domestic purposes concerning the formal government system and informal community and household measures, such as traditional water harvesting systems. This study also includes an analysis of the existing private water markets prevalent in the area * To study prevailing practices, including community participatory mechanisms, regarding domestic water security, with a focus on households having members with disability and women-headed households. * To compute and analyse the socioeconomic costs of domestic water security and its trade-off * To map current barriers and enablers around water access and management, as well as opportunities for community engagement to inform a comprehensive behaviour change communication strategy
2	Risk and Vulnerability Assessment: Key Findings on the Potential Impact of Climate Change on the On-going WASH Inclusion Programme in Informal Settlements- Bhubaneswar and Jaipur	(CFAR 2023)	Centre for Advocacy and Research (CFAR)	2023	The study aims to assess risks and vulnerabilities faced by marginalised communities in WASH services during extreme climate events, prioritise interventions, and disseminate findings to foster collaboration and develop climate and disaster preparedness strategies for WASH, with a focus on resilience, inclusivity, and sustainability for the most vulnerable populations.
3	GENDER EQUALITY IN THE 2030 AGENDA: GENDER-RESPONSIVE WATER AND SANITATION SYSTEMS	(UN Women 2018)	United Nation's Child Fund (UNICEF)	2018	This brief highlight how promoting gender-responsive water, sanitation, and hygiene can drive progress across the 2030 Agenda, offering insights into effectively leveraging the synergies between WASH and gender equality.
4	Identifying Challenges to Climate-Resilient WASH Governance at	(CFAR 2023a)	Centre for Advocacy and Research (CFAR)	2023	The study assesses the current situation of WASH governance in Jaipur and Bhubaneswar cities of Rajasthan and Orissa state of India, respectively, to understand the barriers in

S. No.	Title	In-text citation	Organisations	Year of launch	Objectives
	the Ward Level in the City of Bhubaneswar and Jaipur, India				governance at the ward level and to offer solutions.
5	Climate Change Impacts on Water Resources and Adaptation in the Rural Water Supply and Sanitation Sector in Nicaragua	(World Bank 2021)	World Bank	2021	This paper examines the impacts and implications of potential climate change on Nicaraguan water resources. It makes key recommendations for integrating climate change and rural water supply and sanitation policies and programs to increase resilience to current and future climate conditions.
6	Climate Variability and Change: A Basin Scale Indicator Approach to Understanding the Risk to Water Resources Development and Management	(Strzepek et al. 2011)	World Bank	2011	This study evaluates the effects of climate change on six hydrological indicators across 8,413 basins in World Bank client countries. It provides projections for localised changes in climate, meteorological conditions, and hydrology under a range of possible future climate conditions.
7	Capacity Building for Planning of Climate Resilient WASH Services in Rural Maharashtra	(IRAP and UNICEF Mumbai 2017)	Institute for Resource Analysis and Policy (IRAP) and United Nation's Child Fund (UNICEF)	2017	The project aimed at developing a composite index for assessing climate-induced risk in Water, Sanitation, and Hygiene; mapping the degree of risk in water and sanitation associated with climate hazards; identifying the technical and institutional innovations required to make WASH interventions of the Government resilient to climate-induced risks and their cost implications; and also, identifying the capacity building requirements of WASH sector line agencies to plan, design and execute climate resilient schemes for water supply and sanitation.
8	Thirsting for a Future - Water and children in a changing climate	(UNICEF 2017)	United Nation's Child Fund (UNICEF)		This report explores how climate change endangers children's lives and futures and shows how we can and must collectively address these threats.
9	WASH Climate Resilient Development: Guidance Note - Risk assessments for WASH	(GWP and UNICEF 2017)	Global Water Partnership (GWP) and United Nation's Child Fund (UNICEF)	2017	The Strategic Framework for WASH Climate Resilient Development advances sector thinking around WASH and climate change, cutting across both development and emergency preparedness programmatic spheres. Climate resilience is recognized as a cross-cutting issue that includes elements of disaster risk reduction and climate change adaptation. The framework outlines the rationale and concepts for climate-resilient WASH development, enhancing the understanding of incorporating climate

S. No.	Title	In-text citation	Organisations	Year of launch	Objectives
					resilience into WASH strategies, plans, and approaches. The objective of the Strategic Framework is to support WASH service delivery that is resilient to the climate, both now and in the future.
10	Triple Threat: How disease, climate risks, and unsafe water, sanitation, and hygiene create a deadly combination for children	(UNICEF 2023)	United Nations Children’s Fund (UNICEF)	2023	The triple burden examines the WASH-related threats facing children at the intersection of access to WASH services, the burden of WASH-related diseases, and climate threats. By reviewing the disease burden from unsafe WASH, we see where the problem is most significant, where investment is the lowest, and which countries face the most critical risk to children's health and services.

*A detailed reference list for this table is at the end of the annexures (Annexure 12).

Annexure 6: Long List of Indicators

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
1	Hazard	Environmental hazard	Drought	(GWP and UNICEF 2017) (UNICEF 2017)	2	(Abrams et al. 2021) (Pamidimukkala et al. 2021) (Chathuranika et al. 2023) (Armstrong et al. 2022) (Boholm and Prutzer 2017) (Moyo et al. 2023) (Ekstrom, Bedsworth, and Fencel 2016) (Bryan et al. 2020b) (Tseole et al. 2022a) (Auliagisni, Wilkinson, and Elkhartoutly 2022),	15	17

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
						"(Thomaz et al. 2023) (Gómez-Martínez et al. 2021)" (Anderson et al. 2023) Dennis and Dennis (2012) (Nkiaka 2022)		
2	Hazard	Environmental hazard	Meteorological Drought (MDI)	(Thomaz et al. 2023)	1			1
3	Hazard	Environmental hazard	Standardized Precipitation Index (SPI) (variations in rainfall)					0
4	Hazard	Environmental hazard	Agricultural Drought (ADI)	(Thomaz et al. 2023)	1			1
5	Hazard	Environmental hazard	Reconnaissance Drought Index (RDI)					0
6	Hazard	Environmental hazard	Hydrological Drought (HDI)	(Thomaz et al. 2023)	1			1
7	Hazard	Environmental hazard	Streamflow Drought Index (SDI)	(Goyal et al. 2022)	1			1
8	Hazard	Environmental hazard	Annual low flow (q90)	(Strzepek et al. 2011)	1			1
9	Hazard	Environmental hazard	Aridity	(IRAP and UNICEF Mumbai 2017)	1			1
10	Hazard	Environmental hazard	Flooding	(GWP and UNICEF 2017) (UNICEF 2023) (UNICEF 2017) (Strzepek et al. 2011)	7	(Ahmed 2016) (Pamidimukkala et al. 2021) (Nijhawan et al. 2022) (Chathuranika et al. 2023) (Boholm and Prutzer 2017)	14	21

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
				(World Bank 2021) (CFAR 2023) (IRAP and UNICEF Mumbai 2017)		(Munkhsuld et al. 2020) (Antarpreet Jutla et al. 2023) (Moyo et al. 2023) (Auliagisni, Wilkinson, and ElkhARBoutly 2022) (Wade et al. 2014) (Spegel 2017) (Rebaudet et al. 2013) Dennis and Dennis (2012) (Badamosi et al. 2023)		
11	Hazard	Environmental hazard	Flow velocity			(Eleutério, Hattemer, and Rozan 2013)	1	1
12	Hazard	Environmental hazard	Annual high flow (q10)	(Strzepek et al. 2011)	1			1
13	Hazard	Environmental hazard	Flash flood			(Baudement et al. 2017)	1	1
14	Hazard	Environmental hazard	Rainfall Patterns	(World Bank 2021)		(Bello et al. 2023) (Abrams et al. 2021) (Chathuranika et al. 2023) (Boholm and Prutzer 2017) (Armstrong et al. 2022) (Johannessen et al. 2014) (Ekstrom, Bedsworth, and FencI 2016) (Kaule and Frei 2022)	26	26

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
						(Xu et al. 2014) (Wang et al. 2022) (McPhearson, Hamstead, and Kremer 2014) (Spegel 2017) (Shamsuzzoha, Kormoker, and Ghosh 2018) (Rickert et al. 2019) (Goswami et al. 2014) (Rebaudet et al. 2013) (Hoque et al. 2016) (Lorenzo and Kinzig 2019) (Teutschbein et al. 2023) (Tarnas et al. 2023) (Medeiros et al. 2020) (Rebaudet et al. 2013) (Ahmed et al. 2019) (Baudement et al. 2017) Dennis and Dennis (2012) (Badamosi et al. 2023)		
15	Hazard	Environmental hazard	Heavy/ torrential rainfall	(GWP and UNICEF 2017) ¹	1	(Ahmed 2016) (Boholm and Prutzer 2017) (Gómez-Martínez et al. 2021) (Shamsuzzoha, Kormoker, and Ghosh 2018)	4	5

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
16	Hazard	Environmental hazard	Average rainfall	(IRAP and UNICEF Mumbai 2017)	1	(Hughes et al. 2021) (Johannessen et al. 2014) (Hoque et al. 2016) (Alexander et al. 2018) (Thomaz et al. 2023)	5	6
17	Hazard	Environmental hazard	Variability of monsoon	(IRAP and UNICEF Mumbai 2017)	1	(Iqbal et al. 2022)	1	2
18	Hazard	Environmental hazard	Seasonality			(Lorenzo and Kinzig 2019)	1	1
19	Hazard	Environmental hazard	Increased precipitation	(UNICEF 2017)	1	(Gómez-Martínez et al. 2021) (Anderson et al. 2023)	2	3
20	Hazard	Environmental hazard	Mean annual rainfall (MAR)	(Strzepek et al. 2011)	1			1
21	Hazard	Environmental hazard	Annual renewable water available	(CFAR 2023) (IRAP and UNICEF Mumbai 2017)	2	(Munkhsuld et al. 2020) (Nkiaka 2022)	2	4
22	Hazard	Environmental hazard	Hydrologic Alteration			(Bello et al. 2023)	1	1
23	Hazard	Environmental hazard	Magnitude of stream flow			(Bello et al. 2023)	1	1
24	Hazard	Environmental hazard	Magnitude and duration of extreme flows and base flow condition			(Bello et al. 2023)	1	1
25	Hazard	Environmental hazard	Frequency and duration of high and low Pulses			(Bello et al. 2023)	1	1
26	Hazard	Environmental hazard	Rate and frequency of flow changes			(Bello et al. 2023)	1	1

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
27	Hazard	Environmental hazard	Heatwave	(GWP and UNICEF 2017) (UNICEF 2023) (CFAR 2023)	3	(Gómez-Martínez et al. 2021) (Moyo et al. 2023) (Bryan et al. 2020b)	3	6
28	Hazard	Environmental hazard	Cold spell	(GWP and UNICEF 2017)	1			1
29	Hazard	Environmental hazard	Blizzard	(GWP and UNICEF 2017)	1			1
30	Hazard	Environmental hazard	Heavy snowfall	(GWP and UNICEF 2017)	1			1
31	Hazard	Environmental hazard	Melting of snow, glacier (retreating) and ice	(GWP and UNICEF 2017) (UNICEF 2017)	2	(Bello et al. 2023) (Iqbal et al. 2022)	2	4
32	Hazard	Environmental hazard	Storms - thunder, hail, dust, ice, wind	(GWP and UNICEF 2017) (UNICEF 2023)	2	(Abrams et al. 2021) (Ahmed 2016) (Hughes et al. 2021) (Shamsuzzoha, Kormoker, and Ghosh 2018) (Nkiaka 2022)	5	7
33	Hazard	Environmental hazard	Tornado	(GWP and UNICEF 2017)	1			1
34	Hazard	Environmental hazard	Tropical cyclone	(GWP and UNICEF 2017) (CFAR 2023)	2			2
35	Hazard	Environmental hazard	Cyclone	(UNICEF 2023)	1	(Hoque et al. 2016) (Nkiaka 2022)	2	3
36	Hazard	Environmental hazard	Salinisation (dryland)	(GWP and UNICEF 2017)	1			1
37	Hazard	Environmental hazard	Desertification	(GWP and UNICEF 2017)	1			1

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
38	Hazard	Environmental hazard	Wildfire	(GWP and UNICEF 2017)	1	(Pamidimukkal a et al. 2021) (Ekstrom, Bedsworth, and Fencel 2016)	2	3
39	Hazard	Environmental hazard	Landslide	(GWP and UNICEF 2017)	1	(Nijhawan et al. 2022)	1	2
40	Hazard	Environmental hazard	Mudslide	(GWP and UNICEF 2017)	1			1
41	Hazard	Environmental hazard	Avalanche	(GWP and UNICEF 2017)	1			1
42	Hazard	Environmental hazard	Rockfall	(GWP and UNICEF 2017)	1			1
43	Hazard	Environmental hazard	Subsidence	(GWP and UNICEF 2017)	1			1
44	Hazard	Environmental hazard	Soil erosion	(GWP and UNICEF 2017)	1	(Chathuranika et al. 2023)	1	2
45	Hazard	Environmental hazard	Soil Temperature changes			(Agudelo-Vera et al. 2017)	1	1
46	Hazard	Environmental hazard	Air temprature	(IRAP and UNICEF Mumbai 2017)	1	(Agudelo-Vera et al. 2017) (Tusting et al. 2020)	2	3
47	Hazard	Environmental hazard	Humidity	(IRAP and UNICEF Mumbai 2017)	1	(Goswami et al. 2014) (Xu et al. 2014)	2	3
48	Hazard	Environmental hazard	Groundwater salinity			(Pamidimukkal a et al. 2021) (Araya, Podgorski, and Berg 2023)	2	2
49	Hazard	Environmental hazard	Groundwater contamination - anthropogenic and geogenic	(CFAR 2023)	1	(Janine de Wit et al. 2022) (Shamsuzzoha , Kormoker, and Ghosh 2018)	3	4

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
						(Lorenzo and Kinzig 2019)		
50	Hazard	Environmental hazard	River bank erosion	(GWP and UNICEF 2017)	1	(Shamsuzzoha , Kormoker, and Ghosh 2018)	1	2
51	Hazard	Environmental hazard	River siltation	(GWP and UNICEF 2017)	1			1
52	Hazard	Environmental hazard	Coastal erosion	(GWP and UNICEF 2017)	1	(Johannessen et al. 2014)	1	2
53	Hazard	Environmental hazard	Saline intrusion (coastal)	(GWP and UNICEF 2017)	1	(Araya, Podgorski, and Berg 2023) (Lorenzo and Kinzig 2019) (Shamsuzzoha , Kormoker, and Ghosh 2018)	3	4
54	Hazard	Environmental hazard	Absolute depth to bedrock			(Araya, Podgorski, and Berg 2023)	1	1
55	Hazard	Environmental hazard	Soil pH			(Araya, Podgorski, and Berg 2023)	1	1
56	Hazard	Environmental hazard	Coast distance			(Araya, Podgorski, and Berg 2023)	1	1
57	Hazard	Environmental hazard	Digital elevation models / Elevation			(Araya, Podgorski, and Berg 2023) (Hoque et al. 2016)	2	2
58	Hazard	Environmental hazard	Longterm average groundwater recharge			(Araya, Podgorski, and Berg 2023) (Ahmed et al. 2019)	2	2

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
59	Hazard	Environmental hazard	Nitrogen in (in soil)			(Araya, Podgorski, and Berg 2023)	1	1
60	Hazard	Environmental hazard	Sand fraction			(Araya, Podgorski, and Berg 2023)	1	1
61	Hazard	Environmental hazard	Aridity			(Araya, Podgorski, and Berg 2023)	1	1
62	Hazard	Environmental hazard	Topographic wetness index			(Araya, Podgorski, and Berg 2023)	1	1
63	Hazard	Environmental hazard	Soil electrical conductivity			(Araya, Podgorski, and Berg 2023)	1	1
64	Hazard	Environmental hazard	Drainage density			(Araya, Podgorski, and Berg 2023)	1	1
65	Hazard	Environmental hazard	Drainage basins			(Araya, Podgorski, and Berg 2023)	1	1
66	Hazard	Environmental hazard	Geology			(Araya, Podgorski, and Berg 2023) (Hoque et al. 2016)	2	2
67	Hazard	Environmental hazard	Sea level rise	(GWP and UNICEF 2017) (UNICEF 2017) (World Bank 2021)	3	(Boholm and Prutzer 2017) (Hughes et al. 2021) (Johannessen et al. 2014) (Ekstrom, Bedsworth,	5	8

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
						and FencI 2016) (Nkiaka 2022)		
68	Hazard	Environmental hazard	Storm surge	(GWP and UNICEF 2017)	1			1
69	Hazard	Environmental hazard	Tidal surge/ Tsunami	(GWP and UNICEF 2017)	1	(Shamsuzzoha, Kormoker, and Ghosh 2018)	1	2
70	Hazard	Environmental hazard	Earthquake	(GWP and UNICEF 2017)	1			1
71	Hazard	Environmental hazard	Volcanic eruptions	(GWP and UNICEF 2017)	1			1
72	Hazard	Environmental hazard	High land temperatures	(UNICEF 2023)	1	(Wang et al. 2020) (Han et al. 2021) (Shamsuzzoha, Kormoker, and Ghosh 2018) (Rickert et al. 2019) (Goswami et al. 2014) (Xu et al. 2014) (Shamsuzzoha, Kormoker, and Ghosh 2018)	7	8
73	Hazard	Environmental hazard	High sea surface temperature					0
74	Hazard	Environmental hazard	High temperature in water bodies	(World Bank 2021)	1	(Hughes et al. 2021) (Iqbal et al. 2022) (Johannessen et al. 2014) (Ekstrom, Bedsworth, and FencI 2016)	12	13

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
						(Alexander et al. 2018) (Kaule and Frei 2022) (Antarpreet Jutla et al. 2023) (Chathuranika et al. 2023) (Boholm and Prutzer 2017) (Gómez-Martínez et al. 2021) (Lorenzo and Kinzig 2019) (Shokri, Sabzevari, and Hashemi 2020)		
75	Hazard	Environmental hazard	Rising atmospheric temperatures	(UNICEF 2017)	1	(Anderson et al. 2023) (Chathuranika et al. 2023)	2	3
76	Hazard	Environmental hazard	Fossil fuel burning	(UNICEF 2017)	1			1
77	Hazard	Environmental hazard	Changes in land use	(UNICEF 2017)	1	(van Engelenburg et al. 2021) (Anderson et al. 2023) (Nkiaka 2022)	3	4
78	Hazard	Environmental hazard	Extreme weather - intensity and frequency	(UNICEF 2017) (CFAR 2023)	2	(Iqbal et al. 2022) (Auliagisni, Wilkinson, and Elkhartoutly 2022) (Spegel 2017) (Moyo et al. 2023) (Kiem 2013)	5	7

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
79	Hazard	Environmental hazard	Pollution (point and non-point source)	(GWP and UNICEF 2017)	1	(Budiyono et al. 2015)	1	2
80	Hazard	Socio-political un	Violent conflict	(GWP and UNICEF 2017) (UNICEF 2023)	2			2
81	Hazard	Socio-political un	Riots	(GWP and UNICEF 2017)	1			1
82	Hazard	Socio-political un	Political instability	(GWP and UNICEF 2017)	1	(Munkhsuld et al. 2020) (Bellizzi et al. 2020)	2	3
83	Hazard	Biological hazards	Potential viruses or diseases (water-borne)	(GWP and UNICEF 2017) (CFAR 2023)	2	(Johannesse n et al. 2014) (Hoque et al. 2016)	2	4
84	Hazard	Biological hazards	Insect or animal infestation	(GWP and UNICEF 2017)	1			1
85	Hazard	Biological hazards	Plant or chemical contagion	(GWP and UNICEF 2017)	1			1
86	Hazard	Biological hazards	Moulds and fungi	(GWP and UNICEF 2017)	1			1
87	Hazard	Biological hazards	Algal growth	(GWP and UNICEF 2017)	1			1
88	Hazard	Biological hazards	Proliferation of bacteria in drinking water supply (Total coliform exceeds standard)			(Budiyono et al. 2015)	1	1
89	Hazard	Biological hazards	Drinking water contact with floodwater			(Arrighi et al. 2017)	1	1
90	Hazard	Chemical hazard	Pb (Lead)			(Goyal et al. 2022)	1	1
91	Hazard	Chemical hazard	Cu (Copper)			(Goyal et al. 2022)	1	1

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92	Hazard	Chemical hazard	Ni (Nickle)			(Goyal et al. 2022)	1	1
93	Hazard	Chemical hazard	Zn (Zinc)			(Goyal et al. 2022)	1	1
94	Hazard	Chemical hazard	Cr(chromium)			(Goyal et al. 2022)	1	1
95	Hazard	Chemical hazard	Cd (Cadmium)			(Goyal et al. 2022)	1	1
96	Hazard	Chemical hazard	Fe (Iron)			(Goyal et al. 2022)	1	1
97	Hazard	Chemical hazard	Particulate Matter			(Goyal et al. 2022)	1	1
98	Hazard	Chemical hazards	Arsenic	(GWP and UNICEF 2017)	1			1
99	Hazard	Chemical hazards	Fluoride	(GWP and UNICEF 2017)	1			1
100	Hazard	Chemical hazards	Phosphate	(GWP and UNICEF 2017)	1	(Tellman et al. 2018)	1	2
101	Hazard	Chemical hazards	Nitrate	(GWP and UNICEF 2017)	1			1
102	Hazard	Chemical hazards	Chemical spill	(GWP and UNICEF 2017)	1			1
103	Hazard	Chemical hazards	Mismanagement in the water treatment practices			(Boholm and Prutzer 2017)	1	1
104	Hazard	Cross-border dynamics	Displacement	(GWP and UNICEF 2017)	1	(Bellizzi et al. 2020)	1	2
105	Hazard	Cross-border dynamics	Migration	(GWP and UNICEF 2017) (UNICEF 2023)	2	(Abrams et al. 2021) (Johannessen et al. 2014) (Hoque et al. 2016) (Tseole et al. 2022a)	4	6

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
106	Hazard	Cross-border dynamics	Cross-border violence	(GWP and UNICEF 2017)	1			1
107	Hazard	Financial hazard	Drastic reduction in the price of land and property (Loss of property value)			(Badamosi et al. 2023)	1	1
108	Hazard	Economic hazard	Economic shock/crisis	(GWP and UNICEF 2017)	1	(Bellizzi et al. 2020)	1	2
109	Hazard	Economic hazard	Market instability for specific commodities	(GWP and UNICEF 2017)	1			1
110	Hazard	Economic hazard	Inflation			(Munkhsuld et al. 2020)	1	1
111	Exposure	Social exposure	Location of settlements (Ex - proportion of people living in low-lying areas/ distance to refusal dump/ distance to nearest major street)	(GWP and UNICEF 2017) (IRAP and UNICEF Mumbai 2017) (CFAR 2023)	2	(Auliagisni, Wilkinson, and Elkharboutly 2022) (Spegel 2017) (Hoque et al. 2016) (Gruebner et al. 2012) (Badamosi et al. 2023)	5	7
112	Exposure	Social exposure	Type of settlement			Johannessen et al. (2014) Hoque et al. (2016) Tseole et al. (2022a)	3	3
113	Exposure	Financial exposure	percentage of GDP	(GWP and UNICEF 2017)	1	(Thomaz et al. 2023)	1	2
114	Exposure	Financial exposure	Income from livelihoods according to the sector, e.g.,	(GWP and UNICEF 2017)	1	(Han et al. 2019) (Ghosh et al. 2016)	3	4

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
			agriculture, fishing			(Badamosi et al. 2023)		
115	Exposure	Critical exposure	Percentage of essential WASH infrastructure affected	(GWP and UNICEF 2017) (CFAR 2023)	2	(Wade et al. 2014) (Lorenzo and Kinzig 2019) (Schmidt et al. 2022) (Purwar, Sliuzas, and Flacke 2020) (Hoque et al. 2016)	5	7
116	Exposure	Critical exposure	Damage or failure of pipes/facilities			(Hughes et al. 2021)	1	1
117	Exposure	Critical exposure	Properties of pipe - material, diameter, wall thickness, installation depth, year of installation			(Wols, van Daal, and van Thienen 2014)	1	1
118	Exposure	Critical exposure	Hazard-proofing infrastructure, like houses, etc.			(Satterthwaite et al. 2020)	1	1
119	Exposure	Critical exposure	Livestock population			(Wang et al. 2020)	1	1
120	Exposure	Environmental exposure	Height of tidal inundation			(Budiyono et al. 2015)	1	1
121	Exposure	Environmental exposure	Groundwater available	(IRAP and UNICEF Mumbai 2017)	1			1
122	Exposure	Environmental exposure	Groundwater depletion (depth to the water table)	(CFAR 2023) (IRAP and UNICEF Mumbai 2017)	2	(Araya, Podgorski, and Berg 2023) (Shamsuzzoha , Kormoker, and Ghosh 2018) (Dennis and Dennis 2012) (Ahmed et al. 2019)	4	6
123	Exposure	Environmental exposure	Number of water sources affected	(GWP and UNICEF 2017)	1	(Johannessen et al. 2014)	3	4

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
						(Ekstrom, Bedsworth, and Fencil 2016) (Han et al. 2019)		
124	Exposure	Environmental exposure	Percentage of a particular land type affected	(GWP and UNICEF 2017)	1			1
125	Exposure	Environmental exposure	Type and properties of soil (moisture, porosity, etc.)			(Wang et al. 2020) (Wols, van Daal, and van Thienen 2014) (Schmidt et al. 2023) (Teutschbein et al. 2023) (Rogerson and Rogerson 2019)	5	5
126	Exposure	Environmental exposure	Geology			(Hoque et al. 2016)	1	1
127	Exposure	Environmental exposure	Morphology			(Hoque et al. 2016)	1	1
128	Exposure	Environmental exposure	Geomorphology			(Hoque et al. 2016)	1	1
129	Exposure	Environmental exposure	River mouth type			(Hoque et al. 2016)	1	1
130	Exposure	Environmental exposure	Shoreline type			(Hoque et al. 2016)	1	1
131	Exposure	Environmental exposure	Watershed Response Sensitivity(for riverine floodshed)			(Tellman et al. 2018)	1	1
132	Exposure	Environmental exposure	Aquifer type (storage coefficient) (Fractured, Fractured, and intergranular, Karst, Intergranular)			Dennis and Dennis (2012)	1	1

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133	Exposure	Environmental exposure	Seasonal fluctuation in water demand			(Lorenzo and Kinzig 2019)	1	1
134	Exposure	Human exposure	percentage of population affected	(GWP and UNICEF 2017) (CFAR 2023)	2			2
135	Exposure	Human exposure	Number of people exposed to annual flooding			(Tellman et al. 2018)	1	1
136	Exposure	Human exposure	Quality of water	(CFAR 2023)	1	(Munkhsuld et al. 2020)	1	2
137	Exposure	Human exposure	Open drainage	(CFAR 2023)				0
138	Exposure	Human exposure	Open defecation	(CFAR 2023)	1	(Abrams et al. 2021) (Johannessen et al. 2014) (Ghosh et al. 2016) (Rogerson and Rogerson 2019)	4	5
139	Exposure	Human exposure	Disease outbreak	(CFAR 2023)	1			1
140	Exposure	Human exposure	The distance of the work locations from the nearest hospital			(Venugopal et al. 2016)	1	1
141	Exposure	Human exposure	Disruption of income source	(GWP and UNICEF 2017) (CFAR 2023)	2	(Badamosi et al. 2023)	1	3
142	Vulnerability	Social vulnerability	Social networks (access to social networks such as informal social safety nets)	(GWP and UNICEF 2017) (CFAR 2023)	2	(Auliagisni, Wilkinson, and Elkhartoutly 2022)	1	3
143	Vulnerability	Social vulnerability (Community-wide knowledge and	Community-based risk assessments	(GWP and UNICEF 2017) (CFAR 2023)	2			2

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		understanding of risks and WASH benefits)						
144	Vulnerability	Social vulnerability (Community-wide knowledge and understanding of risks and WASH benefits)	Engagement of community in early warning systems)	(GWP and UNICEF 2017) (CFAR 2023)	2			2
145	Vulnerability	Social vulnerability	Community/ panchayat's interest, representation, and ownership in WASH management	(UNICEF and MoJS 2020)	1	(Pamidimukula et al. 2021) (Nijhawan et al. 2022) (Munkhsuld et al. 2020)	3	4
146	Vulnerability	Social vulnerability	Behaviour change communication and capacity building for water management by NGOs and govt.	(UNICEF and MoJS 2020)	1	(Han et al. 2019) (Tseole et al. 2022a) (Venugopal et al. 2016) (Han et al. 2021) (Rogerson and Rogerson 2019)	2	5
147	Vulnerability	Social vulnerability	Quality of training for community			(Rogerson and Rogerson 2019)	1	1
148	Vulnerability	Social vulnerability (Community-wide knowledge and understanding of risks and WASH benefits)	Community perception of changing climate patterns in the region			(Nijhawan et al. 2022) (Tshimanga et al. 2021)	2	2
149	Vulnerability	Social vulnerability (Community-wide knowledge and understanding	Information source, availability, and transparency			(Munkhsuld et al. 2020) Ekstrom, Bedsworth, and FencI (2016)	3	3

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
		of risks and WASH benefits)				(Alexander et al. 2018)		
150	Vulnerability	Social vulnerability	Inadequate living conditions.			(Ahmed 2016)	1	1
151	Vulnerability	Social vulnerability (Norms and practices)	Early marriage			(Ghosh et al. 2016)	1	1
152	Vulnerability	Social vulnerability (Norms and practices)	Norms and practices related to open defecation	(GWP and UNICEF 2017) (UNICEF 2017)	2	(Ntajal et al. 2022)	1	3
153	Vulnerability	Social vulnerability (Norms and practices)	Norms and practices related to the use of safe toilets (promote)	(GWP and UNICEF 2017) (UNICEF 2017)	2			2
154	Vulnerability	Social vulnerability (Norms and practices)	Norms and practices related to safe household water treatment and safe storage (promote)	(GWP and UNICEF 2017)	1	(Antarpreet Jutla et al. 2023) (Denslow et al. 2010) (Rebaudet et al. 2013)	3	4
155	Vulnerability	Social vulnerability (Norms and practices)	Hand washing before and after food and after toilet use	(IRAP and UNICEF Mumbai 2017)	1	(Rebaudet et al. 2013) (Rogerson and Rogerson 2019)	2	3
156	Vulnerability	Social vulnerability (Norms and practices)	Awareness in communities of the need to protect water sources	(GWP and UNICEF 2017)	1	(Munkhsuld et al. 2020)	1	2
157	Vulnerability	Social vulnerability (Norms and practices)	Water reuse practice (for domestic livestock)	(UNICEF and MoJS 2020)	1			1
158	Vulnerability	Social vulnerability (Norms and practices)	Gender norms (less rigid)	(UNICEF and MoJS 2020)	1	(Han et al. 2019)	1	2
159	Vulnerability	Social vulnerability	Gender-responsive	(UN Women 2018)	1			1

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			infrastructure and service delivery					
160	Vulnerability	Social vulnerability	Needs like water for livestock or small plots in supplying water norms	(UN Women 2018)	1			1
161	Vulnerability	Social vulnerability	Appropriate location of safely managed sanitation facilities	(UN Women 2018)	1			1
162	Vulnerability	Social vulnerability	Protection of workers, particularly at the “back-end” part of the sanitation system	(UN Women 2018)	1			1
163	Vulnerability	Social vulnerability	Mainstreaming menstrual hygiene management	(UN Women 2018)	1	(Iqbal et al. 2022)	1	2
164	Vulnerability	Social vulnerability	Need for Improved data on gender and WASH	(UN Women 2018)	1			1
165	Vulnerability	Social vulnerability	Disaggregation of data on access to safely managed drinking water data (SDG 6.1.1.) for slums, urban areas, disadvantaged groups, and the general population	(UN Women 2018)	1			1
166	Vulnerability	Social vulnerability	Data on shifts in the water collection burden among household members under safely managed drinking water services	(UN Women 2018)	1			1
167	Vulnerability	Social vulnerability	An indicator to track progress on	(UN Women 2018)	1			1

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			how policies respond to specific sanitation needs of women					
168	Vulnerability	Social vulnerability	Disaggregate data on the indicator for SDG 6.2.1 on the use of safely managed sanitation services by sex	(UN Women 2018)	1	(Ghosh et al. 2016)	1	2
169	Vulnerability	Social vulnerability	Women's economic autonomy			(Tshimanga et al. 2021)	1	1
170	Vulnerability	Social vulnerability	Land ownership and property rights			(Tshimanga et al. 2021)	1	1
171	Vulnerability	Social vulnerability	Population density per borehole			(Rebaudet et al. 2013)	1	1
172	Vulnerability	Social vulnerability	Un-even distribution of tubewells					0
173	Vulnerability	Social vulnerability (Social cohesion)	Conflicts between different groups	(GWP and UNICEF 2017) (IRAP and UNICEF Mumbai 2017)	2	(Tshimanga et al. 2021)	1	3
174	Vulnerability	Social vulnerability	The population of the marginalised group	(GWP and UNICEF 2017)	1			1
175	Vulnerability	Social vulnerability	Landless population (nomadic tribes or squatters)	(UNICEF and MoJS 2020)	1			1
176	Vulnerability	Social vulnerability	Single women (socio-economic marginalisation)	(UNICEF and MoJS 2020)	1			1
177	Vulnerability	Social vulnerability	Women (socio-economic marginalisation)	(UNICEF and MoJS 2020)	1			1
178	Vulnerability	Social vulnerability	Population in remote areas/	(UNICEF and MoJS 2020)	1			1

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			undulating topographies					
179	Vulnerability	Social vulnerability	Economically marginalised (ex-farmers)	(UNICEF and MoJS 2020)	1	(Teutschbein et al. 2023)	1	2
180	Vulnerability	Social vulnerability	Caste (socially marginalised)	(UNICEF and MoJS 2020)	1			1
181	Vulnerability	Social vulnerability	People with disabilities	(UNICEF and MoJS 2020)	1	(Ghosh et al. 2016) (Tshimanga et al. 2021) (Rogerson and Rogerson 2019)	3	4
182	Vulnerability	Social vulnerability	Seasonal migrants	(UNICEF and MoJS 2020)	1			1
183	Vulnerability	Social vulnerability	Meaningful participation of women	(UN Women 2018)	1	(Nijhawan et al. 2022) (Rogerson and Rogerson 2019)	2	3
184	Vulnerability	Social vulnerability	Proportion of safe drinking water supply based on drinking water quality standards			(Assefa et al. 2018) (Shokri, Sabzevari, and Hashemi 2020) (Lorenzo and Kinzig 2019) (Purwar, Sliuzas, and Flacke 2020) (Telle et al. 2021) (Gruebner et al. 2012) (Rebaudet et al. 2013) (Hoque et al. 2016)	8	8
185	Vulnerability	Social vulnerability	Access to primary health centres (distance from PHC etc.)	(IRAP and UNICEF Mumbai 2017)	1	(Denslow et al. 2010) (Tusting et al. 2020) (Rogerson and Rogerson 2019)	5	6

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
						(Gruebner et al. 2012) (Rogerson and Rogerson 2019)		
186	Vulnerability	Social vulnerability	Water Security					0
187	Vulnerability	Social vulnerability	Water security index (WSI)			(Nkiaka 2022)	1	1
188	Vulnerability	Social vulnerability	Socioeconomic sub-index (development and sustainable management)					0
189	Vulnerability	Social vulnerability	Biophysical sub-index					0
190	Vulnerability	Social Vulnerability	Drinking water Demand/requirement			(van Engelenburg et al. 2021) (Munkhsuld et al. 2020)	2	2
191	Vulnerability	Social Vulnerability	Per capita freshwater availability			(Assefa et al. 2018) (Teutschbein et al. 2023)	2	2
192	Vulnerability	Social Vulnerability	Per capita water consumption			(Assefa et al. 2018) (Teutschbein et al. 2023)	2	2
193	Vulnerability	Social Vulnerability	Per capita water consumption for hygiene			(Assefa et al. 2018) (Teutschbein et al. 2023) (Telle et al. 2021) (Gruebner et al. 2011) (Gruebner et al. 2012) (Rebaudet et al. 2013)	6	6
194	Vulnerability	Financial Vulnerability	People's access to savings, credit, etc.			(Tshimanga et al. 2021)	1	1

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
195	Vulnerability	Financial Vulnerability (WASH sector budget allocations)	WASH public investment as % of GDP	(GWP and UNICEF 2017)	1	(Abrams et al. 2021)	1	2
196	Vulnerability	Financial Vulnerability	Inclusion of WASH in local election manifestos	(CFAR 2023)	1			1
197	Vulnerability	Financial Vulnerability (WASH sector budget allocations)	Adequacy of WASH recurrent budget	(GWP and UNICEF 2017)	1			1
198	Vulnerability	Financial Vulnerability (Budget disaggregation)	Clear Budget lines for WASH	(GWP and UNICEF 2017)	1			1
199	Vulnerability	Financial Vulnerability (Budget disaggregation)	Budget for mitigation, prevention, preparedness and response, and adaptation	(GWP and UNICEF 2017)	1			1
200	Vulnerability	Financial Vulnerability (Service provider vulnerability)	Ability to draw on contingencies and decentralised funds	(GWP and UNICEF 2017)	1			1
201	Vulnerability	Financial Vulnerability (Service provider vulnerability)	Cash reserves or insurance to rehabilitate services	(GWP and UNICEF 2017)	1			1
202	Vulnerability	Financial Vulnerability (Service provider vulnerability)	Steps to mitigate emergency water supply	(GWP and UNICEF 2017)	1			1
203	Vulnerability	Financial Vulnerability	Investment in the protection of the river basin	(UNICEF 2017)	1			1
204	Vulnerability	Physical Vulnerability / Resilience of	The technology available for WASH infrastructure	(GWP and UNICEF 2017) (CFAR 2023)	2			2

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
		WASH infrastructure						
205	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Technology predominantly used for WASH infrastructure (ex, type of latrines)	(GWP and UNICEF 2017)	1			1
206	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Design or construction standards for WASH infrastructure	(GWP and UNICEF 2017) (CFAR 2023)	2			2
207	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Standards observed in implementation	(GWP and UNICEF 2017)	1			1
208	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Water storage infrastructure	(GWP and UNICEF 2017) (UNICEF and MoJS 2020) (CFAR 2023)	3	(Bruwier et al. 2015) (Baudement et al. 2017)	2	5
209	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Minimum pool level for drinking water			(Bruwier et al. 2015)	1	1
210	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Mean target level			(Bruwier et al. 2015)	1	1
211	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Amplitude of time evolution of the target water level at reservoirs			(Bruwier et al. 2015)	1	1
212	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Discharge threshold at the area of interest (municipality/ town) for detecting flood downstream in different modes			(Bruwier et al. 2015)	1	1

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
213	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Dam height			(Bruwier et al. 2015)	1	1
214	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Crest level			(Bruwier et al. 2015)	1	1
215	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Extra drainage area through water diversion			(Bruwier et al. 2015)	1	1
216	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Maximum water level			(Bruwier et al. 2015)	1	1
217	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Maximum safety level			(Bruwier et al. 2015)	1	1
218	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	By-pass discharge at each reservoir			(Bruwier et al. 2015)	1	1
219	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Adequacy of technology to geographic conditions (hazards)	(GWP and UNICEF 2017)	1			1
220	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Adequacy of operation and maintenance of water supply infrastructure	(UNICEF and MoJS 2020) (IRAP and UNICEF Mumbai 2017) (World Bank 2021) (CFAR 2023) (UNICEF 2017)	5	(Pamidimukula et al. 2021) (Nkiaka 2022)	1	6

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
221	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Adequacy of operation and maintenance of sewerage and drainage infrastructure	(UNICEF and MoJS 2020) (World Bank 2021) (CFAR 2023) (UNICEF 2017)	4			4
222	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Submergence and leakage of infra			(Budiyono et al. 2015) (Eleutério, Hattemer, and Rozan 2013)	2	2
223	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Depth of water			(Eleutério, Hattemer, and Rozan 2013)	1	1
224	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Sediment deposit in infrastructure network			(Eleutério, Hattemer, and Rozan 2013)	1	1
225	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Debris transport			(Eleutério, Hattemer, and Rozan 2013)	1	1
226	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	The elevation of the infrastructure supporting the component			(Eleutério, Hattemer, and Rozan 2013)	1	1
227	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	The arrangement of the technical apparatus inside the component			(Eleutério, Hattemer, and Rozan 2013)	1	1
228	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Flood risk mapping (<i>material vulnerability, functional vulnerability, and structural vulnerability</i>) of each component of water supply			(Eleutério, Hattemer, and Rozan 2013)	1	1

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
			and drainage and sewerage infrastructure, including distance monitoring device					
229	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Safety threshold of water supply system (WSS) to flood depth			(Arrighi et al. 2017)	1	1
230	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Retention of flood capacity/ structural measures (flood protection walls, embankments, etc.)	(IRAP and UNICEF Mumbai 2017)	1	(Johannessen et al. 2014) (Badamosi et al. 2023) (Auliagisni, Wilkinson, and Elkhaboutly 2022) (McPhearson, Hamstead, and Kremer 2014)	4	5
231	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Rainwater control measures			(Abrams et al. 2021)	1	1
232	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Transport infrastructure			(Abrams et al. 2021) (Ghosh et al. 2016)	2	2
233	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Water system leakages			(Munkhsuld et al. 2020)	1	1
234	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	The average age of the sewer			(Munkhsuld et al. 2020) (Pamidimukula et al. 2021)	2	2
235	Vulnerability	Physical Vulnerability / Resilience of	Steepness of slope			(Nijhawan et al. 2022)	1	1

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
		WASH infrastructure						
236	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Adequacy of monitoring by water supply managers			(Nijhawan et al. 2022)	1	1
237	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Sanitary risks around water supply technologies			(Nijhawan et al. 2022)	1	1
238	Vulnerability	Physical Vulnerability / Resilience of WASH infrastructure	Power shutdown/ variation in the distribution system			(Budiyono et al. 2015)	1	1
239	Vulnerability	Environmental vulnerability (Environmental degradation)	Land use (dams/ waterways, etc./ agriculture/ forest/ urban green spaces/ constructed wetlands/ Riparian Habitat Buffer, etc.)			(van Engelenburg et al. 2021) (Johannessen et al. 2014) (Badamosi et al. 2023) (Bastani and Harter 2019) (Nijhawan et al. 2022) (Munkhsuld et al. 2020) (Hoque et al. 2016) (Wang et al. 2020) (Wolff, Rauf, and Hamel 2023) (Baijius and Patrick 2019) (Satterthwaite et al. 2020) (Schmidt et al. 2022) (Rogerson and Rogerson 2019) (Schmidt et al. 2023)	13	13

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
240	Vulnerability	Environmental vulnerability (Environmental degradation)	Land-cover changes			(Bello et al. 2023)	1	1
241	Vulnerability	Environmental vulnerability (Environmental degradation)	Rate of deforestation	(GWP and UNICEF 2017) (UNICEF 2017) (World Bank 2021)	3	(Johannessen et al. 2014) (Tellman et al. 2018)	2	5
242	Vulnerability	Environmental vulnerability (Environmental degradation)	Land use management practices (agricultural land practices, pastureland reforestation, etc.)	(World Bank 2021)	1	(Rickert et al. 2019) (Tellman et al. 2018)	2	3
243	Vulnerability	Environmental vulnerability (Environmental degradation)	Land consolidation			(Nijhawan et al. 2022)		0
244	Vulnerability	Environmental vulnerability (environmental degradation)	Extent of soil degradation	(GWP and UNICEF 2017)	1			1
245	Vulnerability	Environmental vulnerability (environmental degradation)	Deterioration of surface water quality in the dry season			(Lorenzo and Kinzig 2019)	1	1
246	Vulnerability	Environmental vulnerability (environmental degradation)	Water quality	(GWP and UNICEF 2017) (CFAR 2023)	2	(Arrighi et al. 2017) (Munkhsuld et al. 2020) (Gómez-Martínez et al. 2021)	3	5
247	Vulnerability	Environmental vulnerability (environmental degradation)	Point and non-point sources of pollution (usage of nitrogen, phosphorous, and potassium-based fertilisers and pesticides)	(UNICEF 2017)	1	(Pamidimukula et al. 2021) (Essex, Koop, and Van Leeuwen 2019) (Chathuranika et al. 2023) (Goyal et al. 2022)	5	6

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
						(Pelling et al. 2018)		
248	Vulnerability	Environmental vulnerability (environmental degradation)	Quality of wastewater discharged from industries, agriculture, and domestic use			(Lorenzo and Kinzig 2019) (Goyal et al. 2022)	2	2
249	Vulnerability	Environmental vulnerability (environmental degradation)	Proportion of wastewater effluent quality based on wastewater discharge quality standards / Proportion of industries complying with discharge standards			(Assefa et al. 2018) (McPhearson, Hamstead, and Kremer 2014) (Gruebner et al. 2012) (Rebaudet et al. 2013) (Lorenzo and Kinzig 2019)	5	5
250	Vulnerability	Environmental vulnerability (environmental degradation)	Availability of wastewater treatment infrastructure			(Essex, Koop, and Van Leeuwen 2019)	1	1
251	Vulnerability	Environmental vulnerability (environmental degradation)	Systematic testing of water quality	(UNICEF 2017)	1			1
252	Vulnerability	Environmental vulnerability (environmental degradation)	Burning of fossil fuels	(UNICEF 2017)	1			1
253	Vulnerability	Environmental vulnerability (environmental degradation)	Microbial aspects of drinking water quality			(van Engelenburg et al. 2021) (Wang, Knabe, et al. 2022) (Shamsuzzoha , Kormoker, and Ghosh 2018) (Wade et al. 2014) (Anderson et al. 2023)	5	5

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
254	Vulnerability	Environmental vulnerability (environmental degradation)	Chemical aspects of drinking water quality			(van Engelenburg et al. 2021) (Chathuranika et al. 2023) (Wang, Knabe, et al. 2022) (Shamsuzzoha , Kormoker, and Ghosh 2018) (Lorenzo and Kinzig 2019)	5	5
255	Vulnerability	Environmental vulnerability (environmental degradation)	Organic matter			(Anderson et al. 2023)	1	1
256	Vulnerability	Environmental vulnerability (environmental degradation)	Geogenic contamination of groundwater			(Lorenzo and Kinzig 2019) (Shamsuzzoha , Kormoker, and Ghosh 2018)	2	2
257	Vulnerability	Environmental vulnerability (environmental degradation)	Reduction of quality assurance due to the risk of uncontrolled spills and incoming rainwater runoff			(Gómez-Martínez et al. 2021)	1	1
258	Vulnerability	Environmental vulnerability (environmental degradation)	Drinking water temperature fluctuations from source to tap			(Wang, Knabe, et al. 2022) (Shamsuzzoha , Kormoker, and Ghosh 2018)	2	2
259	Vulnerability	Environmental vulnerability (environmental degradation)	Above-ground heat sources (no or little shade, high density of buildings and reflection of building facades, waste heat of specific buildings or infrastructure)			(Agudelo-Vera et al. 2017)	1	1

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260	Vulnerability	Environmental vulnerability (environmental degradation)	Underground heat sources (district heating systems, buried high-power cables, basements/underground parking facilities, tunnels (metro infrastructure))			(Agudelo-Vera et al. 2017)	1	1
261	Vulnerability	Environmental vulnerability (environmental degradation)	Human and animal metabolisms			(Agudelo-Vera et al. 2017)	1	1
262	Vulnerability	Environmental vulnerability (environmental degradation)	Solar Radiation			(Agudelo-Vera et al. 2017)	1	1
263	Vulnerability	Environmental vulnerability (environmental degradation)	Nutrient recovery			(Munkhsuld et al. 2020)	1	1
264	Vulnerability	Environmental vulnerability (Resilience of water sources)	Protection of water sources	(GWP and UNICEF 2017) (CFAR 2023)	2			2
265	Vulnerability	Environmental vulnerability (Resilience of water sources)	Faecal contamination from open defecation			(Nijhawan et al. 2022)	1	1
266	Vulnerability	Environmental vulnerability (Resilience of water sources)	Faecal contamination from pit latrines			(Nijhawan et al. 2022)	1	1
267	Vulnerability	Environmental vulnerability (Resilience of water sources)	Location of water infrastructure	(GWP and UNICEF 2017)	1	(Han et al. 2019)	1	2
268	Vulnerability	Environmental vulnerability (Resilience of water sources)	Should be away from sanitation works	(World Bank 2021)	1			1
269	Vulnerability	Environmental vulnerability	Space between reservoir and lid (contamination)			(Budiyono et al. 2015)	1	1

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
		(Resilience of water sources)						
270	Vulnerability	Environmental vulnerability (Resilience of water sources)	Away from animal access			(Birhan et al. 2023) (Munkhsuld et al. 2020) (Antarpreet Jutla et al. 2023) (Han et al. 2019) (Hoque et al. 2016) (Ntajal et al. 2022) (Tseole et al. 2022a) (Nkiaka 2022)	8	8
271	Vulnerability	Environmental vulnerability (Resilience of water sources)	Sustainability of abstraction	(GWP and UNICEF 2017)	1			1
272	Vulnerability	Environmental vulnerability (Resilience of water sources)	Mean volume exploited (Millionsm ³ /year) by the drinking water supply factory			(Baudement et al. 2017)	1	1
273	Vulnerability	Environmental vulnerability (Resilience of water sources)	Water resource availability - surface and groundwater			(van Engelenburg et al. 2021) (Janine de Wit et al. 2022) (Johannessen et al. 2014)	3	3
274	Vulnerability	Environmental vulnerability (Resilience of water sources)	Characteristic of water resource (ex - perennial, etc.)	(IRAP and UNICEF Mumbai 2017)	1			1
275	Vulnerability	Environmental vulnerability (Resilience of water sources)	Withdrawal to availability (WTA) (environmental flow is a sub-component)			(Yano et al. 2020)	1	1
276	Vulnerability	Environmental vulnerability	Demand to availability			(Yano et al. 2020)	1	1

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
		(Resilience of water sources)						
277	Vulnerability	Environmental vulnerability (Resilience of water sources)	Conjunctive use of local and external sources and ground and surface sources	(UNICEF and MoJS 2020)	1			1
278	Vulnerability	Environmental vulnerability (Resilience of water sources)	Competing demand from energy, industry, and agriculture	(UNICEF 2017) (World Bank 2021)	2	(Bruwier et al. 2015) (Budiyono et al. 2015) (Gómez-Martínez et al. 2021) (van Engelenburg et al. 2021) (Tshimanga et al. 2021) (Ekstrom, Bedsworth, and Fencel 2016)	6	8
279	Vulnerability	Environmental vulnerability (Resilience of water sources)	Replenishing (artificially or naturally) groundwater sources	(GWP and UNICEF 2017)	1	(Teutschbein et al. 2023)	1	2
280	Vulnerability	Environmental vulnerability (Resilience of water sources)	Water management (IWRM included)			(Janine de Wit et al. 2022) (Satterthwaite et al. 2020) (Auliagisni, Wilkinson, and Elkhartoutly 2022) (Rickert et al. 2019) (Nkiaka 2022) (McPhearson, Hamstead, and Kremer 2014)	6	6
281	Vulnerability	Environmental vulnerability	Groundwater level			(Johannessen et al. 2014)	2	2

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
		(Resilience of water sources)				(Baudement et al. 2017)		
282	Vulnerability	Environmental vulnerability (Resilience of water sources)	Electric water pumps for domestic use			(Lorenzo and Kinzig 2019)	1	1
283	Vulnerability	Environmental vulnerability (Resilience of water sources)	percentage of Non-Revenue Water (NRW)			(Assefa et al. 2018) (Rickert et al. 2019) (Rebaudet et al. 2013)	3	3
284	Vulnerability	Environment Vulnerability / Resilience of water sources	Drainage system			(Janine de Wit et al. 2022) (Ntajal et al. 2022) (Tellman et al. 2018)	3	3
285	Vulnerability	Environment Vulnerability / Resilience of water sources	Type of drainage system (Conventional, controlled, composite (climate-adaptive))					0
286	Vulnerability	Environment Vulnerability / Resilience of water sources	Drainage design					0
287	Vulnerability	Environment Vulnerability / Resilience of water sources	Pumping design					0
288	Vulnerability	Environment Vulnerability / Resilience of water sources	Ditch infiltration					0
289	Vulnerability	Environment Vulnerability / Resilience of water sources	Downward seepage					0
290	Vulnerability	Environment Vulnerability / Resilience of water sources	Pipe infiltration					0

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
291	Vulnerability	Environment Vulnerability / Resilience of water sources	Soil type and characteristics (local field scale)					0
292	Vulnerability	Environment Vulnerability / Resilience of water sources	Pipe drainage					0
293	Vulnerability	Environment Vulnerability / Resilience of water sources	Ditch drainage					0
294	Vulnerability	Environment Vulnerability / Resilience of water sources	Surface runoff					0
295	Vulnerability	Environmental vulnerability (Resilience of water sources)	Ground Water Pumping			(Ahmed et al. 2019) (Lorenzo and Kinzig 2019) (Teutschbein et al. 2023)	3	3
296	Vulnerability	Environmental vulnerability (Resilience of water sources)	Groundwater sustainability			(Ahmed et al. 2019)	1	1
297	Vulnerability	Environmental vulnerability (Resilience of water sources)	Reliability					0
298	Vulnerability	Environmental vulnerability (Resilience of water sources)	Resiliency					0
299	Vulnerability	Environmental vulnerability (Resilience of water sources)	The dimensionless vulnerability					0
300	Vulnerability	Environmental vulnerability (Alternative source)	Source of water supply	(World Bank 2021)	1	(Denslow et al. 2010) (McPhearson, Hamstead, and Kremer 2014) (Baijius and Patrick 2019)	10	11

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
						(Ghosh et al. 2016) (Tusting et al. 2020) (Tshimanga et al. 2021) (Telle et al. 2021) (Gruebner et al. 2012) (Rebaudet et al. 2013) (Hoque et al. 2016)		
301	Vulnerability	Environmental vulnerability (Alternative source)	The proportion of people with tap water supply	(IRAP and UNICEF Mumbai 2017)	1	(Assefa et al. 2018) (Teutschbein et al. 2023) (Wade et al. 2014) (Telle et al. 2021) (Baijius and Patrick 2019) (Bellizzi et al. 2020) (Tshimanga et al. 2021) (Purwar, Sliuzas, and Flacke 2020) (Gruebner et al. 2011) (Gruebner et al. 2012) (Rebaudet et al. 2013) (Hoque et al. 2016)	12	13
302	Vulnerability	Environmental vulnerability (Alternative source)	Shallow aquifers as water supply sources	(World Bank 2021)	1			1
303	Vulnerability	Environmental vulnerability (Alternative source)	Surface water as water supply sources	(World Bank 2021)	1			1

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
304	Vulnerability	Environmental vulnerability (Alternative source)	Depending on external water supply, including tankers	(UNICEF and MoJS 2020)	1	(Medeiros et al. 2020)	1	2
305	Vulnerability	Environmental vulnerability (Alternative source)	Existence of diverse sources of drinking water/ alternative water sources, including traditional harvesting structures	(GWP and UNICEF 2017) (UNICEF and MoJS 2020) (UNICEF 2017) (CFAR 2023) (IRAP and UNICEF Mumbai 2017)	5	(Goyal et al. 2022)	1	6
306	Vulnerability	Environmental vulnerability (Alternative source)	Capacity of water storage infrastructure	(GWP and UNICEF 2017) (UNICEF 2017)	2	(Bruwier et al. 2015) (Rickert et al. 2019) (Hoque et al. 2016) (Tellman et al. 2018)	4	6
307	Vulnerability	Environmental vulnerability (Alternative source)	Buffer storage of water in reservoirs per capita	(IRAP and UNICEF Mumbai 2017)	1			1
308	Vulnerability	Environmental vulnerability (Alternative sources)	Alternative sources of sanitation	(CFAR 2023)	1			1
309	Vulnerability	Environmental vulnerability (waste disposal)	Waste Disposal	(UNICEF 2017)	1			1
310	Vulnerability	Environmental vulnerability (waste disposal)	Location and management of landfill sites	(GWP and UNICEF 2017) (GWP and UNICEF 2017) (UNICEF 2017)	3	(Boholm and Prutzer 2017) (Baijous and Patrick 2019) (Teutschbein et al. 2023) (Purwar, Sliuzas, and Flacke 2020)	4	7
311	Vulnerability	Environmental vulnerability (waste disposal)	Coverage of sewerage			(Lorenzo and Kinzig 2019)	2	2

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
						(Shokri, Sabzevari, and Hashemi 2020)		
312	Vulnerability	Environmental vulnerability (waste disposal)	Safe management of sewage (solid and liquid) - collection, treatment, and disposal	(GWP and UNICEF 2017)	1	(Pamidimukula et al. 2021) (Ntajal et al. 2022) (Birhan et al. 2023) (Munkhsuld et al. 2020) (Johannessen et al. 2014) (Munkhsuld et al. 2020) (Ntajal et al. 2022) (Purwar, Sliuzas, and Flacke 2020) (Gruebner et al. 2012) (Baijius and Patrick 2019) (Shokri, Sabzevari, and Hashemi 2020) (McPhearson, Hamstead, and Kremer 2014)	12	13
313	Vulnerability	Environmental vulnerability (waste disposal)	Combined sewer overflows (CSOs)			(Pamidimukula et al. 2021)	1	1
314	Vulnerability	Environmental vulnerability (waste disposal)	System to dispose of effluent, greywater, blackwater, or stormwater			(Abrams et al. 2021) (Ahmed 2016) (Wade et al. 2014) (Shokri, Sabzevari, and Hashemi 2020) (McPhearson, Hamstead,	5	5

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
						and Kremer 2014)		
315	Vulnerability	Environmental vulnerability (waste disposal)	Proportion of stormwater system			(Wang et al. 2022) (McPhearson, Hamstead, and Kremer 2014) (Satterthwaite et al. 2020) (Purwar, Sliuzas, and Flacke 2020) (Gruebner et al. 2012) (Tellman et al. 2018)	6	6
316	Vulnerability	Environmental vulnerability (waste disposal)	Stormwater quality enhancement measures			(McPhearson, Hamstead, and Kremer 2014) (Gruebner et al. 2012) (Köster et al. 2023)	3	3
317	Vulnerability	Environmental vulnerability (waste disposal)	Leaked pipes			(Budiyono et al. 2015) (Gómez-Martínez et al. 2021)	2	2
318	Vulnerability	Environmental vulnerability (waste disposal)	Solid waste recycled			(Munkhsuld et al. 2020)	1	1
319	Vulnerability	Environmental vulnerability (waste disposal)	Solid waste energy recovered			(Munkhsuld et al. 2020)	1	1
320	Vulnerability	Environmental vulnerability (degradation of sub-surface and groundwater sources)	The extent of degradation of sub-surface water sources	(GWP and UNICEF 2017)	1			1
321	Vulnerability	Environmental vulnerability (degradation of sub-surface and groundwater sources)	The extent of degradation of groundwater sources	(GWP and UNICEF 2017)	1			1

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
		groundwater sources)						
322	Vulnerability	Environmental vulnerability (degradation of sub-surface and groundwater sources)	Heavy metal pollution in pond sludge and soil			(Goyal et al. 2022)	1	1
323	Vulnerability	Environmental vulnerability	Hydrological aspects affecting the drinking water supply			(van Engelenburg et al. 2021)	1	1
324	Vulnerability	Environmental vulnerability	Groundwater baseflow	(Strzepek et al. 2011)	1	(Baudement et al. 2017)	1	2
325	Vulnerability	Environmental vulnerability	Basin yield	(Strzepek et al. 2011)	1			1
326	Vulnerability	Environmental vulnerability	Geological conditions	(World Bank 2021)	1	(Johannessen et al. 2014) Hoque et al. (2016)	2	3
327	Vulnerability	Environmental vulnerability	Transmissivity (m ² /d)			Dennis and Dennis (2012)	1	1
328	Vulnerability	Environmental vulnerability	Geo/ Morphological conditions			(Johannessen et al. 2014)	1	1
329	Vulnerability	Environmental vulnerability	Effective porosity			(Bastani and Harter 2019) (Tellman et al. 2018)	2	2
330	Vulnerability	Environmental vulnerability	Streamflow			(Lorenzo and Kinzig 2019)	1	1
331	Vulnerability	Environmental vulnerability	Hydrology characteristics (Regional catchment scale)			(Janine de Wit et al. 2022)	1	1
332	Vulnerability	Human vulnerability (demographic characteristics)	Human Development Index	(GWP and UNICEF 2017)	1	(Nkiaka 2022)	1	2
333	Vulnerability	Human vulnerability	Poverty	(GWP and UNICEF 2017) (IRAP and UNICEF	2	(Araya, Podgorski, and Berg 2023) (Munkhsuld et al. 2020)	4	6

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
				Mumbai 2017)		(Antarpreet Jutla et al. 2023) (Badamosi et al. 2023)		
334	Vulnerability	Human vulnerability	United Nations Standardised Poverty Index					
335	Vulnerability	Human vulnerability	Household structure			(Denslow et al. 2010) (Tshimanga et al. 2021) (Telle et al. 2021) (Gruebner et al. 2011) (Gruebner et al. 2012) (Rogerson and Rogerson 2019)	6	6
336	Vulnerability	Human vulnerability	Number of individuals in the household			(Denslow et al. 2010) (Tshimanga et al. 2021) (Telle et al. 2021)	3	3
337	Vulnerability	Human vulnerability	Sanitation			(Denslow et al. 2010) (Tshimanga et al. 2021) (Gruebner et al. 2012) (Rebaudet et al. 2013)		
338	Vulnerability	Human vulnerability	The proportion of the population with access to potable water			(Denslow et al. 2010) (Tshimanga et al. 2021) (Telle et al. 2021) (Gruebner et al. 2012) (Rebaudet et al. 2013) (Hoque et al. 2016)	6	6

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
339	Vulnerability	Human vulnerability	Employment			(Denslow et al. 2010) (Tshimanga et al. 2021) (Gruebner et al. 2012) (Rogerson and Rogerson 2019) (Badamosi et al. 2023) (Pamidimukula et al. 2021) (Munkhsuld et al. 2020) (Badamosi et al. 2023)	8	8
340	Vulnerability	Human Vulnerability	GDP per capita			(Thomaz et al. 2023) (Nkiaka 2022)	2	2
341	Vulnerability	Human Vulnerability (population growth and urbanisation)	Population			(Wang et al. 2020) (Teutschbein et al. 2023) (Rickert et al. 2019) (Telle et al. 2021) (Gruebner et al. 2012) (Rogerson and Rogerson 2019) (Hoque et al. 2016)	7	7
342	Vulnerability	Human vulnerability (population growth and urbanisation)	Population growth rate	(GWP and UNICEF 2017) (UNICEF 2023) (World Bank 2021)	3	(Johannessen et al. 2014) (Hoque et al. 2016) (Tseole et al. 2022a) (Ntajal et al. 2022) (Goyal et al. 2022)	5	8
343	Vulnerability	Human vulnerability (population	Population density (Inhabitants/km2)	(IRAP and UNICEF	1	(Thomaz et al. 2023)	1	2

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
		growth and urbanisation)		Mumbai 2017)				
344	Vulnerability	Human vulnerability (population growth and urbanisation)	Urbanisation	(GWP and UNICEF 2017) (UNICEF 2023) (UNICEF 2017)	3	(Munkhsuld et al. 2020) (Pamidimukka la et al. 2021) (Araya, Podgorski, and Berg 2023) (Boholm and Prutzer 2017) (Janine) de Wit et al. 2022) (Nkiaka 2022) (Johannessen and Wamsler 2017) (Tusting et al. 2020)	8	11
345	Vulnerability	Human vulnerability (demographic characteristics)	Sex (ratio) of population			(Tusting et al. 2020) (Tshimanga et al. 2021)	2	2
346	Vulnerability	Human vulnerability (demographic characteristics)	Age of population	(GWP and UNICEF 2017)	1	(Denslow et al. 2010) (Tusting et al. 2020) (Rogerson and Rogerson 2019) (Tshimanga et al. 2021) (Gruebner et al. 2012) (Rogerson and Rogerson 2019) (Badamosi et al. 2023) (Han et al. 2019)	8	9
347	Vulnerability	Human vulnerability (demographic characteristics)	Number of children	(UNICEF 2023) (UNICEF 2017)	3			3

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
				(World Bank 2021)				
348	Vulnerability	Human vulnerability (demographic characteristics)	No. of infants					0
349	Vulnerability	Human vulnerability (demographic characteristics)	No. of Neoneonates (0-28 days)					0
350	Vulnerability	Human vulnerability (demographic characteristics)	No of Toddlers (1-4 yrs)					0
351	Vulnerability	Human vulnerability (demographic characteristics)	No of children (4 onwards)					0
352	Vulnerability	Human vulnerability (demographic characteristics)	Percentage of young people	(CFAR 2023)	1			1
353	Vulnerability	Human vulnerability (demographic characteristics)	No of pregnant womens					0
354	Vulnerability	Human vulnerability (demographic characteristics)	Recurring pregnancy			(Ghosh et al. 2016)	1	1
355	Vulnerability	Human vulnerability	Number of children with health-related conditions like malnutrition (height for age stunting in under 5), micronutrient deficiency, respiratory diseases, etc	(UNICEF 2023) (IRAP and UNICEF Mumbai 2017)	2	(Iqbal et al. 2022) (Bellizzi et al. 2020) (Ghosh et al. 2016) (Shokri, Sabzevari, and Hashemi 2020)	4	6
356	Vulnerability	Human vulnerability	State of immunisation of people			(Tusting et al. 2020)	1	1

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
357	Vulnerability	Human vulnerability	The proportion of the population who are unhealthy	(IRAP and UNICEF Mumbai 2017)	1	(Munkhsuld et al. 2020) (Denslow et al. 2010) (Ghosh et al. 2016) (Bellizzi et al. 2020) (Tshimanga et al. 2021) (Gruebner et al. 2012) (Assefa et al. 2018) (Ghosh et al. 2016)	8	9
358	Vulnerability	Human vulnerability	Inadequate core body temperature			(Venugopal et al. 2016)	1	1
359	Vulnerability	Human vulnerability	Inadequate sweat rate (SwR)			(Venugopal et al. 2016)	1	1
360	Vulnerability	Human vulnerability	Inadequate urine specific gravity (USG)			(Venugopal et al. 2016)	1	1
361	Vulnerability	Human vulnerability	Inadequate fluid consumption			(Venugopal et al. 2016)	1	1
362	Vulnerability	Human vulnerability (demographic characteristics)	Levels of education	(GWP and UNICEF 2017)	1	(Munkhsuld et al. 2020) (Assefa et al. 2018) (Denslow et al. 2010) (Ghosh et al. 2016) (Tusting et al. 2020) (Tshimanga et al. 2021) (Gruebner et al. 2012) (Rogerson and Rogerson 2019) (Tshimanga et al. 2021)	12	13

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
						(Rogerson and Rogerson 2019) (Nkiaka 2022) (Badamosi et al. 2023)		
363	Vulnerability	Human vulnerability (demographic characteristics)	Adult education					0
364	Vulnerability	Human vulnerability (demographic characteristics)	Education level in children	(UNICEF 2023)	1			1
365	Vulnerability	Human vulnerability (demographic characteristics)	Education rate					0
366	Vulnerability	Human vulnerability	Access to drinking water			(Munkhsuld et al. 2020) (Birhan et al. 2023) (Antarpreet Jutla et al. 2023) (Han et al. 2019) (Hoque et al. 2016) (Ntajal et al. 2022) (Tseole et al. 2022a) (Nkiaka 2022)	8	8
367	Vulnerability	Human vulnerability	Population with difficulty in accessing water services			(Wang et al. 2020) (Wade et al. 2014)	2	2
368	Vulnerability	Human vulnerability	Water Supply Service Duration per Day			(Assefa et al. 2018) (Gruebner et al. 2012)	2	2
369	Vulnerability	Human vulnerability	Affordability of domestic water supply tariff			(Assefa et al. 2018) (Gruebner et al. 2012)	2	2

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
370	Vulnerability	Human vulnerability	Access to safe drinking water within the dwelling premise	(IRAP and UNICEF Mumbai 2017)	1			1
371	Vulnerability	Human vulnerability	Access to sanitation			(Munkhsuld et al. 2020) (Antarpreet Jutla et al. 2023) (Han et al. 2019) (Hoque et al. 2016) (Ntajal et al. 2022) (Tseole et al. 2022a) (Denslow et al. 2010) (Telle et al. 2021) (Rebaudet et al. 2013) (Rogerson and Rogerson 2019) (Venugopal et al. 2016) (Ghosh et al. 2016) (Rebaudet et al. 2013) (Rogerson and Rogerson 2019)	14	14
372	Vulnerability	Human vulnerability	The proportion of customers connected to the sewer system			(Assefa et al. 2018) (Teutschbein et al. 2023) (McPhearson, Hamstead, and Kremer 2014) (Bellizzi et al. 2020) (Purwar, Sliuzas, and Flacke 2020)	13	13

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
						(Telle et al. 2021) (Gruebner et al. 2011) (Gruebner et al. 2012) (Rebaudet et al. 2013) (Wang et al. 2022) (Shokri, Sabzevari, and Hashemi 2020) (McPhearson, Hamstead, and Kremer 2014) (Purwar, Sliuzas, and Flacke 2020)		
373	Vulnerability	Human vulnerability	Access to safe sanitation within a premise			(Badamosi et al. 2023)	1	1
374	Vulnerability	Human vulnerability (resource vulnerability)	Type of sanitation facilities (pit latrines/ open defecation/ modern toilets, etc.)	(IRAP and UNICEF Mumbai 2017)	1	(Birhan et al. 2023) (Nijhawan et al. 2022) (Antarpreet Jutla et al. 2023) (Han et al. 2019) (Hoque et al. 2016) (Ntajal et al. 2022) (Tseole et al. 2022a) (Tusting et al. 2020) (Lorenzo and Kinzig 2019)	9	10
375	Vulnerability	Human vulnerability (knowledge and understanding)	Knowledge and understanding of local hazard	(GWP and UNICEF 2017) (CFAR 2023)	2			2

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
376	Vulnerability	Human vulnerability (knowledge and understanding)	Knowledge and understanding of WASH benefits	(GWP and UNICEF 2017) (CFAR 2023)	2	(Tseole et al. 2022a) (Munkhsuld et al. 2020)	2	4
377	Vulnerability	Human vulnerability (knowledge and understanding)	Awareness of disaster response and recovery			(Pamidimukka la et al. 2021) (Johannessen and Wamsler 2017)	2	2
378	Vulnerability	Human vulnerability (knowledge and understanding)	Participation in self-protection during disaster training			(Auliagisni, Wilkinson, and Elkhaboutly 2022)	1	1
379	Vulnerability	Human vulnerability (knowledge and understanding)	Knowledge & Health			(Ahmed 2016)	1	1
380	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Public policy to provide the necessary guidance for identifying and addressing vulnerabilities and risks	(GWP and UNICEF 2017)	1	(Munkhsuld et al. 2020)	1	2
381	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Climate risk assessments at an appropriate scale to inform policies	(UNICEF 2017)	1			1
382	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Generation of more data and evidence	(UNICEF 2017)	1	(Venugopal et al. 2016)	1	2
383	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Compiling data at an appropriate scale on the impacts of water stress and climate change on WASH services	(UNICEF 2017)	1			1
384	Vulnerability	Political and institutional vulnerability	Investment in a high-risk population	(UNICEF 2017)	1			1

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
		(Government effectiveness)						
385	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Governance structure			(Venugopal et al. 2016) (Nkiaka 2022)	2	2
386	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Meaningful participation and mainstreaming of participatory processes involving civic institutions	(CFAR 2023a)	1			1
387	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Active engagement of children in climate activities and policies	(UNICEF 2017)	1			1
388	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Institutional capacity of government, providers, and CSOs	(CFAR 2023a) (IRAP and UNICEF Mumbai 2017)	2			2
389	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Awareness of issues of climate resilience	(CFAR 2023a)	1	(Johannessen and Wamsler 2017)	1	2
390	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Sense of urgency on climate resilience			(Munkhsuld et al. 2020)	1	1
391	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Awareness and commitment to address inclusion and climate risks in WASH services	(CFAR 2023a)	1			1
392	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Capacity to influence, plan, and manage WASH projects	(CFAR 2023a)	1			1

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
393	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Institutional coordination and convergence (for planning, data sharing, etc.)	(CFAR 2023a)	1	(Munkhsuld et al. 2020) (Pelling et al. 2018)	2	3
394	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Cohesion of information and knowledge among stakeholders			(Munkhsuld et al. 2020)	1	1
395	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Policy-science integration			(Johannessen and Wamsler 2017)	1	1
396	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Accountability between service/ resource user, provider, and manager			(Johannessen and Wamsler 2017)	1	1
397	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Sensitisation on the inclusion of marginalised groups, disabled, and third-gender	(CFAR 2023a)	1			1
398	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Harmonisation and alignment in govt and non-govt spaces	(UNICEF 2017)	1			1
399	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Capacity to innovate			(Boholm and Prutzer 2017) (Munkhsuld et al. 2020)	2	2
400	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Capacity to co-ordinate and converge with actors outside of the immediate system			(Munkhsuld et al. 2020) (Rickert et al. 2019)	2	2
401	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Sustainable and system planning (at the organisational level)	(UNICEF 2017)	1	(Pamidimukula et al. 2021)	1	2

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
402	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Available funds/ability to invest			(Chathuranika et al. 2023) (Johannessen et al. 2014) (Satterthwaite et al. 2020)	3	3
403	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Official development assistance for water and sanitation services (ODA-WSS)			(Nkiaka 2022)	1	1
404	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Agencies registered (including Government, private, and NGOs) for relief and rehabilitation measures for disasters	(IRAP and UNICEF Mumbai 2017)	1			1
405	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Resources and human (technical and non-technical) capacity			(Chathuranika et al. 2023) (Johannessen et al. 2014)	2	2
406	Vulnerability	Political and institutional vulnerability (WASH and other policies)	Existence of WASH committees			(Ahmed 2016)	1	1
407	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Existence of early warning systems			(Auliagisni, Wilkinson, and Elkhartoutly 2022) (Satterthwaite et al. 2020) (Venugopal et al. 2016) (Bellizzi et al. 2020)	4	4
408	Vulnerability	Political and institutional vulnerability	Prioritisation of WASH in planning and	(CFAR 2023a)	1	(Munkhsuld et al. 2020)	1	2

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
		(Government effectiveness)	implementing actions					
409	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Structural scarcity (incomplete public supply systems)			(Britto, Formiga-Johnsson, and Carneiro 2016) (Tusting et al. 2020)	2	2
410	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Devolution of power and finances to lower levels of governance institutions	(CFAR 2023a)	1			1
411	Vulnerability	Political and institutional vulnerability (Government effectiveness)	A national-level comprehensive performance assessment framework for the WASH sector, encompassing both inclusion and climate resilience	(CFAR 2023a)	1			1
412	Vulnerability	Political and institutional vulnerability (WASH and other policies)	Appropriate WASH policies in place	(GWP and UNICEF 2017)	1	(Chathuranika et al. 2023)	1	2
413	Vulnerability	Political and institutional vulnerability (WASH and other policies)	WASH policies specifically include climate resilience	(GWP and UNICEF 2017) (UNICEF 2017)	2			2
414	Vulnerability	Political and institutional vulnerability (WASH and other policies)	Policies need to be in place to plan for future changes in water supply and demand and to adapt to climate risks	(GWP and UNICEF 2017) (UNICEF 2017)	2			2
415	Vulnerability	Political and institutional vulnerability	Water efficiency measures			(Munkhsuld et al. 2020)	1	1

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
		(WASH and other policies)						
416	Vulnerability	Political and institutional vulnerability	Role of local markets to establish affordable and resilient sanitation solutions	(UNICEF 2017)	1			1
417	Vulnerability	Political and institutional vulnerability (Government effectiveness)	Protective and regulatory provisions for water use and management			(Abrams et al. 2021) (Boholm and Prutzer 2017) (Chathuranika et al. 2023) (van Engelenburg et al. 2021) (Rickert et al. 2019)	5	5
418	Vulnerability	Political and institutional vulnerability (WASH and other policies)	Statutory compliance			(Munkhsuld et al. 2020)	1	1
419	Vulnerability	Political and institutional vulnerability (WASH and other policies)	Pricing policies			(Chathuranika et al. 2023)	1	1
420	Vulnerability	Political and institutional vulnerability	Increased global advocacy	(UNICEF 2017)	1			1
421	Vulnerability	Political and institutional vulnerability	Drought mitigation plan			(Wang et al. 2020)	1	1
422	Vulnerability	Political and institutional vulnerability	Adequacy of public health systems to (accessibility/affordability/quality of service)	(IRAP and UNICEF Mumbai 2017)	1	(Boholm and Prutzer 2017) (Munkhsuld et al. 2020) (Satterthwaite et al. 2020) (Purwar, Sliuzas, and Flacke 2020)	4	5

S. No.	Sub-component of risk	Further categorisation	Indicator	Grey Literature in-text citations	Grey literature frequency count	Non-grey literature In-text citation	Non-grey literature - frequency count	Total frequency count
423	Vulnerability	Political and institutional vulnerability	The existence of a policy to hire private tankers for emergency water supply	(IRAP and UNICEF Mumbai 2017)	1			1
424	Vulnerability	Political and institutional vulnerability	Heat management in the workplace			(Han et al. 2021)	1	1
425	Vulnerability	Political and institutional vulnerability	Policies for higher temperature			(Han et al. 2021)	1	1
426	Vulnerability	Political and institutional vulnerability	Adaptation plans to flood			(Satterthwaite et al. 2020) (Badamosi et al. 2023)	1	1
427	Vulnerability	Political and institutional vulnerability	Flood management practices			(Satterthwaite et al. 2020)	1	1
428	Vulnerability	Political and institutional vulnerability	Risk management and communication protocols			(Rickert et al. 2019) (Pelling et al. 2018) (Bellizzi et al. 2020)	3	3

*A detailed reference list for this table is at the end of the annexure (Annexure 12)

Annexure 7: Questionnaire for choice of ranking the indicators online, as shared with stakeholders

(Note - Indicators in this section have been reworded and re-categorized into hazard, exposure, sensitivity, and adaptive capacity based on stakeholder consultation and the research team's call. The final changes have been updated in Table 4.)

A. HAZARD

(Do not give scores to indicators in this section, as all hazards will hold equal weight in our risk assessment. You may skip to section B directly)

Hazard refers to the potential occurrence of climate-related physical events or trends or their physical impacts (IPCC 2014).

The types of hazards considered in this study are:

- Number of flood events in past 40 years (1984 - 2023)
- Number of meteorological drought events in the past 40 years (1984 - 2023)
- Number of extreme rainfall events in last 10 years (2014-2023)
- Number of heat wave events in the last 10 years (2014 - 2023)
- Number of cyclones in the last 10 years (2014 - 2023)

B. EXPOSURE

Exposure refers to the presence of people, livelihoods, species or ecosystems, environmental functions, services, resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected (IPCC 2014).

For each indicator below, please tick the category that best represents its relevance to assessing the WASH sector's exposure to climate-extremes-induced risk. Please tick the box only under one category of significance for each indicator. This section has 11 indicators. Space has been given for you to suggest up to 2 new indicators. Please mention scale and the data source of these newly proposed indicators, and rank them on a scale of relevance

Category of relevance (→) Indicators (↓)	Very highly relevant	Highly relevant	Moderately Relevant	Less relevant	Not relevant
<i>Population density of district (2023)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of urban slum area to total district area</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of rural population to total district population</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Average age of water supply infrastructure in the district</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Stage of groundwater development of the district</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Category of relevance (→) Indicators (↓)	Very highly relevant	Highly relevant	Moderately Relevant	Less relevant	Not relevant
<i>Groundwater quality index of the district</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Surface water quality index of the district</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of households connected to sewerage in urban areas</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of rural households in the districts covered by drainage facilities</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of rural households in the district with individual compost pits/ leach pits/ soak pits/ magic pits</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Water resource availability per capita in the district</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Space to suggest new indicators. Please provide the data source. And rank this newly proposed indicator.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Space to suggest new indicators. Please provide the data source. And rank this newly proposed indicator.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C. SENSITIVITY

Sensitivity refers to the degree to which a system or species is affected by climate change (IPCC 2014).

For each indicator given below, please tick the category that best represents its relevance to assessing the sensitivity of the WASH sector in India to climate-extremes-induced risk. Please tick the box only under one category of significance for each indicator. This section has 12 indicators. Space has been given for you to suggest up to 2 new indicators. Please mention scale and the data source of these newly proposed indicators and rank them on the relevance scale.

Category of relevance (→) Indicators (↓)	Very highly relevant	Highly relevant	Moderately Relevant	Less relevant	Not relevant
<i>Slope of district</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Altitude (elevation) of the district</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>The district has changed land use and land cover over the last 10 years.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>The maternal mortality rate in the state per 100,000 live births</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Under 5 mortality rate in the state per 1000 live births</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of children under 5 who are stunted at the district level</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of children under 5 who are wasted at the district level</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of drinking water schemes relying on groundwater in overexploited groundwater districts</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Category of relevance (→) Indicators (↓)	Very highly relevant	Highly relevant	Moderately Relevant	Less relevant	Not relevant
<i>Percentage of drinking water schemes relying on surface water in the district</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>The sex ratio of the total district population</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of persons with disabilities at the state level</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Total fertility rate at the state level</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Space to suggest new indicators. Please provide the data source. And rank this newly proposed indicator.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Space to suggest new indicators. Please provide the data source. And rank this newly proposed indicator.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

D. ADAPTIVE CAPACITY

Adaptive capacity is the ability to adjust to potential damage, take advantage of opportunities, or respond to consequences (IPCC 2014).

For each indicator given below, please tick the category that best represents its relevance to assessing the sensitivity of the WASH sector in India to climate-extremes-induced risk. Please tick the box only under one category of significance for each indicator. This section has 29 indicators. Space has been given for you to suggest up to 2 new indicators. Please mention scale and the data source of these newly proposed indicators and rank them on a scale of relevance.

Category of relevance (→) Indicators (↓)	Very highly relevant	Highly relevant	Moderately Relevant	Less relevant	Not relevant
<i>Percentage of rural agricultural landless households</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of short-term migrants</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of the population below the poverty line</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of district population under the age of 5 in 2023</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of district population above the age of 65 in 2023</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of the population with positive water-borne diseases occurring annually</i> - <i>Number of cases of Cholera</i> - <i>Number of cases of acute diarrhoeal disease</i> - <i>Number of cases of Enteric Fever (Typhoid)</i> - <i>Number of cases of Viral Hepatitis</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of households having safely managed drinking water services at the district level</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Category of relevance (→) Indicators (↓)	Very highly relevant	Highly relevant	Moderately Relevant	Less relevant	Not relevant
<i>Percentage of schools and aanganwadis having safely managed drinking water services.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of (government) healthcare facilities having safely managed drinking water services at the district level</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of households having safely managed sanitation facilities at the district level</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of schools and aanganwadis having safely managed sanitation facilities at the district level.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of schools in the district with gender-separate toilets</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of (government) healthcare facilities having safely managed sanitation services at the district level</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of schools and aanganwadis having functional hand-hygiene facilities (water and soap or alcohol-based hand rub) at the district level</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Category of relevance (→) Indicators (↓)	Very highly relevant	Highly relevant	Moderately Relevant	Less relevant	Not relevant
<i>Percentage of (government) health-care facilities having functional hand-hygiene facilities (water and soap or alcohol-based hand rub) at the district level</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Annual average completion rate of Jal Jeevan Mission schemes, from 2019-20 to 2023-24 (district-wise)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Women in a district with 10 or more years of schooling</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Number of functional government health facilities in the district per 1,000 population</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Average distance females travel to the principal source of drinking water.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Women aged 15-24 years in the district who use hygienic methods of protection during their menstrual period (%)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>The annual average budget allocated by the government to WASH per district per capita for the last 5 years (2019-2023)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Category of relevance (→) Indicators (↓)	Very highly relevant	Highly relevant	Moderately Relevant	Less relevant	Not relevant
<i>Climate risk assessments to inform policies as part of district disaster management plans</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Inclusion of WASH in state disaster management plans (taken as a proxy for the district)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Identification of agencies (including government, private, and NGOs) for WASH-related relief and rehabilitation measures for disasters as part of state disaster management plans (taken as a proxy for the district)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of villages or gram panchayats in districts with village water sanitation committees or other similar local institutions in rural areas</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of households in the state who practice hand washing before meals</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Percentage of households in the state who practice hand washing after defecation</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>The density of rain gauges in the district per sq. km</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Category of relevance (→) Indicators (↓)	Very highly relevant	Highly relevant	Moderately Relevant	Less relevant	Not relevant
<i>Provisions in state disaster management plan for emergency water supply (taken as a proxy for the district)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Space to suggest new indicators. Please provide the data source. And rank this newly proposed indicator.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Space to suggest new indicators. Please provide the data source. And rank this newly proposed indicator.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Annexure 8: Rationale for choice of indicators, as shared with stakeholders for online ranking of indicators

Some of these indicators were further revised after stakeholder consultation.

S. No.	Category	Main indicator (individual)	Rationale
1	Hazard	Number of flood events in the past 40 years (1984–2023)	Flooding can severely affect drinking water and sanitation infrastructure by either washing it away or compromising its integrity due to water seepage or debris. When drinking water comes into contact with floodwaters, it becomes a biological hazard, as these waters can carry pathogens and pollutants that contaminate drinking sources. Additionally, access to drinking water may decrease if roads and other necessary infrastructure are damaged or destroyed. Health emergencies related to water, sanitation, and hygiene (WASH) may need to be addressed, as health facilities can become dysfunctional, overloaded, or inaccessible during such events.

S. No.	Category	Main indicator (individual)	Rationale
2	Hazard	Number of meteorological drought events in the past 40 years (1984–2023)	Populations experiencing environmental stress, such as drought, will utilize any available water, irrespective of its quality, potentially endangering their health. During droughts, the use of water for sanitation and hygiene often takes a backseat. Droughts also impact water quality by reducing dissolved organic carbon levels. As water levels in aquifers drop, the water can become salinized. This situation may strain existing water purification techniques excessively, rendering them ineffective or obsolete.
3	Hazard	Number of extreme rainfall events in the past 10 years (2014–2023)	Changes in precipitation affect the flushing rate of materials into rivers and groundwater, while alterations in flow volumes influence the dilution of these loads. The critical consequences of declining water quality due to climate change include increasing water withdrawal from low-quality sources, greater pollutant loads from diffuse sources due to heavy precipitation (via higher run-off and infiltration), water infrastructure malfunctioning during floods, and overloading the capacity of water and wastewater treatment plants during extreme rainfall. Changes in precipitation can cause changes in the seasonality of some allergenic species and the seasonal distribution of malaria, dengue, tick-borne diseases, cholera, and other diarrhoeal diseases.
4	Hazard	Number of hot days in the past 10 years (2014–2023)	<ul style="list-style-type: none"> ● Rising temperatures enhance the atmosphere's ability to store water, which decreases water availability in the short term, especially during the warmer months. However, when the air eventually cools, it leads to more intense rainfall. This pattern can cause severe water shortages followed by heavy rain and flooding. Additionally, it increases the frequency and intensity of tropical cyclones and other extreme weather events. ● Increasing temperatures also affect freshwater lakes and rivers' physical, chemical, and biological properties. As temperatures rise, algal blooms can also occur, contaminating water with toxins and pathogens that can damage the human liver and nervous systems and cause the spread of diseases such as diarrhoea. ● Diseases that are the leading cause of fatalities in children are susceptible to climate change. For example, recent research has shown an eight per cent increase in <i>Escherichia coli</i>-related diarrhoea for every 1°C increase in temperature.

S. No.	Category	Main indicator (individual)	Rationale
			<ul style="list-style-type: none"> Temperature changes can also affect the seasonality of some allergenic species and the seasonal distribution of malaria, dengue, tick-borne diseases, cholera, and other diarrhoeal diseases.
5	Hazard	Number of cyclones in the past 10 years (2014–2023)	A tropical cyclone has the potential to cause damage to WASH facilities due to heavy rainfall, flooding, coastal storm surges, and high winds. Some of the ways cyclones could disrupt access to safe WASH services are as follows: pipe breaks due to washouts, uprooted trees, and so on, resulting in wastewater overflows or low or no water pressure throughout the service area; loss of power and communication infrastructure due to high winds; restricted access to water and wastewater treatment facilities and water and wastewater networks due to debris and floodwaters; loss of water-quality testing capability during the cyclone (as laboratories may be closed/damaged); and contamination of drinking water sources.
6	Exposure	Population density of the district (2023)	A more significant number of people per unit space implies a greater need for resources for WASH services, greater exposure of the population to hazards, and a greater need for resources during post-disaster response. Population growth challenges the design and construction of present and future infrastructural facilities and also challenges the availability of water for sectors other than WASH, such as agriculture, industry, and recreation
7	Exposure	Percentage of urban slum area to total district area	The provision of WASH services in urban slums has conventionally lagged behind that in urban areas in terms of absolute coverage, quantity, and quality. Also, the living conditions in slums make the infrastructure and population more vulnerable to damage from hazards.
8	Exposure	Percentage of rural population to total district population	<ul style="list-style-type: none"> Low literacy rates, high dependence on climate-sensitive occupations such as rain-fed agriculture, stand-alone or distant houses, houses built in difficult-to-reach locations, conservative gender practices, and the prevalence of caste-based divisions in resource access make rural areas vulnerable. Detailed data on the provision of WASH services in rural areas may also be lacking. Lower population in rural areas may result in low revenue collection by service providers, with a consequent limited ability to finance WASH services

S. No.	Category	Main indicator (individual)	Rationale
9	Exposure	Average age of water supply infrastructure in the district	The age of an infrastructure determines its resilience at the time of disasters.
10	Exposure	Stage of groundwater development of the district	Groundwater is an essential source of water for WASH (Water, Sanitation, and Hygiene) services in India. However, when it is extracted more rapidly than it can be naturally replenished, it can lead to significant problems. Over-extraction of groundwater reduces the availability of water for WASH services and compromises its quality. This deterioration can increase the costs associated with WASH services and jeopardize the long-term sustainability of groundwater as a reliable water source.
11	Exposure	Groundwater quality index of the district	Groundwater is a crucial source of water for WASH services in India. The concentration of dissolved salts and salinity in groundwater jeopardizes the availability of quality water for these services, the infrastructure, and the associated costs of provision.
12	Exposure	Surface water quality index of the district	Surface water is also a source of water for WASH services in India. If surface water quality goes down, it threatens the availability of quality water for WASH services, the water infrastructure, and the provision costs. The contaminants in surface water may also leach into groundwater and threaten its quality.
13	Exposure	Water resource availability per capita in the district	The water available per capita in the district should be sufficient to supply the population for present and future needs. This includes water for drinking and various other activities applicable to surface water and groundwater.
14	Exposure	Percentage of households connected to sewerage in urban areas	Disposal of wastewater is necessary for public health and hydrological balance. Also, open drains are a public health hazard since they can be breeding grounds for diseases, contaminate other water and land sources, and disrupt the hydrological balance by increasing evapotranspiration, which is more significant for open channels than closed channels.
15	Exposure	Percentage of rural households in the district with individual compost pits/leach pits/soak pits/magic pits	These structures are necessary for solid waste and grey-water management. The absence of these can increase the risk of contamination of water sources and soil and encourage the breeding of mosquitoes and pathogens, all of which increase the occurrence of diseases.

S. No.	Category	Main indicator (individual)	Rationale
16	Exposure	Percentage of rural households in the districts covered by drainage facilities	Disposal of wastewater is necessary for public health and hydrological balance. Also, open drains are a public health hazard since they can be breeding grounds for diseases, pose a danger of contaminating other water and land sources, and disrupt the hydrological balance by increasing evapotranspiration from the open channel.
17	Sensitivity	The under-five mortality rate in the state per 1,000 live births	Inadequate water, sanitation, and hygiene (WASH) provisions for children can lead to serious health issues, including acute respiratory infections, diarrheal diseases, and cholera. These inadequate provisions can also disrupt education, impact livelihoods, lead to migration and conflict, and create an environment that encourages child labour, ultimately increasing the risk of child mortality. Diarrheal disease is the fourth leading cause of death among children under five globally, primarily caused by unsafe drinking water and insufficient sanitation and hygiene practices.
18	Sensitivity	The maternal mortality rate in the state per 1,00,000 live births	An estimated eight per cent of maternal deaths worldwide are due to unhygienic conditions during labour and birth, as well as inadequate postnatal hygiene. Exposure to contaminated water during pregnancy can lead to serious health issues such as malaria, pre-eclampsia, gestational hypertension, typhoid, dysentery, and amoebiasis. These conditions can result in miscarriage, foetal death, and maternal mortality.
19	Sensitivity	Slope of the district	Steepness impacts landslides and water flow during floods. Water sources and WASH infrastructure located downhill steep slopes with managed forests, cultivated land, or bare soil may be at greater risk of damage during heavy rainfall.
20	Sensitivity	Altitude (elevation) of the district	Low-lying areas in plains are more prone to flooding, particularly during heavy rains, cyclones, or when rivers overflow. Higher elevations in mountains, especially mountainous regions with unstable soil, may be susceptible to landslides. In both cases, the provision of WASH services may become difficult as the risks to infrastructure and water sources increase.
21	Sensitivity	Change in land use and land cover of the district over the past 10 years	Changing land-use land cover impacts atmospheric, land, and water temperatures; precipitation patterns; and the health of water-, land-, and air-based ecosystems. It can exacerbate the effects of floods, droughts, cyclones, and heat waves. This change stresses the quantity and quality of water sources and infrastructure, which can negatively impact human health. For

S. No.	Category	Main indicator (individual)	Rationale
			instance, deforestation for agricultural production can increase transpiration, block precipitation, and reduce runoff volume. It also reduces infiltration and increases flood run-off and peak discharges, changing the soil's water storage capacity. Urbanisation impacts local water cycles and results in air pollution due to industries and other anthropogenic causes. Acid rain can negatively affect water quality by damaging essential ecosystems like forests, regulating water cycles, and purifying water.
22	Sensitivity	Percentage of children under five who are wasted at the district level	Wasting is a type of undernutrition, expressed as low weight for height. Poor sanitation and hygiene increase the risk of infections such as diarrhoea, which can rapidly lose nutrients and fluids and cause wasting in children. According to the WHO, nearly half of deaths among children under five years of age are linked to undernutrition. These mainly occur in low—and middle-income countries.
23	Sensitivity	Percentage of children under five who are stunted at the district level	Stunting is a type of undernutrition, expressed as low height for age. Continuous exposure to infections and poor health due to inadequate sanitation and hygiene can cause long-term nutritional deficits. These sustained nutritional deficits prevent children from reaching their full growth potential, leading to stunting.
24	Sensitivity	Percentage of drinking water schemes relying on surface water in the district	Relying on surface water is often preferable to relying on groundwater because surface water is more easily accessible for recharge. Although surface water is more vulnerable to degradation in water quality since it is not hidden underground, it can be replenished more easily through natural or artificial methods.
25	Sensitivity	Percentage of drinking water schemes relying on groundwater in groundwater-overexploited districts	Heavy reliance on groundwater for WASH services in overexploited districts threatens the sustainability of this resource in terms of water quantity, extraction costs, and quality. As groundwater levels decrease, the salinity of the water may increase.
26	Sensitivity	Percentage of persons with disabilities at the state level	Persons with disabilities often have specialised mobility needs or may be slow to understand and respond to emergencies, making it more difficult to evacuate or access safe areas during hazards such as floods, cyclones, and heat waves. The design of WASH infrastructure may not be adequate to accommodate the unique needs of such people, and their participation in planning processes for WASH may also be low because of negative stereotypes associated with disability or under-reporting of disability levels.

S. No.	Category	Main indicator (individual)	Rationale
27	Sensitivity	Sex ratio in the total district population	<ul style="list-style-type: none"> ● The sex ratio is the number of females per 1,000 males. ● Women are more susceptible to the negative impacts of inadequate resources. In many countries, gender norms put women at a disadvantage. They are often responsible for collecting water, and menstrual hygiene is overlooked, whereas men are given priority for bathing. ● WASH services. Women and girls are more vulnerable to health risks because they could experience emotional distress, harassment, violence, and injury when they go outside the home to haul water or just to use the toilet. Carrying water over long distances may lead to pregnancy complications or muscle and bone problems. ● Women and girls are primarily responsible for domestic chores and caring for others – including cleaning, preparing food, and looking after the sick – which likely exposes them to diseases and other risks to their health without the protection of hand washing. ● Additionally, time spent fetching water or the absence of safe sanitation facilities in school can limit girls’ chances of entering and completing schooling and gaining employment. ● Many of these factors may also apply to minority genders and those who face discrimination, not just women.
28	Sensitivity	Total fertility rate at the state level	<p>The total fertility rate of a population is the average number of children born to a woman over her reproductive cycle (15–49 years of age). Higher fertility rates are associated with higher mortality and morbidity, thus making such women more vulnerable to comorbidities that arise due to poor WASH provisioning.</p>
29	Adaptive capacity	Percentage of rural agricultural landless households	<p>Members of landless households may migrate more often in search of employment opportunities, and hence, their access to safe WASH facilities is compromised. Also, such a family may need dedicated toilets or drinking water taps within the premises and may share them, making them more vulnerable to disasters in general. As more women join the agricultural labour force, it is essential to increase their incomes to access quality healthcare. Additionally, landlessness worsens vulnerabilities related to water, sanitation, and hygiene (WASH).</p>

S. No.	Category	Main indicator (individual)	Rationale
30	Adaptive capacity	Percentage of short-term migrants	It is difficult for a migrating population to access safe WASH facilities. Most of this population migrates from rural to urban or peri-urban areas, where they may need dedicated toilets or drinking water taps within the premises and may share the same. Such poor WASH facilities make them more vulnerable not just in times of disaster but also in general. They may miss out on government enrolment for WASH services within the premises, and their incomes may need to be increased to get toilets, water access, and quality healthcare from out-of-pocket expenditure, thus compounding their WASH vulnerability. Extreme weather events like floods, droughts, and increasing water stress can drive migration. This situation creates a cycle of marginalisation and deprivation that perpetuates itself.
31	Adaptive capacity	Percentage of the population below the poverty line	Income is a critical factor in vulnerability. Lower-income households will be less resilient and have little or no financial resources to fall back on during a flood, drought, or cyclone event. They cannot access improved drinking water and sanitation provisions within the household or receive quality healthcare from out-of-pocket expenditure. Additionally, the nutritional deficiencies and emotional distress of this population make them more vulnerable to the impacts of poor provisioning of WASH services.
32	Adaptive capacity	Percentage of the district's population under the age of five in 2023	Children's minds and bodies are more vulnerable to impacts from poor provisioning of WASH facilities or disasters. A lack of water severely inhibits good sanitation and hygiene practices for children. Water is rationed to meet a family's immediate survival needs—drinking and food preparation—so hand washing and toilet cleaning are often minimised to conserve water. A reduction in hygiene practices places children at an increased risk for malnutrition and diseases, such as cholera, typhoid, acute respiratory infections, and measles. Chronic diarrhoea and malnutrition can also lead to stunted physical and cognitive development in the long term, undermining children's ability to reach their full potential both at school and in adult life.
33	Adaptive capacity	Percentage of the district's population above the age of 65 in 2023	Older people are more prone to the effects of extreme temperatures—both hot and cold—as they can struggle to regulate their body temperatures, especially if they have a pre-existing condition such as heart disease, diabetes, or dementia. If the quality of water or sanitation facilities deteriorates, it could contribute to comorbidities in this population.

S. No.	Category	Main indicator (individual)	Rationale
34	Adaptive capacity	Percentage of the population with positive water-borne diseases occurring annually: number of cases of cholera, acute diarrhoeal disease, enteric fever (typhoid), and viral hepatitis	2019 the WHO reported that safe water, sanitation, and hygiene (WASH) practices could have prevented 1.4 million deaths globally. Cholera can cause severe, acute water diarrhoea, which is the fourth leading cause of death in children under five globally. It is expected that climate change would worsen drought and flood conditions. These extreme conditions may result in limited water supply or inadequate WASH practices, leading to an increased incidence of diseases.
35	Adaptive capacity	Percentage of households having safely managed drinking water services at the district level	Suppose a population has access to safely managed drinking water sources. In that case, water is available from an improved source accessible on-site whenever needed and free from faecal contamination and harmful chemicals. This access is crucial for women and individuals of all genders across all age groups, as well as for public health systems and disaster preparedness.
36	Adaptive capacity	Percentage of schools and <i>aanganwadi</i> having safely managed drinking water services.	Safely managed drinking water services may become compromised in the wake of disasters. Their non-provision in school facilities increases children's vulnerability. Schools and <i>aanganwadi</i> can also act as shelter homes in times of disaster, and their water supply can become a source of drinking water for the population in emergencies.
37	Adaptive capacity	Percentage of (government) healthcare facilities having safely managed drinking water services at the district level	Safely managed drinking water services prevent infections, reduce antimicrobial resistance, end preventable maternal and new-born deaths, and respond to outbreaks and climate-induced emergencies.
38	Adaptive capacity	Percentage of households having safely managed sanitation facilities at the district level	Safely managed sanitation facilities are defined as improved sanitation facilities not shared with other households and where excreta are safely disposed of in situ or transported and treated off-site. Inadequate and low-quality sanitation may increase morbidities, which in turn would increase vulnerability during extreme events. These facilities are crucial for reducing the vulnerability of women and children specifically, but also of all other genders across age groups.

S. No.	Category	Main indicator (individual)	Rationale
39	Adaptive capacity	Percentage of schools and <i>Anganwadi</i> having safely managed sanitation facilities at the district level	Safely managed sanitation services can reduce water-borne diseases and significantly lessen the adverse health impacts of other disorders responsible for death and disease among children. Such infections weaken children and make them more susceptible to malnutrition and opportunistic infections such as pneumonia, measles, and malaria. Children who are already weak become more vulnerable in times of extreme events.
40	Adaptive capacity	Percentage of schools in the district with gender-separate toilets	Ensuring that sanitation facilities at schools are comfortable and safe to use for both boys and girls is one of the preconditions for safe WASH practices for girls and for increasing their school attendance
41	Adaptive capacity	Percentage of (government) healthcare facilities having safely managed sanitation services at the district level	Safely managed sanitation facilities reduce disease burdens, but they are especially crucial for healthcare facilities treating the already ill. The absence of these can render the public health system inefficient in response to changing climate-induced emergencies, as it may compound morbidities.
42	Adaptive capacity	Percentage of schools and <i>anganwadi</i> having functional hand-hygiene facilities (water and soap or alcohol-based hand rub) at the district level	Good hand hygiene practices prevent the spreading of bacteria and viruses in children and from them to other people. Lower morbidity in children increases their resilience to climate change-induced weather extremes.
43	Adaptive capacity	Percentage of (government) healthcare facilities having functional hand hygiene facilities (water and soap or alcohol-based hand rub) at the district level.	Maintaining good hand hygiene is essential for reducing the risk of hospital-acquired infections. It is the most crucial practice in minimizing disease transmission in healthcare settings. This fundamental approach is vital for ensuring the public health system remains efficient in responding to health emergencies caused by climate change.
44	Adaptive capacity	Annual average completion rate of <i>Jal Jeevan Mission</i> schemes, from 2019–20 to 2023–24 (district-wise)	The completion rate of water-provisioning schemes is an essential parameter for assessing the government's efficiency and commitment to delivering safely managed drinking water for improved public health.

S. No.	Category	Main indicator (individual)	Rationale
45	Adaptive capacity	Women in the district with 10 or more years of schooling	A woman who has completed her education must comprehend the essential information regarding climate-related risks and warnings. She will likely be more open to learning about and adopting safe practices related to drinking water, handwashing, menstrual hygiene, toilet usage, and overall hygiene. Research in India has indicated that children whose mothers have 10 or more years of education tend to have higher immunization rates, hence this indicator is framed in this manner.
46	Adaptive capacity	Number of functional government health facilities in the district per 1,000 population	The higher the number of functional health facilities in a district, the greater its preparedness to respond to WASH-related health conditions during disasters and under normal conditions.
47	Adaptive capacity	Average distance females travel to the principal source of drinking water	Women and girls primarily shoulder the burden of fetching water in low- and middle-income countries. They are thus more vulnerable to health risks because they are prone to emotional distress, harassment, violence, and injury when they have to go outside the home to haul water. Carrying water over long distances may lead to pregnancy complications or problems related to muscles and bones. Additionally, time spent fetching water can limit girls' chances of entering, completing schooling, and gaining employment.
48	Adaptive capacity	Women aged 15–24 years in the district who use hygienic methods of protection during their menstrual period (%)	Mainstreaming menstrual hygiene management is integral to WASH. Poor menstrual hygiene due to a low supply of water or rigid social norms has negative consequences for women's health and puts pressure on public health facilities.
49	Adaptive capacity	Annual average budget allocated by the government to WASH per district per capita for the past five years (2019–23)	Financial resources are critical for achieving any targets and for subsequent government interventions. This indicator measures the budget's adequacy and the government's commitment to WASH targets.

S. No.	Category	Main indicator (individual)	Rationale
50	Adaptive capacity	Climate risk assessments to inform policies as a part of district disaster management plans	Risk assessments at more detailed levels are essential for protecting both natural and human resources from the impacts of climate change-related hazards. District disaster management plans should include localized natural, economic, and social practices to assist policymakers in better managing disasters. This approach will help reduce the vulnerability of WASH (Water, Sanitation, and Hygiene) infrastructure and water supply sources to the effects of climate change.
51	Adaptive capacity	Inclusion of WASH in state disaster management plans (taken as a proxy for the district)	Providing clean drinking water and proper sanitation facilities during and after disasters is the responsibility of states. These services are necessary for the health of humans and animals, and the absence of this can compound the damage caused by a disaster. It is thus essential to include WASH in disaster management plans in various ways, such as by providing specific guidelines for restoring and maintaining water supply and sanitation in relief shelters or by including WASH in capacity-building training and resource mobilisation to enhance community preparedness and response.
52	Adaptive capacity	Identification of agencies (including government and private organisations and NGOs) for providing WASH-related relief and rehabilitation measures after disasters as part of state disaster management plans (taken as a proxy for the district)	Identifying agencies and allocating roles and responsibilities is crucial for efficient relief and rehabilitation after a disaster and for establishing proper procedures. Dedicated WASH agencies will ensure the same for WASH services post-disaster. These agencies will provide capacity building for their personnel for managing disasters and carrying out relief, rehabilitation, and reconstruction activities in the affected areas. They can also assist in prevention and mitigation activities.
53	Adaptive capacity	Percentage of villages or gram panchayats in districts with village water sanitation committees or other similar local institutions in rural areas	Capacity building of people for better WASH practices, capacity building for responding to disasters, dissemination of warning information before the catastrophe, behaviour change communication towards more climate-resilient usage of resources, quick response for recovery from disasters, and generation of micro-level data for better climate and WASH policies are some of the functions that village water sanitation committees can perform. These committees thus act as the last-mile linkage of the government to citizens.

S. No.	Category	Main indicator (individual)	Rationale
54	Adaptive capacity	Percentage of households in the state that practice hand washing before meals	Hand washing with soap before meals is a critical practice for preventing the transmission of infectious diseases such as diarrhoea, respiratory infections, and others. It is essential for children, as it helps prevent illnesses that can cause malnutrition and hinder growth and development. Thus, it can reduce human morbidity and mortality.
55	Adaptive capacity	Percentage of households in the state that practice hand washing after defaecation	Hand washing after defaecation is critical to prevent the spread of diseases such as typhoid, cholera, and hepatitis A, which are directly associated with faecal contamination. This practice directly reduces the risk of waterborne and intestinal diseases, ensuring safer and healthier communities. It can thus reduce human morbidity and mortality
56	Adaptive capacity	The density of rain gauges in the district per square kilometre	The optimum density of rain gauges improves the accuracy of the study of rainfall. It thus helps in planning and managing WASH infrastructure and water sources during floods, droughts, and cyclones.
57	Adaptive capacity	Provisions in the state disaster management plan for emergency water supply (taken as a proxy for the district)	Assigning departments responsible for providing an emergency water supply after a disaster is essential. Usually, this is allotted to the water supply department, which has to ensure the availability of an adequate number of water tankers, drums, or jerrycans or identify private agencies that supply them to prepare for the supply of water in emergencies where potable water is scarce.

Annexure 9: List of stakeholders who attended the consultation for risk assessment of the WASH sector

S. No.	Name of stakeholder	Organisation
1	Puneet Srivastava	WaterAid India (Jal Seva Charitable Foundation)
2	Vinod Mishra	United Nations Office for Project Services India, UNOPS
3	Dr. Richa Sharma	The Energy and Resources Institute (TERI)
4	Depinder Kapur	Centre for Science and Environment (CSE)
5	Sheena Arora	World Bank

S. No.	Name of stakeholder	Organisation
6	Sujit Sinha	WAPCOS
7	Ankita Chorkroborty	Sigma Foundation
8	Dr Dhruva Ghosh	BDO pvt ltd
9	Rushabh Himani	UNICEF India
10	Pankaj Mathur	UNICEF India
11	Kumar Premchand	UNICEF India
12	Ananya Ghoshal	UNICEF India
13	Yusuf Kabir	UNICEF India
14	Balaji Varkat	UNICEF India
15	Nageshwar Patidar	UNICEF India
16	Pragyan Bharati	UNICEF India
17	Sudhakar Reddy	UNICEF India
18	Laxmi Saxena	UNICEF India
19	Biraja Satapathy	UNICEF India
20	Venkatesh Aralikatty	UNICEF India
21	Tithal Parmar	UNICEF India
22	Aanand Prakash Kanu	UNICEF India

Annexure 10: Detailed methodology for each indicator

In this annexure, 'D' indicates that the indicator directly correlates with risk, while 'InV' indicates an inverse correlation.

1. Number of flood events in the district in the past 40 years (D)

We used two sources to gather data on flood events over the past 40 years. We used the EMDAT global database (EM-DAT 2024) to compile data on flood events from 1984 to 2019. We obtained the information on flood events occurring after 2019 by analysing state disaster management plans maintained by state disaster management authorities.

2. Number of meteorological drought events in the district in the past 40 years (D)

We used two sources to collect the number of meteorological drought events in the past 40 years. We collated the data for drought events from 1984 to 2019 from the EM-DAT global database (EM-DAT 2024). We identified the number of meteorological drought events post-2019 by analysing state disaster management plans maintained by the state disaster management authorities.

3. Change in the number of heavy rainfall (October, November, December) days in the past 10 years, as compared to climate baseline (D)

The precipitation change was analysed using the IMDAA (Indian Monsoon Data Assimilation and Analysis) Project. The data is available at a 12-km grid resolution, the finest long-term climate data for the Indian subcontinent. The IMDAA reanalysis covers the period from 1979 to the present and uses a 4D-Var data assimilation method, making it the highest-resolution atmospheric reanalysis for India.

4. Change in the number of heavy rainfall (June, July, August, September) days in the past 10 years, as compared to climate baseline (D)

Same as indicator number 3

5. Change in the number of extremely hot days in the district for the past 10 years (D)

The number of extremely hot days and warm nights was estimated using a combination of data from the IMDAA and the Coordinated Regional Downscaling Experiment–South Asia (CORDEX-SA) regionally downscaled models (RegCM4 by the Indian Institute of Tropical Meteorology) were utilised. We calculated the extremely hot days and extremely warm nights based on the 95th percentile threshold of the baseline from 1982 - 2011 for the individual months between March and June. Further, we calculated the number of days exceeding this threshold for each year from 1982 to 2023.

6. Number of cyclone events in the district in the past 40 years (D)

We collected data on cyclone events over the past 40 years from two sources. The EM-DAT global database provided information on cyclone occurrences from 1984 to 2019. We identified the number of cyclone events post-2019 by analysing state disaster management plans maintained by the state disaster management authorities and cyclone DALA (damage, loss, and needs assessments) reports.

7. Population density of the district in 2022 (D)

We calculated the population density of a district as the ratio of the total district population to the district's total area in 2022. We projected the 2022 population for 733 districts using the compound annual growth rate (CAGR) method, with the 2001 and 2011 census populations as the base (Table A-01). We used the area apportionment method to estimate the population of newly formed districts and their parent districts. The parent district's population density determines the area apportionment method. Additionally, we referred to the City Population website for the total populations of both the new and parent districts for 2001 and 2011. In some instances, we consulted the socio-economic reports and census district handbooks to refine the population estimates. We

calculated the area of each district using GIS shapefiles of India, obtained from the 2022 topographical maps provided by the Survey of India.

Indicator = Total district population/ Area of the district

According to the 2001 Census, India comprises 594 districts with a population of 1,02,87,37,436. By the 2011 Census, the number of districts had risen to 640, with a total population of 1,21,08,54,977. The projected total population for the year 2022, as per CEEW analysis, is 1,50,34,67,753, while the Unique Identification Authority of India (UIDAI) projected it to be 1,37,29,89,959. The two have a difference of 8.68 per cent.

8. Percentage of urban slum area to total area in the district (D)

We calculated the total urban slum area using the microdata from the NSS 69th round ((Urban District, India - Urban Slums Survey, July 2012 - December 2012) for each district. We extracted the data using STATA software. Further, we divided the data by the total area in the district to estimate the indicator. The survey captures only the urban districts of India, counting 262 districts. For all other districts, we gave a value of 0.

9. Percentage of rural population to total district population in 2022 (D)

We calculated the rural population in 2022 using a methodology similar to that of the total population. We used the rural population from Table A-01 of the 2001 and 2011 Census to calculate the CAGR for 731 districts, based on which we extrapolated the population for 2011 to the 2022 level. The following formula holds:

$$\text{CAGR} = (\text{2011 population} / \text{2001 population})^{(1/10)} - 1$$

$$\text{2022 population} = (\text{CAGR} + 1)^{(11)} * \text{2011 population}$$

Then the rural population was divided by the total population.

10. Percentage of rural water supply schemes which are less than or equal to five years of age, at the district level (InV)

This indicator is taken from *Format B15 - Piped Water Supply Schemes*, under MoJS's real-time reports called JJM Reports. This dataset includes district-wise information for rural areas of each state and union territory in India. We took data from 2009-2010 to 2023-2024 for the study. To analyse the data, it was categorised based on the age of water supply infrastructure into three groups:

1. **5 years or less:** Covering 2018-2019 to 2023-2024.
2. **5 to 10 years (including the 10th year):** Covering the period from 2013-2014 to 2017-2018.
3. **10 to 14 years:** Covering the period from 2009-2010 to 2012-2013.

After calculating the aggregate data for each category, the percentage of each category was determined by dividing the district-wise aggregate for that age range by the district aggregate for all 3 age ranges. The data was then apportioned to the district level for 2022, covering 733 districts from 772 districts (as reported in JJM reports) in 2024.

11. Stage of groundwater development of the district (D)

We obtained the data from the 2023 Dynamic Groundwater Resource Estimation report from the Central Groundwater Board of India. This report includes information on groundwater resources across all districts in India, explicitly focusing on groundwater's status and utilisation levels. The data was directly collected for the year 2023 for all the districts of India, in which the report has calculated this indicator using the following formula:

$$\text{Indicator} = (\text{Annual groundwater extraction} / \text{Annual groundwater recharge}) * 100$$

12. Groundwater quality index of the district (D)

The data was sourced from the 2022 Water Quality Data of Ground Water under the National Water Monitoring Programme by India's Central Pollution Control Board (CPCB). A groundwater quality index is a comprehensive single value that expresses the overall groundwater quality of a particular water sample (location and time specific) based on multiple water quality parameters. It provides an overview of the possible problems with the water quality in the region.

Using the CPCB data on 10 parameters, namely pH, total hardness, calcium, magnesium, chloride, TDS, fluoride, nitrate, iron, and sulphate, we calculated an average for the range of values for 2020. We also calculated the sub-indexes for each parameter, as shown in Figure A5.

Figure A5 shows the groundwater quality index calculated using chemical parameters according to the BIS standards and their respective weights according to CPCB.

Table No. 12: Relative Weight of chemical parameters used for calculating WQI for Ground water

Chemical Parameters	Indian Standards for Drinking Water Quality ²⁰		Weight (Wi)			
	Acceptable Limit	Permissible Limits	Weight	Relative Weight	Weight w/o Iron, Manganese and Bicarbonate	Relative Weight w/o Iron, Manganese and Bicarbonate
pH	6.5-8.5	No relaxation	4	0.09756	4	0.13333
Total Hardness (TH)	300	600	2	0.04878	2	0.06667
Calcium	75	200	2	0.04878	2	0.06667
Magnesium	30	No relaxation	2	0.04878	2	0.06667
Bicarbonate	244	732	3	0.07317	-	-
Chloride	250	1000	3	0.07317	3	0.10000
Total Dissolved Solids (TDS)	500	2000	4	0.09756	4	0.13333
Fluoride	1	1.5	4	0.09756	4	0.13333
Manganese	0.1	0.3	4	0.09756	-	-
Nitrate	45	No relaxation	5	0.12195	5	0.16667
Iron	0.3	No relaxation	4	0.09756	-	-
Sulphate	200	400	4	0.09756	4	0.13333
			41	1	30	1

Source: BIS 10500 and CPCB 2001

Finally, each district calculates its weighted sum using the following formula to estimate its groundwater quality index (GWQI).

$$GWQI = \sum (q_i * w_i)$$

Where $q_i = (C_i/S_i) \times 100$ Where; C_i = the concentration of each chemical parameter in each water sample in mg/l, S_i = the Indian drinking water standard for each chemical parameter in mg/l according to the guidelines of the BIS 10500, (2004-2005); w_i = relative weights, as shown in figure A5.

The overall GWQI is a weighted sum of all sub-indices, providing a single composite number representing groundwater quality at a particular monitoring station.

We calculated the average Groundwater Quality Index (GWQI) for each district by averaging the values from all monitoring stations located within that district. If a district did not have a monitoring station, we assigned it a GWQI value of zero and classified it as having the highest risk.

13. Surface water quality index of the district (D)

The data was extracted from the 2022 Water Quality of Medium & Minor Rivers under the National Water Monitoring Programme by the Central Pollution Control Board of India. We collected the surface water quality data from CPCB's surface water monitoring stations, distributed across various districts in India.

Four key parameters—dissolved Oxygen (DO), Fecal Coliform (FC), pH, and Biochemical Oxygen Demand (BOD)—were chosen to calculate the Surface Water Quality Index (SWQI). We computed a sub-index for each parameter. This sub-index reflects the quality status of each parameter and its permissible limits or standards.

Figure A6: Modified weights for computation of WQI based on DO, FC, pH, and BOD

Parameters	Original Weights from NSF WQI	Modified Weights by CPCB
Dissolved Oxygen (DO)	0.17	0.31
Fecal Coliform (FC)	0.15	0.28
pH	0.12	0.22
BOD	0.1	0.19
Total	0.54	1

Source: Maharashtra Pollution Control Board 2023

We computed the **SWQI** for each monitoring station by aggregating the sub-indices of all four parameters. Further, the SWQI is a weighted sum of all sub-indices and we used the following calculation formula:

$$\text{Indicator} = \sum (\text{Sub-index} * \text{Weight modified by CPCB})$$

$$\text{Sub-index (SI)} = [\text{Observed value} / \text{range applicable}] * \text{Weight}$$

We calculated the average Surface Water Quality Index (SWQI) for each monitoring station within a district and then averaged those results to determine the district's overall SWQI. In districts with multiple monitoring stations, we summed the SWQI values from all stations. We divided the total by the number of stations to obtain the average SWQI. We assigned a zero value for districts without monitoring stations, indicating the highest risk.

Figure A7: Sub-index equation used to calculate NSF WQI for DO, FC, pH, and BOD

Water Quality Parameters (units)	Range Applicable	Equation
Dissolved Oxygen (DO)(% Saturation)	0-40	$0.18 + 0.66 \times \% \text{ Saturation DO}$
	40-100	$(-13.55) + 1.17 \times \% \text{ Saturation DO}$
	100-140	$163.34 - 0.62 \times \% \text{ Saturation DO}$
Fecal Coliform (FC) (counts/100 ml)	1 - 10^3	$97.2 - 26.6 \times \log \text{ FC}$
	$10^3 - 10^5$	$42.33 - 7.75 \times \log \text{ FC}$
	$>10^5$	2
pH	02 - 05	$16.1 + 7.35 \times (\text{pH})$
	05 - 7.3	$(-142.67) + 33.5 \times (\text{pH})$
	7.3 - 10	$316.96 - 29.85 \times (\text{pH})$
	10 - 12	$96.17 - 8.0 \times (\text{pH})$
	<2, >12	0
BOD (mg/l)	0 - 10	$96.67 - 7 \times (\text{BOD})$
	10 - 30	$38.9 - 1.23 \times (\text{BOD})$
	>30	2

Source: Maharashtra Pollution Control Board 2023²

14. Water resource availability per capita in the district (InV)

We calculated this indicator using the 2019 report Reassessment of Water Availability in India using Space Inputs by the Central Water Commission (CWC) of India. The report gives basin-wise estimates of water resources based on 75 per cent dependable yield and the percentage area of each state in the basin. Based on this, we calculated the water availability in each district using the area apportionment method for 706 districts (number of districts in 2019).

The following formula was used:

$$\text{Indicator} = \frac{[(\text{Annual water resource availability in the district in million cubic metre (75\% dependable)}) / (\text{Population of the district})] \times 100}{1}$$

The area apportionment method was used for the newly formed districts after 2019 to arrive at the indicator from their parent district(s), giving the estimate for 733 districts in total.

15. Average percentage of stormwater drainage to total area of the district (InV)

The data was sourced from the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) project database, specifically from the dataset titled "City-wise details of Storm Water Drainage Projects under AMRUT" for the year 2021 and service level benchmarking (SLB) reports of various states. The SLB data was present for all the ULBs in the states of Uttarakhand, West Bengal, Uttar Pradesh, Karnataka, Odisha, Gujarat, Haryana, Punjab, Jharkhand, Rajasthan, Mizoram, and Kerala. For each ULB or city, we calculated the percentage stormwater drainage coverage using the formula:

$$\text{Storm water drainage coverage percentage} = \frac{[(\text{Catchment area of storm water drainage network}) / (\text{Total area of ULB or city})] \times 100}{1}$$

We assessed the stormwater benchmarking data provided by the states, calculating the average stormwater drainage coverage across different urban local bodies (ULBs) within a district.

For the districts with no SLB dataset present, the AMRUT city data (available for 104 cities) was considered a benchmark for the districts of those states. No data districts were considered at the highest risk and given a value of 0.

16. Percentage of forest cover to the total area of the district (InV)

From Chapter 13 of India's *State Report in Forest Survey of India's 2021*, we take the indicator, where the detailed analysis and data for the forest cover are available density-wise (very dense, moderately dense, and open forests). Forest cover is aggregated across these categories to get the total forest area. The survey reports data for 638 districts (2021), which we adjusted to reflect the number of districts in 2022 (733 districts) using area wise apportionment method.

17. Percentage of the total SC or ST households in the district with access to an improved source of drinking water within the premise that is available in sufficient quantities throughout the year (InV)

We calculated this indicator using the microdata from the 78th round of the National Sample Survey (NSS) collected between 2019 and 2021. We mapped each respondent's unique identity to their district codes and caste codes, where scheduled tribes (ST) were assigned code 1 and scheduled castes (SC) were assigned code 2. We then matched the unique identifiers with codes related to access to improved drinking water sources. These sources included piped supplies, such as tap water in the dwelling (code 02), tap water in the yard or plot (code 03), piped water from a neighbour (code 04), and public pipes or standpipes (code 05). Non-piped supplies included borewells/tube wells (code 06), protected wells (code 08), springs (code 12), rainwater (code 14), packaged water (code 01), and delivered water, including tanker water (code 19).

The dataset shows whether enough water is available throughout the year (indicating yes with one or no with two) and whether the water source is on the premises.

Finally, we consolidated all the filters and divided the results by the total number of respondents for each district. We used STATA software to carry out the entire process.

The NSSO collected this data for 682 districts, which we adjusted to reflect the total number of districts in 2022 (733 districts) using an area-wise apportionment method.

18. Percentage of the total SC and ST households in the district with access to at least basic sanitation facilities (InV)

We calculated this indicator using data from the 78th National Sample Survey (NSS) round conducted between 2019 and 2021. We mapped the unique identity of each respondent to specific caste codes: 1 for Scheduled Tribes (ST) and 2 for Scheduled Castes (SC), and district codes. The respondents provided information about their access to at least basic sanitation facilities, with options including: (01) shared use by households within a building, (02) public/community use without payment, (03) public/community use with payment, and (04) common use of facilities by households in the building. Using STATA software, we divided the resulting data for each district by the total number of respondents in those districts.

NSSO captured this data for 682 districts, which we adjusted to reflect the number of districts in 2022 (733 districts). NSSO gathered this information for 682 districts, which we adjusted to align with the number of districts in 2022 (733 districts) using an area-wise apportionment method.

wise apportionment method. We used STATA software to carry out the entire process. NSSO gathered this information for 682 districts, which we adjusted to align with the number of districts in 2022 (733 districts) using an area-wise apportionment method.

19. Percentage of the total SC and ST households in the district with access to at least basic hygiene facilities (InV)

We calculated this indicator using microdata from the 78th round of the National Sample Survey (NSS) collected between 2019 and 2021. Each respondent's unique identity is associated with specific caste codes: 1 for Scheduled Tribes (ST) and 2 for Scheduled Castes (SC) and as district codes. We also gathered their responses regarding access to basic hygiene facilities, which include water and soap or detergent (coded as 01). We then divided the resulting data by the total number of respondents in each district. We used STATA software to conduct this entire process.

NSSO captured this data for 682 districts, which we adjusted to reflect the number of districts in 2022 (733 districts) using area wise apportionment method.

20. Maternal mortality ratio (MMR) at the state level (D)

This indicator is taken directly from the Special Bulletin on Maternal Mortality in India (2018-20), published by the Sample Registration System (SRS). The bulletin provides state-specific maternal mortality ratio for 19 states in Table 1: *Maternal Mortality Ratio (MMR), Maternal Mortality Rate and Life Time Risk; India, EAG & Assam, South and Other states, 2018-20*. The remaining nine states and nine UTs in 2020 are clubbed together in SRS and have indicators reported under a single head of 'other states.' We used the state value as a proxy for all districts within that state. We did not perform any additional calculations on this indicator.

21. Slope of the district (D)

We derived the data for this indicator from the United States Geological Survey (USGS). We developed the gridded spatial layers created from coarse grain base-level maps at 25 km × 25 km resolution. These base-level maps were spatially analysed using a downscaling method to produce grid-level attribution data at a resolution of 30 m by 30 m.

22. Altitude (elevation) of the district (InV)

We derived the data for this indicator from the United States Geological Survey (USGS). We developed the gridded spatial layers from coarse grain base-level maps at 25 km × 25 km resolution. These base-level maps were spatially analysed using a downscaling method to produce grid-level attribution data at a resolution of 30 m by 30 m.

23. Total fertility rate at the state level (D)

This indicator is taken directly from the National Family Health Survey (NFHS)-5 (2019-21) for all states/ UTs. We took the data for this indicator from serial number 22 in the section 'Marriage and Fertility' of the state fact sheet. We used the state value as a proxy for all districts within that state.

24. Change in land use/ land cover of the district over 10 years (2005-15) (D)

We derived the data for this indicator from the Bhuvan portal (a geo-platform maintained by the Indian Space Research Organisation (ISRO)). We developed the gridded spatial layers from coarse grain base-level maps at a 25 km × 25 km resolution. These base-level maps were spatially analysed using a downscaling method to produce grid-level attribution data at a resolution of 30 m by 30 m. Further, the total change in rural and urban built-up was calculated and divided by the total district area.

25. Percentage of the total district population under the age of 5 and above 65 years, in 2022 (D)

The total population aged 5 years or less and 65 years or above is estimated using the total population between the brackets 0-5, 65 - 69, 70 - 74, 75 - 79, and 80+ as identified in Table C-14: Population in five-year age group by residence and sex (total) in both Census 2001 and Census 2011.

We extrapolated the total required population from the Census 2001 and 2011 to calculate the CAGR for 731 districts. The following formula was used:

$$\text{CAGR} = (\text{2011 population} / \text{2001 population})^{(1/10)} - 1$$

$$\text{2022 population} = (\text{CAGR} + 1)^{(11)} * \text{2011 population}$$

26. Percentage of the total children under five years old who are wasted, at district level (D)

We sourced the data for this indicator from the **NFHS-5 (2019-21)**. We obtained the district-specific data directly for 707 districts included in the study from serial number 74 in the section 'Child Feeding Practices and Nutritional Status of Children' in the district fact sheet. We used it as a proxy for the 26 districts created after the survey period and the state/ UT level data under which that district lies. This information was taken from serial number 82 in the same section of the state fact sheet. We did not perform any additional calculations on the indicators from this source.

27. Percentage of the total children under five years old who are stunted, at district level (D)

The same data source and methodology is followed for this indicator: "percentage of children under 5 who are wasted at the district level." For 707 districts, we took the information from serial number 73 in the section 'Child Feeding Practices and Nutritional Status of Children' in the district fact sheet. For the 26 newly created districts, the information was taken from serial number 81 in the same section of the state fact sheet.

28. Percentage of all rural drinking water schemes relying only on surface water in the district (InV)

We obtained the data *B40—Schemes with—Scheme source Status*, under MoJS's real-time reports called JJM Reports. The dataset provides detailed information about the water source status of various drinking water schemes in rural areas across India, division-wise. We used data for the year 2024 for all divisions of all states.

We then matched the divisions with the districts, aggregating all the divisions with the same districts. In cases where a division spans multiple districts, the percentage is divided equally among

those districts. For each district, the percentage of rural drinking water schemes that rely solely on surface water was calculated using the following formula:

Indicator = (Number of schemes relying only on surface water)/ (Total number of drinking water schemes) x 100

The data was then apportioned area-wise to the district level for 2022, covering 733 districts from 715 districts in 2024 (as reported in JJM reports).

29. Percentage of all rural drinking water schemes relying only on groundwater in the district (D)

We collected data from Format B40, including information on Schemes with Water Source Status, as part of the Ministry of Jal Shakti's real-time reports called JJM Reports. We calculated this indicator like the percentage of surface water schemes indicator; however, the formula used in this case is different, as outlined below:

Indicator = (Number of schemes relying only on groundwater)/ (Total number of drinking water schemes) x 100

The data was then apportioned area-wise to the district level for the year 2022, covering 733 districts from 715 districts in 2024 (as reported in JJM reports)

30. Percentage of persons with disabilities at the district level (D)

We computed this indicator using the microdata of **NFHS-5 (2019-21)** for 707 districts. It provides detailed information on individual disabilities aggregated into broader categories (hearing, speech, visual, mental, locomotor, and other types). We used the data file RECH3 with ID V200 (Does any member of this household, including you, have any disability?)

31. Sex ratio of the total district population (D)

This indicator uses the same data source and methodology as the “percentage of children under five who are wasted at the district level.” For 707 districts, the information is taken from serial number 3 in the section ‘Population and Household Profile’ in the district fact sheet. For the 26 newly created districts, the information was taken from serial number 3 in the same section of the state fact sheet.

32. Percentage of rural agricultural landless households among the total households, at the state level (D)

We took this Indicator from *NSS REPORT NO. 587: Situation Assessment of Agricultural Households and Land and Livestock Holdings of Households in Rural India, 2019 (January – December 2019)*, by Ministry of Statistics and Programme Implementation (MoSPI).

The report defines landless households as those with the size of land holding less than or equal to 0.002 hectares. An agricultural household, as determined by the NSS 77th round survey, is a household that receives more than INR 4,000 in value from agricultural activities. These activities include cultivating field crops, horticultural crops, fodder crops, plantations, animal husbandry, poultry, fisheries, piggery, beekeeping, vermiculture, sericulture, and more. Additionally, the household must have at least one member who has been self-employed in agriculture, either as the principal source of income or as a subsidiary source, during the past 365 days.

Statement 2.2.1: Percentage distribution of households and areas owned for different size categories of ownership holdings during the agricultural year July 2018- June 2019 for other States/Group of UTs/ Group of North-Eastern States was referred to by us for the final value of the indicator.

We did not perform any other calculations for this indicator.

33. Percentage of distress migrants among the total migrants in a district (D)

The data was sourced from the Unit Level Data of the Periodic Labour Force Survey (July 2020-June 2021), conducted by the Ministry of Statistics and Programme Implementation (MoSPI). Under schedule 10.4, block 7.2, item 11 (reason for leaving the last usual place of residence) was referred to.

We calculated the percentage of distressed migrants to total migrants in a district using the formula: Indicator = (Number of distressed migrants in the district/ Total number of migrants in the district) ×100

This data was available and computed for 682 districts.

34. Percentage of the total population that is multidimensionally poor in a district (D)

This indicator is taken from the *National Multidimensional Poverty Index: A Progress Review 2023* by NITI Aayog. Multidimensional poverty captures overall health, education, and living standards. The head-count ratio of the multidimensionally poor, defined as the number of multi-dimensionally poor persons divided by the total population, has been considered in section 3 of the report. The data was available for 709 districts (the number of districts in 2021). They were then taken up to 733 districts (the number of districts in 2022) using the area apportionment method.

35. Prevalence of diarrhoea in the two weeks preceding the survey in children under five years old, at the district level (D)

We obtained the data for this indicator from the NFHS-5 (2019-21) microdata, which includes information from 707 districts. For the 26 districts established after the survey period, we used data from the corresponding state or Union Territory (UT) as a proxy. This state-level information was sourced from item number 69 in the section titled "Treatment of Childhood Diseases (Children Under Age 5 Years)" in the state fact sheet.

36. Percentage of the total households having exclusive access to water from an improved source of drinking water located in the household premises, which is available in sufficient quantities throughout the year, at the district level (InV)

We have taken the data from Micro-data, NSS 78th round (Sch. 5.1 - c1, c22, c23, and c24). According to NFHS data, filters for exclusive access to improved drinking water sources, including piped and non-piped supplies, are analysed in relation to the water sources available on the premises throughout the year.

37. Percentage of rural schools and *aanganwadi* with availability of drinking water through tap connection, at the district level (InV)

This indicator is taken from *Format F26—Status of Pipe Water Supply in School/ Balwadi/ aanganwadi*, under MoJS's real-time reports called JJM Reports. We computed the absolute numbers for schools and *aanganwadi* separately and then added them to arrive at percentage. The formula used is as follows:

Indicator= [(Total No. of Schools having the availability of drinking water through tap connection + Total No. of *aanganwadi* having the availability of drinking water through tap connection)/ (Total No. of Schools + Total No. of *Balwadi/aanganwadi*)] *100

We considered the total numbers reported by the state for both schools and *aanganwadi*. The numerator and denominator were first computed for 765 districts (the number of districts in 2024 as reported in JJM data). They were then brought down to 733 districts (the number of districts in 2022) using the area apportionment method.

38. Percentage of rural households having individual household latrines, at the district level (ID)

We sourced the data on rural households with individual latrines from the *Swachh Bharat Mission (Gramin)* - Format ER 77 A for 2024. This dataset provides a comprehensive overview of the *Swachh Bharat Mission's* targets versus achievements based on detailed entries (Entry Status).

District-wise data for each state and union territory was apportioned to 2022, covering 733 districts from 761 districts in 2024 (as reported in SBM data).

39. Percentage of rural schools and *aanganwadis* having running water in toilets/ urinals, at the district level (InV)

This indicator is computed using *Format F26—Status of Pipe Water Supply in School/ Balwadi/ aanganwadi*, under MoJS's real-time reports called JJM Reports. The format reports this information at the district level as 'running water in toilets/ urinals' separately for schools (column 7) and *aanganwadi* (column 6). The following formula was used:

Indicator= [(Total No. of Schools having running water in toilets/urinals + Total No. of *aanganwadi* having running water in toilets/urinals)/ (Total No. of Schools + Total No. of *Balwadi/aanganwadi*)] *100

We considered the total numbers reported by the state for both schools and *aanganwadi*. The numerator and denominator were first computed for 765 districts (the number of districts in 2024 as reported in JJM reports). They were then reduced to 733 districts (the number of districts in 2022) using the area apportionment method.

40. Percentage of rural schools in the district with gender-separate toilets (InV)

This indicator is computed using *Format F26—Status of Pipe Water Supply in School/ Balwadi/ aanganwadi*, under MoJS's real-time reports called JJM Reports. The format reports this information at the district level as 'separate toilet for girls' and boys' in column 9. The following formula is used:

Indicator= [(Total No. of Schools having gender-separate toilets for girls and boys/ (Total No. of Schools)] *100

For schools, we considered the total numbers reported by the state. The numerator and denominator were first computed for 765 districts (the number of districts in 2024 as reported in JJM reports). They were then reduced to 733 districts (the number of districts in 2022) using the area apportionment method.

41. Percentage of households with hand-washing facility available within the premises, at the district level (InV)

We calculated this indicator using the microdata of the National Sample Survey (NSS's) 78th round, collected during 2019-21. The unique ID of each household (schedule 0.0: list of households under section [0] - descriptive identification of sample FSU) was stitched with the data on respondents having hand washing facilities (schedule 5.1, block 4, item 28 (whether hand washing facility is available within the premises), code 01 (washing with water and /soap/alcohol) and district codes (appendix- 1 of list of NSS regions and their composition)).

NSSO captured this data for 682 districts, which we adjusted to reflect the number of districts in 2022 (733 districts) using area wise apportionment method.

42. Percentage of rural schools and *aanganwadis* having hand-washing facilities, at the district level (InV)

This indicator is taken from *Format F26: Status of Pipe Water Supply in School*, under MoJS's real-time reports called JJM Reports. For schools, column 8 and *aanganwadi*, column 7 have been used under their separate respective forms. The formula used is as follows,

Indicator= [(Total No. of Schools having availability of Hand washing facilities + Total No. of *aanganwadi* having availability of Hand washing facilities)/ (Total No. of Schools + Total No. of *Balwadi/ aanganwadi*)] *100

We considered the total numbers reported by the state for both schools and *aanganwadi*. The numerator and denominator were first computed for 765 districts (the number of districts in 2024 as reported in JJM reports). They were then reduced to 733 districts (the number of districts in 2022) using the area apportionment method.

43. Percentage of women aged 15-24 years in the district who use hygienic methods of protection during their menstrual period (InV)

This indicator follows the same data source and methodology as the "percentage of children under 5 who are wasted at district level". For 707 districts, we took the information from serial number 19 in the section 'Marriage and Fertility' in the district fact sheet. For the 26 newly created districts, the information was taken from serial number 124 in the section 'Women's Empowerment (women age 15-49 years)' of the state fact sheet, using the state number as the proxy for districts created in that state.

44. Percentage of women in the district with 10 or more years of schooling (InV)

This indicator follows the same data source and methodology as the "Percentage of children under 5 who are wasted at district level". For 707 districts, we took the information from serial number 15 in the section 'Characteristics of Women (age 15-49 years)' in the district fact sheet. For the 26 newly created districts, the information was taken from serial number 16 in the section 'Characteristics of Adults (age 15-49 years)' of the state fact sheet, using the state number as the proxy for districts created in that state.

45. Average distance people travel to the principal source of drinking water at the district level (D)

We calculated this indicator from NSS's 78th round of microdata, collected between 2019 and 2021. It combines the household's unique ID, district code, and the average distance individuals travel to collect water. Schedule 5.1, block 4, item 23 has the data distance to the principal source of drinking water. The distance travelled is present as five codes (1 - the source of drinking water is within the dwelling unit; 2 - the source of drinking water is outside the dwelling but within the household premises, 3 - the source is at a distance of less than 0.2km; 4 - the source is at a distance of 0.2 to 0.5 km, 5- the source is at a distance of 0.5 to 1.0 km. The mean weighted average has been considered for computing the average distance travelled to the principal source of drinking water at the district level using STATA software and Microsoft Excel.

NSSO captured this data for 682 districts, which we adjusted to reflect the number of districts in 2022 (733 districts) using area wise apportionment method.

46. Number of functional government health facilities in the district per 1,000 population (ID)

We extracted the total number of healthcare centres from the Rural Health Statistics (RHS) 2021-22 report. We calculated the total number of healthcare centres for each district and divided this number by the population estimates for that year. The resulting values were multiplied by 1000 to determine the number of functional government health facilities per 1000 people in each district.

47. Annual average budget expenditure by government on WASH in rural areas per district per household for years 2020-23 (InV)

This indicator is computed using three data sources - (i) the SBM G 2.0 MIS, *Format [MR 14]—Physical and Financial Progress of new IHHL in SBM Phase 2*, (ii) JJM Reports, *Format C33 - State-Wise No of Schemes and Total Expenditure*, and (iii) *Live dashboard of JJM*.

The following formula has been used:

$$\text{Indicator} = \left[\frac{\text{Total Sum of SBM budget} + \text{Total Sum of JJM budget (adding all the years) per district}}{\text{Total No. of households in a district}} \right] * 100$$

We extracted the total financial progress data (found in column 23 of MR14) to obtain an aggregated figure for 2020 to 2023. We downloaded Format C33 at the district level for each state, organised by year—specifically for 2020-21, 2021-22, 2022-23, and 2023-24. For this download, we used the 'All' filter under 'Type' in column five. 'Total expenditure (in Lakhs)' is utilised from C33. The total number of households has been taken from the JJM live dashboard and is available under the 'status of households with tap water connection' section.

The numerator and denominator were calculated for 765 districts (the number of districts in 2024 as reported in SBM reports) and then individually adjusted to the number of districts in 2022 (733) using the area apportionment method.

48. Restoring basic services as a part of the district disaster management plan (InV)

We conducted a keyword analysis under the "Reconstruction, Rehabilitation & Recovery" section across all District Disaster Management Plans (DDMPs) to assess whether they mentioned the scope of restoration, including the "how," "when," and "who" aspects for restoring essential services. We then evaluated each plan and scored it on a binary scale from zero to one, where zero indicated the absence and one the presence of such details, based on a straightforward "yes" or "no" analysis. This scoring system evaluated how thoroughly the plans addressed the restoration protocols.

49. Restoring critical infrastructure (transportation, telecommunication, health facilities, education facilities, water supply) as a part of the district disaster management plan (InV)

We conducted a keyword analysis under the "Reconstruction, Rehabilitation & Recovery" section for all *District Disaster Management Plans* (DDMPs) to determine whether they outlined the scope of restoration, including the "how," "when," and "who" for restoring critical infrastructure such as transportation, telecommunications, health facilities, education facilities, and water supply. We then evaluated each plan and scored it from 0 to 1 based on a simple "yes" or "no" analysis, where 0 indicated the absence of this information and 1 stated its presence. This assessment offered valuable insights into how effectively each plan addresses restoring essential services.

50. Density of automatic weather stations (AWSs) and automatic rain gauge (ARG) stations in the district, per square kilometre (InV)

We utilised the Indian Meteorological Department's (IMD) AWG and ARG station network to gather the total number of stations for 2023. We then plotted stations using QGIS software and counted each district's total number of stations. To estimate the density of stations per square kilometre, we calculated the total number of stations and divided it by the area of each district.

51. Percentage of the total villages or *gram panchayats* in districts with village water sanitation committees, or other similar local institutions in rural areas (InV)

We have taken the indicator from the March 2024 results in the JJM District Progress cards under *Jal Jeevan Survekshan* 2023. The following formula was applied:

Indicator= [(Total No. of VWSEs or villages where at least one JJM scheme handed over to VWSCs or GPs)/ (Total No. of Villages)] *100

The data was taken for 741 districts (the number of districts in 2024 as reported in JJM reports). Then, using the area apportionment method, they were reduced to 733 districts (the number of districts in 2022).

52. Percentage of the total villages declared as ODF+ in the district (InV)

We obtained the data from the *Swachh Bharat Mission (SBM)* Grameen dashboard for the year 2024. We collected information on villages declared as ODF+ for each district. We identified the total

number of villages in each district from the SBM dashboard, which is the denominator for calculating the percentage.

The following formula was used:

$$\text{Indicator} = \left[\frac{\text{Number of ODF+ villages}}{\text{Total number of villages in the district}} \right] * 100$$

The data is reported for only 671 districts because not all districts may seek recognition as ODF+ and similar categories.

53. Percentage of the total wards/urban local bodies declared as ODF++ in the district (InV)

We collected the data from the *Swachh Bharat Mission (SBM) Urban* dashboard, which provides information about the number of urban local bodies (ULBs) and wards that have achieved ODF++ status. We obtained the total number of Urban Local Bodies (ULBs) or wards in each district from the SBM Urban dashboard. This figure serves as the denominator for percentage calculations.

The following formula was used:

$$\text{Indicator} = \left[\frac{\text{Number of ODF++ ULBs/Wards}}{\text{Total number of ULBs or wards in the district}} \right] * 100$$

The data was collected for 635 districts, as not all districts may seek recognition as ODF+ or similar categories.

Annexure 11: Detailed examples of data limitations

1. **Some datasets used for computing the indicators need to be updated.** The following examples hold:
 - The Indian boundary shapefile is available for 2022 but not for 2023. Therefore, we adjusted all the from 2023 and 2024 to match the 2022 administrative boundaries.
 - As indicated in Table 4 of the main report, indicators 7, 9, 14, and 25 use population data from the 2011 Census Survey conducted by the Government of India (GoI).
 - The authors have extrapolated this population data using the compound annual growth rate (CAGR) methodology. For more details on the CAGR methodology, please refer to Annexure 9.
 - Indicators **17, 18, and 19** rely on 2019-21 data. India's national missions like SBM and JJM have updated and live data on sanitation facilities and drinking water coverage through FHTCs but do not have caste-wise segregated data.
 - Indicator number **32** relies on nationwide and comparable estimates from 2019.
 - Indicator **36** is at the 2021 level. The latest data is only on the presence of FHTC, as captured by India's JJM's live dashboard. However, it could not be used since it covers only some aspects of safely managed drinking water services for households (refer to glossary for more details).
 - Indicator **8** relies on the 2012 enumeration of the country's slum area at the national level. State-level datasets are non-comparable.
 - India last endorsed the national poverty estimates in 2011-12. Hence, indicator number **34** relies on multidimensional poverty (MDP). The critique of MDP, as valid in international literature, holds.

- Indicator **15** relies on the latest estimates, which are not from a uniform year. Also, this data is only available for 12 out of 28 states and 8 union territories.
 - Indicator number **24 on the LULC dataset is considered for 2005-2015 and does not map** the changes for the latest years.
2. **Some of the datasets used for computing the indicators must capture all the aspects necessary for formulating a holistic understanding of the indicator.** The following examples hold:
- Indicator number **36** only captures some aspects of safely managed drinking water services for households (refer to the glossary for more details).
 - Indicator number **37** does not cover all aspects of basic drinking water services for education facilities (refer to glossary for more details).
 - **Indicators 39 and 40, taken together, also** only cover some aspects of basic sanitation facilities for education facilities (refer to glossary for more details).
 - Indicator number **41** does not capture all elements of basic sanitation for households.
 - Indicator number **42** only covers some aspects of basic hygiene facilities for educational facilities.
 - Indicator **43** needs to tell us whether there is a private place to wash and change at home.
 - Indicators **37, 39, 40, and 42** could not be taken from the Ministry of Education's open data platform, UDISE Plus (Unified District Information System for Education Plus), since it does not provide an urban-rural breakdown in its static reports on the number of schools with various infrastructure facilities, such as handwashing, functional toilets, and urinal facilities.
3. **The data sets used for computing the indicators are either not available or not available at the required scale in the public domain:**
- Indicator **15** is available from service level benchmarking reports only for ULBs of 12 states, and that too, only for some of the cities in them. It is also separately available for the 104 AMRUT cities in total. The indicator's recent estimate is not publicly available for all other cities and districts.
 - For indicator number **13**, the CPCB dataset is currently present for only some districts but only in a few regions.
 - Indicators on coverage of WASH facilities in the public health sector, as measured in the Kayakalp programme (refer to section 1.2.3 for more details), are not available in the public domain. Only a few states have state-level reports available, and they are different. Consequently, these indicators are excluded from the final list.
 - One indicator for the localisation of WASH-related SDGs, measured by the percentage of GPs recognising the three SDGs, is classified as private; therefore, we decided to exclude it from the final list of indicators.
 - Indicators on 20 and 23 were not available at the sub-state level. The records are not available separately for nine states and 9 UTs and are clubbed as "other states" in the national database.
 - Comparable and consolidated nationwide estimates for indicator number 32 are unavailable at the sub-state level.

Annexure 12: References for studies included in systematic literature review

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