

Singapore Management University

Institutional Knowledge at Singapore Management University

Research Collection College of Integrative
Studies

College of Integrative Studies

2-2022

Fact sheet - Human settlements: Climate change impacts and risks

Winston T. L. CHOW

Singapore Management University, winstonchow@smu.edu.sg

Richard DAWSON

Bruce GLAVOVIC

Marjolijn HAASNOOT

Mark PELLING

See next page for additional authors

Follow this and additional works at: https://ink.library.smu.edu.sg/cis_research



Part of the [Biodiversity Commons](#), [Environmental Sciences Commons](#), and the [Urban Studies and Planning Commons](#)

Citation

CHOW, Winston T. L.; DAWSON, Richard; GLAVOVIC, Bruce; HAASNOOT, Marjolijn; PELLING, Mark; and SOLECKI, William. Fact sheet - Human settlements: Climate change impacts and risks. (2022). 1-3.
Available at: https://ink.library.smu.edu.sg/cis_research/46

This Report is brought to you for free and open access by the College of Integrative Studies at Institutional Knowledge at Singapore Management University. It has been accepted for inclusion in Research Collection College of Integrative Studies by an authorized administrator of Institutional Knowledge at Singapore Management University. For more information, please email cherylds@smu.edu.sg.

Author

Winston T. L. CHOW, Richard DAWSON, Bruce GLAVOVIC, Marjolijn HAASNOOT, Mark PELLING, and William SOLECKI

Fact sheet - Human Settlements

Climate Change Impacts and Risks



Concentrated risk and concentrated opportunity for action

Cities and settlements are crucial for delivering urgent climate action. The concentration and interconnection of people, infrastructure and assets within and across cities and into rural areas drives the creation of risks and solutions at a global scale (*high confidence*). {TS.D.6}

Globally, urban populations grew by more than 397 million people between 2015 and 2020, with more than 90% of this growth taking place in less developed regions. The most rapid growth in urban vulnerability has been in unplanned and informal settlements and in smaller to medium urban centres in low- and middle-income nations where adaptive capacity is limited (*high confidence*). {TS.B.8.1}



Key impacts

Globally, exposure to climate-driven impacts such as heatwaves, extreme precipitation and storms in combination with rapid urbanisation and lack of climate-sensitive planning, along with continuing threats from urban heat islands, is increasing the vulnerability of marginalised urban populations and key infrastructure to climate change, for example, more frequent and/or extreme rainfall and drought stress existing design and capacity of current urban water systems and heighten urban and peri-urban water insecurity (*high confidence*). {TS.B.8.1}

COVID-19 has had a substantial urban impact and generated new climate-vulnerable populations (*high confidence*). {TS.B.8.1} Climate impacts on urban population health, livelihoods and well-being are felt disproportionately, with the most economically and socially marginalised being most affected (*high confidence*). {TS.B.8.3}

Urban areas and their infrastructure are susceptible to both compounding and cascading risks arising from interactions between severe weather from climate change and increasing urbanisation (*medium evidence, high agreement*). Losses become systemic when they affect entire systems and can even jump from one system to another (e.g., drought impacting rural food production contributing to urban food insecurity) (*medium confidence*). {TS.C.11.5}



Coastal cities

Coastal cities are disproportionately affected by interacting, cascading and climate-compounding climate- and ocean-driven impacts, in part because of the exposure of multiple assets, economic activities and large populations concentrated in narrow coastal zones (*high confidence*). Early impacts of accelerating sea level rise have been detected at sheltered or subsiding coasts, manifesting as nuisance and chronic flooding at high tides, water-table salinisation, ecosystem and agricultural transitions, increased erosion and coastal flood damage (*medium confidence*). Coastal settlements with high inequality, for example a high proportion of informal settlements, as well as deltaic cities prone to land subsidence and small island states are highly vulnerable and have experienced impacts from severe storms and floods in addition to, or in combination with, those from accelerating sea level rise (*high confidence*). {TS.B.8.2}

Risks to coastal cities and settlements are projected to increase by at least one order of magnitude by 2100 without significant adaptation and mitigation action (*high confidence*). The population at risk in coastal cities and settlements from a 100-year coastal flood increases by approx. 20% if the global mean sea level rises by 0.15 m relative to current levels, doubles at 0.75 m and triples at 1.4 m, assuming present-day population and protection height (*high confidence*). {TS.C.5.4} Realising global aspirations for climate resilient development depends on the extent to which coastal cities and settlements institutionalise key enabling conditions and chart place-based adaptation pathways to close the coastal adaptation gap, and on the extent to which they take urgent action to mitigate greenhouse gas emissions (*medium confidence*). {ES-CCP2}

Adaptation Options and Barriers



Adaptation plans, opportunities and gaps

Many cities and settlements have developed adaptation plans since AR5, but a limited number of these have been implemented so that urban adaptation gaps exist in all world regions and for all hazard types (*high confidence*). {TS.D.1.4} The urban adaptation gap shows that for all world regions, current adaptation is unable to resolve risks from current climate change associated hazards. {TS.D.1.6}

Continuing rapid growth in urban populations and unmet needs for healthy, decent, affordable and sustainable housing and infrastructure represent a global opportunity to integrate inclusive adaptation strategies into development (*high confidence*). Retrofitting, upgrading and redesigning existing urban places and infrastructure combined with planning and design for new urban infrastructure can utilise existing knowledge on social policy, nature-based solutions and grey/physical infrastructure to build inclusive processes of adaptation into everyday urban planning and development. {TS.D.6.1}

Projected number of people at risk of a 100-year coastal flood.

Calculated for sea level rise and population change under SSP2-4.5, based on current protection levels

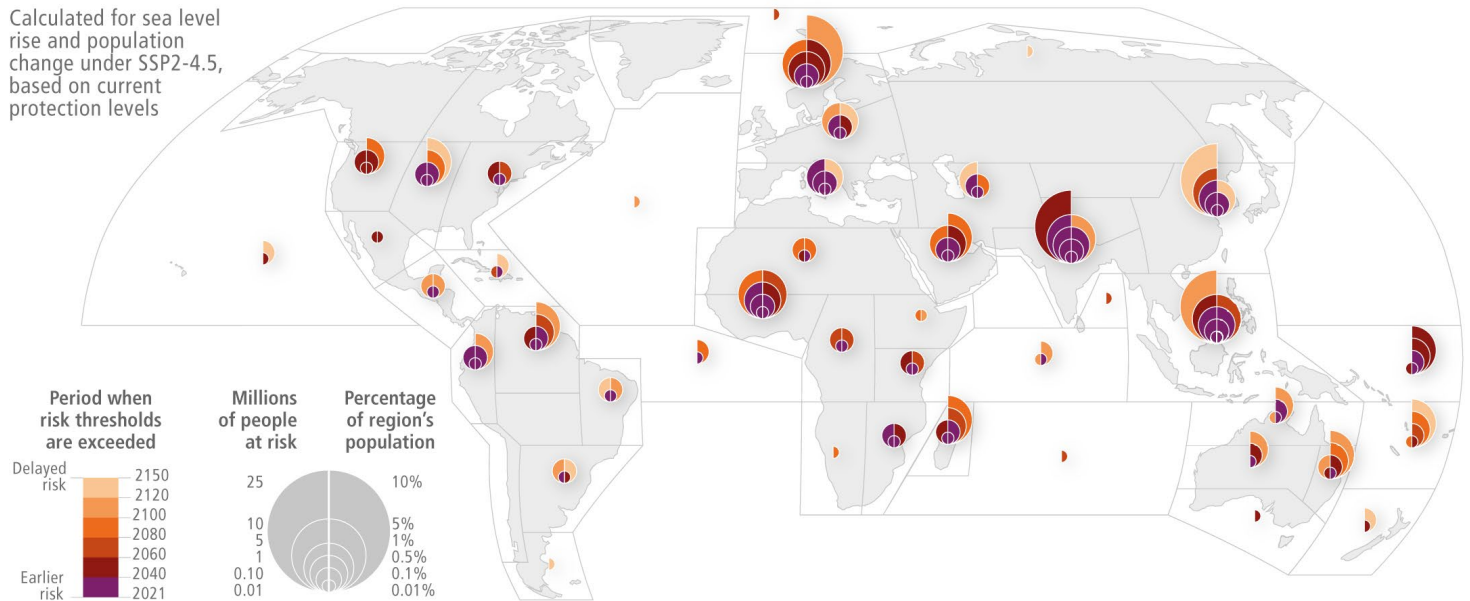


Figure 1: The size of the circle represents the number of people at risk per IPCC region and the colours show the timing of risk based on projected population change and sea level rise under SSP2-4.5*. Darker colours indicate earlier in setting risks. The left side of the circles shows absolute projected population at risk and the right side the share of the population in percentage. {Figure TS.9c}.

Key adaptation options

A mix of infrastructure, nature-based, institutional and sociocultural interventions can best address the risks. The options include vulnerability-reducing measures, avoidance (e.g., disincentivising developments in high-risk areas and addressing existing social vulnerabilities), hard and soft protection (e.g., sea walls, coastal wetlands), accommodation (e.g., elevating houses), advance (e.g., building up and out to sea) and staged, managed retreat (e.g., landward movement of people and development) interventions (*very high confidence*). {TS.D.7.3}

Disaster risk management, climate services and risk sharing, increase the feasibility and effectiveness of other options by expanding the solution space available (*high confidence*).{TS.D.11.1}

There is *high confidence* in the economic and ecological feasibility of green infrastructure and ecosystem services, as well as sustainable urban water management, once institutional barriers in the form of limited social and political acceptability are overcome. {TS.E.1.4}

Co-benefits and synergies of adaptation

Urban adaptation measures have many opportunities to contribute to climate resilient development pathways (*medium confidence*). They can enhance social capital, livelihoods, human and ecological health and contribute to low-carbon futures. Urban planning, social policy and nature-based solutions bring great flexibility with co-benefits for climate mitigation and sustainable development. Participatory planning for infrastructure provision and risk management in informal, precarious and underserved neighbourhoods, the inclusion of Indigenous knowledge and local knowledge, and communication and efforts to build local leadership especially among women and youth are examples of inclusive approaches with co-benefits for equity. {TS.D.6.6}

Inertia, maladaptation and limits to adaptation

Maladaptation has been observed across many regions and systems and occurs for many reasons, including inadequate knowledge and short-term, fragmented, single-sectoral and/or non-inclusive governance planning and implementation (*high confidence*). Examples include in urban areas, e.g., inflexible infrastructure in cities and settlements that cannot be adjusted easily or affordably for increased heavy rainfall and human settlements, e.g., stranded assets and stranded vulnerable communities that cannot afford to shift away or adapt and require and increase in social safety nets. {TS.D.3.1}

Considering the long term now will help avoid maladaptive lock-in, to build capacity to act in a timely and pre-emptive manner and to reduce risks to ecosystems and people. {TS.D.7.1} Approaches that break down adaptation into manageable steps over time and use pathway analyses to determine low-regret actions for the near-term and long-term options are a useful starting point for adaptation (*medium confidence*). {TS.D.10.5}

Limits to adaptation will be reached in more systems, including, for example, coastal communities, water security, agricultural production and human health, as global warming increases (*medium confidence*). {TS.D.2.3}

* Please see 'Introduction to WGII AR6 Fact Sheets'

Climate Resilient Development

Global urbanization as a window of opportunity

Global urbanisation offers a time-limited opportunity to work toward widespread and transformational adaptation and climate resilient development (*high confidence*). An additional 2.5 billion people are projected to be living in urban areas by 2050. How settlements and key infrastructure are planned, designed and maintained determines patterns of exposure, social and physical vulnerability and capacity for resilience. {ES-Ch6}

Finance and governance

Key innovations in adaptation in social policy and nature-based solutions have not been matched by innovation in adaptation finance, which tends to favour established mechanisms, often led by grey/physical infrastructure at the national scale. {TS.D.6.5} Governance capacity, financial support and the legacy of past urban infrastructure investment constrain how all cities and settlements are able to adapt (*high confidence*). Limits to adaptation are often most pronounced in rapidly growing towns and cities and smaller settlements including those without dedicated local government. {ES-Ch6}

Access to finance is most difficult for city, local and non-state actors, and in conditions where governance is fragile. {ES-Ch6} This highlights the significance of addressing underlying inequalities in development that shape differential vulnerability. {6.3.2}

Climate governance will be most effective when it has meaningful and ongoing involvement of all societal actors from local to global levels (*very high confidence*). Actors, including individuals and households, communities, governments at all levels, private-sector businesses, non-governmental organisations, Indigenous Peoples, religious groups and social movements, at many scales and in many sectors, are adapting already and can take stronger adaptation and mitigation actions. {TS.E.5.3}

Contributions of urban adaptation options to climate resilient development.

Nature-based solutions and social policy as innovative domains of adaptation show how some of the limitations of grey infrastructure can be mediated. A mixture of the three categories has considerable future scope in adaptation strategies and building climate resilience in cities and settlements.

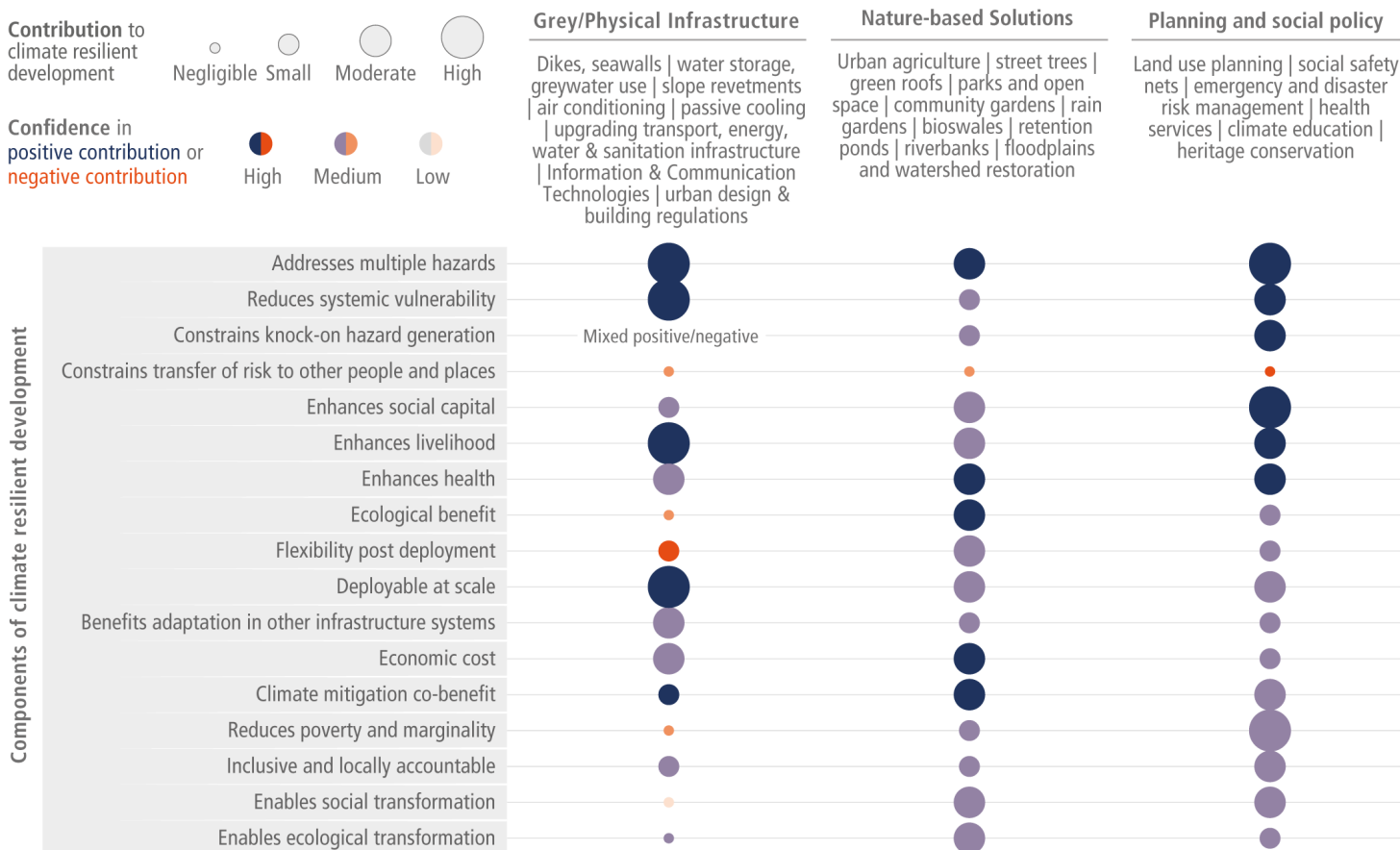


Figure 2: The figure is based on Table 6.6 which is an assessment of 21 urban adaptation mechanisms. Supplementary Material 6.3 provides a detailed analysis including definitions for each component of climate resilient development and the evidences. {Figure TS.9d}