

Survival in Half-Sunken Cities: Urban Adaptations to Sea Level Rise in Speculative Fiction

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Abstract

This paper surveys fictional depictions of urban adaptation to rising sea levels using climate resilience strategies identified by The Intergovernmental Panel on Climate Change as a guideline. The paper first lays out the four generic categories for urban adaptation under different conditions, namely accommodation, protection, advancement, and retreat, which provide a collection of fluid and interchangeable options. Preservation and creating alternatives are identified as the two main distinct characteristics of these strategies. The paper then focuses on their diverse portrayals in different media and how advantages and challenges of each are presented in fictional setting. The portrayals of accommodation are shaped by the envisioned magnitude and timeframe of sea level rise and generally underline the temporary nature of the strategy, while stories of long-term adaptation of coastal cities rely on techno-optimistic solutions. Stories depicting protection through exaggerated hard engineering projects underline how they also preserve and amplify existing social inequalities. Advancement in speculative fiction also relies on extreme engineering, inspired by existing and proposed architectural projects, each with diverse sociocultural connotations and visions for alternate societies. Retreat stories emphasize the broader implications of climate change and depict it as a long-term, evolving, and challenging process with uncertain outcomes. The paper concludes with a general assessment of common and divergent characteristics of the portrayals of the main climate resilience strategies in speculative fiction.

Keywords: Sea Level Rise, Climate Change, Speculative Fiction, Climate Resilience, Urban Adaptation

Introduction

Amongst the many consequences of human-caused climate change, sea level rise (hereinafter referred to as SLR) and its impact on coastal cities and settlements stands out as a central theme in numerous works of climate narratives across media. Linking it with ancient myths and traditions of flood narratives, Trexler (2015) argues that SLR as a narrative theme offers a familiar entry point to comprehend climate change. Compared to more complex issues like ocean acidification or biodiversity, SLR and flooding provides a more familiar and tangible local disaster scenario with extreme individual and social consequenc-

es audiences can identify with. These consequences are not purely functional, as in the lost of a place to live in and organize a society, but also entail severe and irreversible loss of material and immaterial heritage (Reimann et al., 2018). According to Dobraszcyk (2019), putting the spotlight on the possibilities for urban life in a world transformed by SLR, narratives of adaptation can compel audiences to assess their individual and collective roles and options for addressing the consequences of climate change.

Scientific projections on SLR vary due to gaps in our understanding of Earth's climate and the intricate interplay of socioeconomic and technological factors influencing human activities (McVeigh, 2023). Thus, while all SLR projections entail extreme water levels and wave heights, submergence of coastlines, and alterations of coastal geomorphologies as consequences (Goodell, 2018), there are multiple directions for stories of urban adaptations to SLR to take in terms of magnitude and timeframe. In this regard, this paper surveys the depictions of urban adaptation to rising sea levels using climate resilience strategies identified by The Intergovernmental Panel on Climate Change (IPCC) as a guideline. The paper first lays out the ways IPCC proposes for urban adaptation under different conditions, and then presents diverse portrayals of these strategies in different media, focusing on how advantages and challenges of each strategy are presented in fictional setting.

Mitigating Strategies for Coastal Cities and Settlements

Despite the challenges posed by the uncertainties around SLR, preparing coastal cities and settlements and developing future adaptation strategies for coastal communities is an essential necessity. Emphasizing environmental uncertainties and socio-economic inequalities shaping the availability of these options, the IPCC offers a set of climate resilience strategies for coastal communities (Glavovic et al., 2021). These are organized into four generic categories: accommodation and protection, which focus on preserving urban environments as much as possible, and advancement and retreat, which seek new alternatives for communities.

Regarded as one of the prevalent strategies employed to counter present degrees of SLR, the accommodation of the built environment seeks to mitigate the vulnerability of coastal cities and settlements through adaptive action (Doberstein et al., 2019). Various techniques are proposed to achieve accommodation, including increasing drainage capacity, retrofitting existing buildings against flooding, and adopting amphibious design principles in future developments (Barsley, 2020). The next strategy, protection, aims to create various types of barriers against SLR ranging from hard engineering measures like sea walls and dikes to the establishment of natural sponge zones through retaining mangroves and marshes. Contemporary successful flood defenses like the

Delta Works storm surge barriers in southwest Netherlands provide examples of how the protection strategy may be implemented in the future with time and investment under suitable conditions (d'Angremond, 2003). The third option, advancement, proposes the creation of new elevated land masses through land reclamation from the sea, which not only protect the new hinterlands but also generate areas for further growth. New York's Climate Resilience Master Plan partially adopts this strategy and proposes the extension of the shoreline towards the East River instead of building protections which would isolate the city from the sea (The Mayor's Office of Climate Resiliency, 2021). Finally, retreat as a strategy aims to reduce exposure by moving people and assets out of coastal hazard zones, with its extreme case being the relocation of island nations. Entailing cultural, socioeconomic, and equity considerations, retreat is one of the most challenging alternatives for coastal communities, potentially precipitating a global humanitarian crisis unless effectively addressed by environmentally conscious local and global policies (Hauer et al., 2020). Rather than being strict alternatives to each other, these strategies represent key options available to coastal communities, each with its own challenges and limitations. Communities might adjust, combine, and sequence them in different ways while managing and balancing emerging environmental factors, available economic and technical resources, and psychosocial and socio-political expectations. The decision-making processes on how to protect coastal cities and settlements thus face challenges beyond the dynamics of the SLR.

Multiple factors can shape how societies choose to prepare and adapt to SLR. Evaluating climate resilience strategies as design solutions, Stefen Al (2018) argues that local governments may be driven by priorities beyond the defense of coastal cities and settlements—namely the economy, community, or ecology. This approach views changing waterfront typologies not only as a risk to mitigate but also as an opportunity to reshape coastal communities' relationship with water and restore the ecological and environmental health of the shoreline in the long term. However, when assessing the same strategies from economic, legal, and policy perspectives, McGuire (2019) underscores the political challenges surrounding decision-making processes. Limited resources, uncertainties regarding long-term risks and benefits, and legal roadblocks like property rights pose significant hurdles for governments in implementation. Furthermore, the presence of techno-optimistic attitudes further complicates the process. Techno-optimism, considered by its critics as a form of covert climate denialism, posits that the factors driving climate change may be managed and eventually overcome by new technological solutions (Petersen et.al., 2019). Its advocates suggest that investments should be directed towards the research and development of such technologies instead of adaptation strategies. Pilkey and Pilkey (2019) argue that techno-optimism, coupled with a 'too rich to flood' mentality among the upper classes, reflects false expectations fueled by the desire to maintain the status quo and decreases the priority of SLR in the

eyes of decision-makers. Consequently, this diminished priority contributes to the potential failure to implement any climate resilience strategy. In this regard, narratives of not only consequences of SLR, but also implementations of different resilience strategies play a major role in exposing and exploring the options and challenges coastal communities face.

Discussions on the portrayal of resilience strategies in climate narratives bring forth a range of perspectives, incorporating cautionary concerns alongside constructive suggestions. Echoing the warnings against techno-optimism, Rabitsch and Fuchs (2022) emphasize the need to avoid portraying climate resilience strategies as easy solutions which can be implemented within short periods of time. Hageman (2012) asserts that climate change and its ramifications, along with how communities navigate them, should be more than backdrop elements in a narrative; rather, they should constitute integral components of the story. Advocating for a symbiotic relationship between climate narratives, art, and design, Dobraszcyk (2019) argues that the representation of resilience strategies should foster a holistic approach in envisioning the futures of urban submergence while encouraging radical responses to it. These views parallel with the intrinsic nature of climate resilience strategies as a collection of fluid and interchangeable options towards an uncertain and complex space of long-term possibilities.

Preserving Urban Environments

Despite the diversity of protection strategies proposed by the IPCC, accommodation and protection seem to get much attention in climate narratives, as they present transformed, yet still familiar urban environments to audiences. However, these portrayals sometimes require the transformation of the core characteristics of these strategies as well. As one of the most prominent climate resilience strategies in use today, accommodation of the built environments mainly focuses on enhancement of survivability of existing buildings and infrastructure against temporary flooding through retrofitting (Barsley, 2020). The fictional depictions of the strategy as a response to permanent substantial SLR however, either re-appropriate this temporary characteristic, or introduce extreme versions of transformational adaptation to prolonged exposure to the sea. Both variants feature partially submerged buildings, usually high-rises, while in the former they act as temporary shelters, in the latter they undergo a transformation into artificial islands or even urban archipelago.

Exemplifying temporary habitation, J. G. Ballard's seminal climate change novel, *The Drowned World* (1962), depicts how scientists coming from a re-treated society reside on the upper floors of the city's symbol buildings while exploring a flooded London. In Jean-Claude Mézières and Pierre Christin's comic *Valerian: The City of Shifting Waters* (2010) looters turned rebels occupy

parts of the crumbling half-sunken New York before its destruction under the waves. In Mathieu Babelt's comic *Carbon and Silicone* (2021), the titular androids retreat to one of the last standing buildings in mostly submerged Tokyo for more than a decade until sea levels reach their shelter. In these narratives, individuals or small groups often have minimal or no ownership claims on the buildings they inhabit, and their efforts to adapt them to SLR are likewise limited.

Narratives featuring communities responding to permanent SLR through flexible, parasitic architecture present a step towards a full accommodation of half sunken cities. In Brian Wood and Garry Brown's global cataclysm comic *The Massive* (2019), most half-sunken cities share a fate of abandonment, but as an example of a community led effort, Hong Kong manages to adapt itself to SLR by repurposing floating debris collected from the sea and transforms its high-rises into an interconnected port network. A similar example of adaptation can be seen at the beginning of Frédéric Blanchard and Fred Duval's comic *Renaissance* (2019), where half-sunken landmarks like the Eiffel Tower are expanded by ad hoc additions of prefabricated living pods and platforms to house communities. In both stories, it is implied that despite their initial success these haphazard solutions had reached their limits, but before any alternatives could be explored, the survivor communities fall to attacks from outside.

Narratives of long-term, top-down, coordinated efforts in accommodation run by governments and supported by corporate interests contrast to these random, spontaneous, and temporary forms of adaptation. Miami in Lisa Joy's neo-noir film *Reminiscence* (2021) keeps its semi-submerged downtown alive by adapting its buildings to SLR and controlling flood cycles with the help of barriers, while leaving older sections of the city to slowly crumble into the rising seas. Robbie Morrison and Jim Murray's graphic novel *Downtown* (2013) similarly depicts a flooded London, which still acts as a financial and political center, thanks to being transformed into a city of canals thanks to the investment of shady corporations. Overall, while their appearances change, the social and economic structures of these cities endure, retaining their inherent inequalities and corruption.

Despite featuring corporate corruption, stark class disparity, and urban negligence, as a novel focusing on the interplay between finance, property, and climate change, Kim Stanley Robinson's *New York 2140* (2017) provides a coordinated and balanced mode of transformational adaptation. In Robinson's story, high-rises in half-drowned lower Manhattan not only survive but flourish thanks to technological, social, and economic interventions. Application of new composite materials transform structures built on bedrock into waterproof artificial islands, which are connected by sky bridges to form neighborhoods. As co-ops owned by residents, individual buildings are then organized to produce their own energy and food by utilizing new carbon neutral production techniques. Finally, multiple co-ops are structured as mutual aid societies,

which could provide additional material and fiscal services, including their own digital currencies. Robinson's half sunken New York is described by Bellamy (2018) as a case for highly localized self-sustainability for adapting communities to climate change and SLR, while Rabitsch and Fuchs (2022) underline the importance of grassroots institutions in achieving this. However, while praising the detailed depiction of anti-capitalist economic action in Robinson's utopia, McBride (2019) also criticizes the novel for its reliance on technological and economic achievements in the background. Indeed, core technologies used to adapt the high-rises to SLR do not exist today. Therefore, despite its detailed portrayal of climate change and socio-economic foresight, the adaptive solutions in New York 2140 are in many ways techno-optimistic, like many other stories featuring inhabited half-sunken cities, as they try to employ a short-term adaptation strategy for a long-term challenge with unknown aspects.

Following the real-life trend of coastal hard engineered solutions which modified %50 of global shorelines (Dafforn et al., 2015), protection of coastal settlements through various types of barriers, especially high seawalls also get much attention in climate narratives. In Paolo Bacigalupi's *The Windup Girl* (2009), Bangkok, a bastion against agricultural biotechnology corporations, is protected against rising sea levels by a giant sea wall and supporting pumps. Similarly, massive sea walls towering next to city blocks of Los Angeles and New York can be seen in different iterations of the Blade Runner (Johnson & Guinaldo, 2021) and *The Expanse* (2011-2022) franchises. In John Lanchester's *The Wall* (2019), United Kingdom, run by an authoritarian regime, is surrounded by the National Coastal Defence Structure which not only stands against the rising seas but also climate refugees. Tabletop role playing games like *Shadowrun* (WizKids, 2007) and *Cyberpunk RED* (R. Talsorian Games, 2022) speculate on the potential social consequences of walling off cities and societies by featuring sea walls with growing slums attached to them. In all these narratives sea walls seem to have two main functions. By preserving megacities mostly as they are, they preserve the core aspects of the capitalist order which led to the climate catastrophe and continues to risk the ecological future of the planet (Hageman, 2012). At the same time, by physically isolating and reordering cities, they impose the pressures of the same catastrophe on lower classes (Hamblin & O'Connell, 2020). As a result, all these fictional sea walls are depicted as being targeted by rebels and revolutionaries from within and from outside, leading to varying levels of destruction. In *The Windup Girl* and *The Expanse*, the destruction of the pumps and the sea wall respectively are prominent plot points, forcing urban populations to retreat. While in the former retreat is portrayed as a new beginning for Earth, in the latter it takes the shape of a grim exodus from the planet.

New Alternatives for Communities

Despite opposing each other as reactions to SLR, both advancement and retreat narratives portray departures from existing urban settings and paradigms in varying degrees. While stories of retreat in speculative fiction are intrinsically rooted in the experience of loss, advancement narratives entail elements of opportunism and stubborn confrontation against SLR. In this regard many science fiction stories diverge from more critical climate narratives reflecting on real life failures of advancement, as in the stories of sinking landfills (Courtois, 2021), and instead focus on extreme engineering solutions.

Mega projects inspired by traditional stilt houses and houseboats are the two major types of exaggerated advancement found in speculative fiction. Distancing these new urban developments from older cities, advancement in those stories also functions as a means of dismantling ties with the existing social structures. In Sam J. Miller's novel, *Blackfish City* (2018), the privately owned city of Qaanaaq is architecturally modeled after oil platforms on metal legs, with its primary objective being the exploitation of climate refugees. New London in the TV series *Brave New World*, loosely based on Aldous Huxley's novel of the same name, is constructed atop of its flooded predecessor, featuring hundreds of meters high colossal columns supporting multiple wide horizontal surfaces, upon which the new idyllic city emerges (Wiener et al., 2020). The verticality of the structure also reflects the societal order of the city. While upper class residents do not perceive the artificial nature of New London, lower class citizens live and work near the columns and other infrastructure and witness the fragility of their world. Unsurprisingly, despite their wondrous engineering, the artificial cities in both stories fall from within following uprisings.

Acknowledged as an experimental variant of advancement strategy by the IPCC (Glavovic et al., 2021), floating habitats are another common trope in speculative fiction, featured in novels like Stephen Baxter's *Flood* (2008) and Sakyō Komatsu and Kōshū Tani's *Japan Sinks: Part II* (2006), as well as Daniel Pecqueur and Nicolas Malfin's comic *Golden City* (2004-2023), and Sid Meier's strategy game *Civilization VI* (2K, 2016). However, as Dobraszczyk (2019) notes, most narratives incorporating them neglect to consider the dynamic nature of the seas and potential distributive effects of climate change, such as ocean acidification, and thus fail to address the limits of urban adaptability to marine ecosystems. Moreover, the floating city concept comes with multiple socio-political connotations. In western tradition floating cities are fetishized by libertarian and counter cultural movements seeking autonomy from central governments (Dunn and Cureton, 2020). In Japanese tradition, they are explored by Metabolist architects as a way of building organically growing cities, out of a desire to overcome the destruction of the Second World War and to protect Japan's national sovereignty, while also being used in fiction to critique these same desires and methods as forms of expansionism (Gardner, 2020).

Due to these connotations, adversarial relations between floating habitats and communities keeping ties to the land and old cities is a common trope in narratives featuring them.

Compared to other resilience strategies, retreat is the most challenging and at the same time potentially most effective one. Its fictional depictions are diverse in line with the timeframes and magnitude of potential conditions forcing it, but they appear to share some bleak tones. In Dale Pendell's *The Great Bay* (2010), which tells the millennia long story of the flooded Central Valley in California, retreat from coastal cities fails to have any significant mitigating effect, as rapid SLR is coupled with other disasters, including a pandemic, and humanity slides back to a more primitive way of living. Steven Spielberg's *A.I. Artificial Intelligence* (2001) depicts two distinct time periods. The main portion of the story features a technologically advanced society enjoying life in inland suburbs and new coastal cities as the flooded old ones either slowly crumble, or in rare occasions are accommodated by tech companies for shady purposes. However, the film's ending reveals that despite its temporary success, the retreated humanity still fails to adapt to ongoing climate change in the following relatively short time frame of 2000 years and goes extinct. These narratives underline the interconnected nature of the consequences of climate change and pose the question of whether a society compelled to retreat because of rising sea levels can secure its survival amidst further impacts of the climate change.

Not all retreat narratives are that fatalistic though. The framing story of George Turner's *The Sea and Summer* (1987) illustrates how retreat may shape the evolution of a highly climate-aware advanced society over generations. Yet, as the main body of the novel unfolds, it becomes apparent that this enlightenment comes at a steep price. The initial breakdown of coastal defenses prompts a retreat stratified by class. While the upper classes move inland, most of the population is forced to endure inhumane and oppressive accommodations in partially submerged high-rises as refugees. Moreover, the narrative suggests that future generations may be struggling to fully grasp these hardships endured by their predecessors during this transformative process. Focusing on the process of adaptation itself, the goal-oriented medium of video games on the other hand posit retreat as challenge in the form of a new type of slow re-colonization of the planet players must undertake, either in an orderly fashion under corporate control as in *Anno 2070* (Ubisoft, 2011), or as a last-ditch effort of bands of climate refugees, as in *Floodland* (Ravenscourt, 2022). In both games players are challenged by both environmental factors and the other human factions, conveying the social complexities inherent in retreat. All in all, these narratives characterize retreat as a new but uncertain and challenging beginning, a long-term evolving process that undergoes continual change and requires constant adaptation.

Conclusion

Narratives depicting cities and coastal settlements facing the threat of SLR, collectively serve as an invaluable tool for cultivating a holistic understanding of the intricate interplay between climate change, humanity, and its aspirations for sustainable adaptation. On an individual level, each story provides further insights into the potential challenges of the resilience strategies they portray. Stories centered on strategies preserving current urban environments seem to accurately depict their viability primarily in optimistic scenarios of SLR and acknowledge their inherent fragility as long-term solutions. Similarly, narratives depicting retreat align with IPCC projections, highlighting the complexities of this strategy. Finally, most narratives of continuous adaptation address the ongoing and evolving nature of climate change in a comprehensive manner, reflecting the fluidity inherent in the IPCC's resilience strategies. However, techno-optimism prevails in stories relying on extreme engineering solutions or wonder materials, whether to maintain urban environments or create alternatives. These narratives strive to balance their reliance on future inventions with intricate portrayals of the social and economic challenges such solutions may introduce. Continuation of class disparity, corruption, and exploitation of climate refugees are thus common themes. Overall, while the magnitude and timeframe of SLR, and their material limitations are defining factors of the success or failure of resilience strategies in climate narratives, social and humanitarian costs of maintaining them also play a major role.

Climate change entails various unknowns and uncertainties. Given a trajectory of energy-intensive global economic practices heavily dependent on fossil fuels, coastal cities and settlements may experience sudden and extreme SLR. Adaptation may become unattainable, and both protection and advancement may falter, leaving retreat as a potentially costly but necessary, yet still uncertain only option. Depictions of urban adaptations to SLR in speculative fiction can help us envision such futures and encourage audiences to act upon their prevention. Nevertheless, further studies on the details of these depictions in a holistic manner is needed. A deeper analysis of how individual resilience strategies are depicted, on which aspects their creators focused and which aspects they left out can foster a deeper understanding of these visions and their viability.

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