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Community Planning Opportunities: Building Resilience to Climate Variability Using Coastal Naturalization



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Synonyms

[City planning](#); [Democratic decision-making](#); [Interactive planning](#); [Town planning](#); [Urban planning](#)

Definitions

Community planning is the process of solving problems, making improvements, or advancing a community in any way, shape, or form using plans, policies, and structures. This process can lead to progressive improvements in a community's physical, social, and ecological contexts. The task of community planning is typically carried out by professional urban planners, with assistance from stakeholders, governments, and other professionals such as engineers and architects.

Community planning is also known as city planning, town planning, and urban planning (Hodge and Gordon 2014). The use of the term

“community” however, rather than “town” or “city,” is more accurately representative of many Canadian settlements, which include cities, towns, hamlets, suburbs, and agricultural communities, among others. Regardless of the location or size of a settlement, it is a community, hence the term community planning.

The Oxford Dictionary (2018) defines **opportunity** as a culmination of circumstances that allow for the possibility of something. Ultimately, an opportunity is an order of events that allow for some form of growth or progress.

Community planning opportunities can be defined as moments that arise – often following a community planning challenge – that provide the necessary circumstances for a diverse array of members in a community to enact democratic decision-making processes for community-building and improvement.

Community planning opportunities often appear when a community is faced with an obstacle that challenges the community's welfare and stability. These obstacles can be physical, environmental, social, or economic in nature, but regardless of their origin, all community planning challenges demand a desired solution or response. In the process of resolving or improving the problem, a community's assortment of professionals and stakeholders gain the chance to work collectively toward a common goal or objective that aims to make a direct, positive impact on the community. This objective could take the form of a new plan or policy, transforming what was initially considered

a community planning challenge into a community planning opportunity.

Creating opportunities out of challenges is especially relevant for coastal communities grappling with the growing threat of climate change. While the impacts of climate change are problematic to a community on multiple levels, this circumstance provides the opportunity for a forward-thinking community to integrate and implement an appropriate plan of action to improve resilience against local climate change impacts.

Introduction

Climate change is an inevitable topic when discussing the current and future status of our ecosystem. As stated by the Intergovernmental Panel on Climate Change (IPCC) (2013), *climate change* refers to pattern changes in Earth's climate system. Although a politically controversial topic, scientific research strongly suggests an anthropogenic nature to climate change; human activities have increased the release of greenhouse gas (GHG) emissions (IPCC 2013). The buildup of GHGs in Earth's atmosphere creates instability in the climate system, resulting in observable climate impacts including rising global mean temperatures, sea level rise, severe and frequent storm events, extreme precipitation events, and retreating glaciers (IPCC 2013).

The impacts of climate change affect all regions across the globe, with coastal zones being particularly susceptible (IPCC 2014; Birchall and Bonnett 2018). Due to their proximity to oceans, coastal land is directly vulnerable to climate impacts such as sea level rise – mainly a result of thermal expansion and water transfer from land to the sea (IPCC 2013, 2014). The stress of climate change-induced sea level rise is amplified by increasingly severe storm surge (Gopalakrishnan et al. 2016). According to the IPCC (2014), coastal regions are experiencing, and will continue to experience, increased foreshore inundation and erosion as sea levels rise and storm surges intensify.

The physical impacts of climate change along the world's coastlines are increasingly concerning due to the burden that these impacts impose on

coastal populations and urban development. Coastal regions have long been favorable for human settlement because they offer efficient trade, accessible transport, ample recreational opportunities, and sense-of-place connections (Neumann et al. 2015). Indeed, in the territory of Nunavut, Canada, for instance, 25 of the territory's 26 communities are coastal communities (Labbé et al. 2017).

In many situations, the attractiveness of coastlines to mass populations make coastal land highly valuable from a developmental perspective (Neumann et al. 2015; Birchall *in review*). Most urban centers located along the coast benefit economically from the large numbers of tourists that visit coastlines every year (Toubes et al. 2017). For this reason, coastal urban development is expansive. Indeed, many of the world's megacities are located on coastal land and are projected to experience extensive growth into the future, incrementally more than non-coastal communities (Neumann et al. 2015).

The impacts of climate change exacerbate pre-existing stressors that these expanding communities are already facing (Schmidt et al. 2013). As coastal communities grow, they must contend with the stresses of urbanization, loss of coastal resources, and destruction of natural ecosystems (Neumann et al. 2015; Cormier-Salem and Panfili 2016). For instance, since 1980, mangroves have globally reduced in size by at least 20% due to human activities (Cormier-Salem and Panfili 2016). The effects of these stresses are worsened by localized climate change impacts, including foreshore flooding and erosion from climate change-induced sea level rise and storm surge (Cormier-Salem and Panfili 2016).

Ultimately, there are physical, economic, and social implications for coastal communities dealing with the effects of climate change. In one scenario Neumann et al. (2015) project the coastal flood risk to spread to 286 million people worldwide by year 2030. The physical component to climate change – flooding and erosion brought on by climate change-induced sea level rise and storm surge – will result in changes to land use. The economic effects of these physical changes are obvious, as the destruction of coastal

environments severely hinders coastal urban development and tourism; tourism is crucial to the economy of many coastal urban communities (Toubes et al. 2017). This economic detriment also has a social association, since citizens of these coastal communities will have their livelihoods significantly impeded (Schmidt et al. 2013). The multifaceted nature of these implications and their localized impacts pose as significant planning challenges to coastal communities.

With climate change becoming an increasingly pressing concern, coastal communities must discover ways to overcome these community planning challenges. Though mitigative efforts to reduce atmospheric GHG levels have been made globally (e.g., Birchall 2014; Birchall et al. 2015, 2017), the benefits will be experienced in the long term and do not help coastal communities deal with the immediate impacts of climate change. While still pursuing mitigation, coastal communities must also adapt to these impacts. Adaptations allow coastal communities to address the immediate impacts of climate change and integrate resiliency in both the short and long term. Examples of adaptations for coastal communities experiencing climate change-induced sea level rise and storm surge include building seawalls, increasing flood construction levels – minimum construction height of the first floor of a building within a hazardous zone – and relocating their most vulnerable infrastructure/assets.

Coastal Adaptation as a Community Planning Opportunity

The incorporation of climate change adaptation into planning and policy in response to climate impacts is a prime example of a community planning opportunity. Urban planners and community stakeholders can achieve this through integrating resiliency to climate change using an adaptation strategy or other planning instruments. Climate change impacts disturb the entire community, as will the adaptations to such impacts; therefore, there is a need for community involvement in

the incorporation of adaptation into planning (Schmidt et al. 2013). The desired goal of a coastal community's planning opportunity is to incorporate adaptation that is beneficial for the entire community and feasible to implement at ground level, for the purpose of building resilience.

Coastal communities can adapt to climate change using a variety of methods. The three main categories of adaptation include coastal retreat, accommodation measures, and direct protection of coastal areas (Harman et al. 2015).

1. Coastal retreat can be defined as organized recession from hazardous areas along the coast (Harman et al. 2015). Harman et al. (2015) discuss the following methods of retreat:
 - *Managed retreat* grants use and habitation of a hazardous coastal zone. When the hazardous level, however, becomes exceedingly dangerous – often referring to flood height or erosion of a coastline – occupants are expected to withdraw from the coast for their safety. If infrastructure is involved, relocation or abandonment is the expected procedure.
 - *Setbacks*, in a planning context, are defined as regulations that require development to take place a certain distance back from a focal point. In a coastal setting, infrastructure cannot be developed within a designated minimum distance from the shoreline.
2. Through decreasing the vulnerability of development, accommodation measures allow communities to continue using and developing in hazardous areas. Harman et al. (2015) discuss the following methods of accommodation:
 - *Building codes* can be revised or updated to meet a standard that correlates with hazard levels of climate change-enhanced impacts. A raised flood construction level (FCL) can reduce the exposure of infrastructure to foreshore flooding.
 - *Urban design standards* can ensure that coastal development meet certain criteria

in which adaptation is incorporated during the design and construction phase.

- *Public disclosure* includes open communication with the community/stakeholders within at-risk coastal zones; stakeholders must be aware of the threats they face regarding climate change.

In October 2012, the province of British Columbia, Canada, released “Cost of Adaptation – Sea Dikes and Alternative Strategies Final Report” (Delcan Technologies 2012). This document noted the following additional accommodation methods:

- *Secondary dikes* are backup or additional measures. A dike is typically considered a method of protection; however, a secondary dike is an accommodation measure because it works in conjunction with a primary dike. A secondary dike is not the first line of defense against coastal climate impacts – that is the job of the primary dike – but rather a method to further decrease vulnerability of susceptible development, such as highly urbanized coastal communities.
 - *Emergency preparedness* requires plans and strategies to respond to emergency situations.
3. Protection of coastal areas involves the physical defense of a shoreline. Harman et al. (2015) discuss the following methods of protection:
- *Hard defenses* such as dikes, levees, groynes, revetments, and sea walls are engineering projects that substantially shield the coastline. Hard defense structures work by absorbing the energy of water that is rushing toward the shoreline or by blocking the inflow of water directly.
 - *Soft defenses* such as beach nourishment and coastal/shoreline naturalization involve the use of natural processes within a coastal setting. Soft defenses can artificially supplement a pre-existing environment – beach

nourishment imports sand to beaches to counteract erosion – or allow natural ecosystems to completely invade a coastal space and apply adaptive processes.

Each adaptation method has its own strengths and weaknesses that make it appropriate for different contexts. Managed retreat is expensive during the time that a community is physically retreating (not as active retreat) but may be less costly in the long run compared to other methods that require continual upkeep or could incur serious damage costs. Managed retreat may even be the only viable option in situations where the flood or erosion risk has elevated to an unsustainable level. Nonetheless, managed retreat can be unsuccessful due to public disdain, legal restrictions, and issues involving displacement of people and infrastructure (Harman et al. 2015). Schmidt et al. (2013) demonstrate the unwillingness of stakeholders to retreat from the coast of Vagueira, Portugal, even though the stakeholders are knowledgeable regarding devastating future climate risks facing the community. The unwillingness of stakeholders and high up-front financial demand of managed retreat make it a less-preferred adaptation option for highly developed coastlines.

Setbacks are considered a low-cost substitute to managed retreat (Harman et al. 2015). While setbacks offer a buffer zone between coastal development and climate risks, the buffer capacity will reduce with intensifying climate conditions (Harman et al. 2015). Therefore, shorelines experiencing increased risks at an alarming rate may not benefit substantially.

Accommodation measures such as building codes and urban design standards are inexpensive ways of building infrastructural resilience within a community (Harman et al. 2015) that can be set to adapt to all climate conditions for every coastal community. The drawback to building codes and design standards is that they require constant monitoring and revision to keep pace with rising risk levels.

Hard protection methods also require routine maintenance – in fact, countries across the globe are enhancing their hard-engineered structures, such as levees and dikes, to accommodate climate change-induced flooding (Harman et al. 2015; Deltacommissie 2008; Ligtoet et al. 2012); yet, as demonstrated by Schmidt et al. (2013), stakeholders gravitate toward hard protection measures over other adaptation alternatives. Highly developed or tourist-oriented coastlines greatly contribute to a coastal community's economy, and constructing hard defense structures leaves the coastline relatively unaltered from its current, highly attractive state – an explanation for the observable, global preference for this adaptation method. While hard defense structures appear to be an appropriate choice for coastal urban development, they can degrade (e.g., Butler et al. 2016). Due to these degradation and failure risks, a hard structure can be more of a maladaptation – rather than an adaptation – that offers false protection to a community (Cooper and Pile 2014). Hard structures also alter sediment patterns and transport sediment along coastlines, which may enhance erosion rates (Harman et al. 2015).

Soft defense measures can better supplement sediment modifications from hard defense structures (Harman et al. 2015) and offer benefits that are more suited for coastal urban development. Soft defenses create aesthetically pleasing coastlines that offer an organic defense system with natural adaptive abilities. Soft defenses such as beach nourishment simply build on a natural system in place, resulting in an adaptation with the ability to withstand high-energy coastal systems and events (Harman et al. 2015), decreasing storm-induced damage (Gopalakrishnan et al. 2016). Gopalakrishnan et al. (2016) define beach nourishment as a process that regularly repairs or restores the eroded surfaces of beaches using externally dredged sand. While beach nourishment can temporarily mitigate the erosive and inundating effects of rising sea levels, the monitoring demands and upkeep costs are still extensive. Thus, coastal naturalization is a superior choice of soft defense adaptation for coastal communities.

Coastal/Shoreline Naturalization

As an adaptation against the impacts of climate change, coastal naturalization, also known as shoreline naturalization, foreshore naturalization, coastal greening, and greening flood protection, requires coastal land remain in an undeveloped state. This can be achieved through coastal ecosystem restoration, which is defined as certain measures taken to rehabilitate ecosystems that have been degraded, damaged, or completely devastated (Montoya et al. 2012). For instance, naturally occurring mangrove networks, coastal forests, oyster beds, and dune systems along the coast have been destroyed with urbanization (Cormier-Salem and Panfili 2016; Janssen et al. 2014, 2015; Yudhicara 2015). Naturalization efforts can be fulfilled by returning an artificially developed, coastal zone back into its natural state or by using avoidance measures along untouched coastlines. Avoidance measures simply refer to refraining from developing in hazardous coastal zones, thereby allowing the naturalized state of a coast to remain intact. Communities aid this process by utilizing planning instruments to regulate and prevent development in coastal areas (Harman et al. 2015). Coastal communities can greatly benefit from coastal naturalization.

Naturalized shorelines are inherently resilient and can provide coastal developments with a natural buffer to immediate climatic impacts (McDougall 2017). These ecosystems, such as coastal vegetation and wetlands, act as protective barriers against the flood risk of sea level rise and storm surge (McDougall 2017). Natural ecosystems reduce flood risk by absorbing wave energy and stifling tidal flow inland (Cormier-Salem and Panfili 2016), minimizing foreshore inundation. Naturalized shorelines also provide a form of erosion control along the coast. For instance, mangrove forests stabilize the coast by trapping sediment within their roots (Cormier-Salem and Panfili 2016), while oyster beds attenuate waves and allow sediment to settle (De Vries et al. 2007; Janssen et al. 2014; Piazza et al. 2005; The Oyster Restoration Workgroup 2018).

Naturalized shorelines can be aesthetically pleasing as well and facilitate public access to

recreation and leisure opportunities (Gopalakrishnan et al. 2016; Harman et al. 2015). Natural beach-like settings, along with activities such as fishing and wildlife observation, encourage ecotourism and tourism (Cormier-Salem and Panfili 2016).

Lastly, naturalized shorelines contribute to a coastal community's mitigative actions by sequestering carbon; coastal vegetation can remove carbon-based GHGs from the atmosphere (Cormier-Salem and Panfili 2016). Altogether, natural shorelines offer coastal communities both adaptive and mitigative benefits.

Coastal naturalization, and adaptation methods in general, offer a variety of solutions to the problematic effects of climate change and, in turn, build resilience throughout a community – a clear example of how a community planning challenge is transformed into a community planning opportunity.

It is important to recognize that shoreline naturalization does have its limitations. With urbanization of coastal zones on the rise, coastal land is highly profitable and sought after for developmental purposes (Mueller and Meindl 2017), putting the detainment of undeveloped land in direct conflict with conventional economic interests. Many areas that appear to be undeveloped, such as sand-only beaches, are often manufactured artificially and are not conducive to a naturalized shoreline. Even naturally occurring beach environments are less than ideal as they are easily eroded and demand constant monitoring (Harman et al. 2015). Although coastal naturalization is considered the economical choice when compared to hard defense adaptation measures (McDougall 2017), naturalization is often the less-preferred choice among conventional stakeholders (Schmidt et al. 2013).

Similar to retreat measures, coastal naturalization can be viewed as economically hindering, specifically in the instance of re-naturalization. In a study conducted by Schmidt et al. (2013), coastal property owners were more inclined to pursue hard defense measures over others because their idea of adaptation followed a hold the line concept. Private property owners – commercial in particular – receive economic benefits from the

tourist attraction of artificial beaches and have a vested interest in keeping them in their current state. Re-naturalization, including ecosystem restoration, changes the beachfront coastline, which may have the potential to negatively impact the tourist industry. Schmidt et al. (2013) discovered that majority of the adaptation methods recommended by stakeholders included the coast remaining unchanged from its artificial and developed state.

This disinterest in coastal naturalization by community stakeholders may be a result of a lack of knowledge. Coastal naturalization is a relatively new adaptation approach, especially in the fields of planning and policy (Janssen et al. 2014). Janssen et al. (2015) recognize that the lack of support and implementation around coastal naturalization projects is due to a lack of knowledge among stakeholders. In fact, Schmidt et al. (2013) specifically mention the rarity of naturalized viewpoints from stakeholders. It can be understood that lack of knowledge results in little understanding of how coastal communities can benefit from coastal naturalization. While soft defense approaches are still being learned and understood, hard defense structures have a long history of knowledge distribution and implementation, giving insight into why stakeholders show preference for hard defense structures.

Future Directions

The need for appropriate planning and policy around coastal land is critical to the success and resilience of coastal communities. Coastal communities must adapt and build resilience to the impacts of climate change, and planning instruments can assist these communities in efficiently implementing the various aforementioned approaches. Siders (2017) identified that using planning to initiate climate change adaptation is a successful method for distributing knowledge and awareness of climate change risks, for integrating the adaptation efforts already in place, for offering leadership and encouraging stakeholders to participate in personal and independent adaptation, and

for inspiring future leaders and administrations to maintain and pursue further adaptation.

There is a need for multilevel governance in current and future adaptation planning. Multilevel governance is necessary for two significant reasons. First, many adaptation options are not attainable due to fiscal constraints at a local level (Harman et al. 2015), and higher levels of government – state, national, or international – can offer funding for large-scale projects (Harman et al. 2015; Siders 2017). Second, social and political pressure can easily slow the progress of adaptation efforts at the local level (Harman et al. 2015). For instance, Australia is highly decentralized for coastal adaptation planning – local governments and private stakeholders are completely responsible for discussion, funding, development, and implementation (Harman et al. 2015). Adaptation efforts throughout Australia have been limited by the direct influence of cultural, political, and institutional norms on local governments (Harman et al. 2015). Higher-level government is less confined by local norms than local governments and can mandate the implementation of adaptation at the local level.

The need for multilevel governance in adaptation efforts includes both government – local, state, and national – and community members. Schmidt et al. (2013) stresses the need for a better approach that incorporates stakeholders into the adaptation process.

The community buy-in and widespread understanding of coastal climate change adaptation are where sound planning practices and policies are key. Community engagement is critical to any adaptation mechanism becoming socially amenable, especially when concerning measures that are perceived to be more drastic such as shoreline naturalization. The implications of shoreline naturalization are currently considered to be economically damaging due to its up-front cost and potential impacts on tourism and existing development. Therefore, community stakeholders must be incorporated in the conversation and decision-making process early on and often. While community engagement seems like an obvious and necessary step in adaptation planning, many communities are disregarding this step. In fact, in

Vagueira, Portugal, attempts to communicate with and incorporate the public and stakeholders in the decision-making process rarely take place (Schmidt et al. 2013).

Community engagement can take on many forms. Public meetings that allow citizens the chance to voice their opinions and offer ideas are commonly used to communicate with stakeholders. Other forms of engagement, to list a few, include open houses, citizen juries or committee groups, public workshops, essay/letter or photo submissions, debates, design competitions (Van Assche et al. 2016), and online forums.

A necessary step to community engagement moving forward is the incorporation of education and information. Citizens must first understand the severity of climate change and the detrimental effects they are facing due to local climate impacts; a perspective of climate change as a community planning challenge will emerge from this knowledge. Citizens must then be made aware of the multiple adaptation options provided to them, including the benefits and downfalls of each method; stakeholders must understand how each adaptation can benefit them specifically. Educating the community about adaptation possibilities will likely foster greater and more in-depth discussion during community outreach. Thorough community engagement allows municipalities to better incorporate climate change adaptations into planning practice and policy, perpetuating the attitude of climate change as a community planning opportunity rather than a challenge and, in turn, building a more resilient and better-equipped community.

Cross-References

- ▶ [Adaptation](#)
- ▶ [Climate Change Adaptation \(CCA\)](#)
- ▶ [Climate Change and Human Migration as Adaptation \(“Climate Refugees”\)](#)
- ▶ [Climate Change Effects Natural and Human Systems](#)
- ▶ [Climate Change Impacts and Resilience](#)
- ▶ [Climate Change Planning](#)
- ▶ [Climate Resilient Communities](#)

- ▶ Immediate Climate Vulnerabilities
- ▶ Long-Term Climate Vulnerabilities
- ▶ Vulnerability
- ▶ Vulnerable Communities

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