



The role of colonial pasts in shaping climate futures: Adaptive capacity in Georgetown, Guyana

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ARTICLE INFO

Keywords:

Adaptation
British Guiana
Climate change
Colonial history
Stabroek
West Indies

ABSTRACT

This article examines the role of colonial institutions and legacies in shaping modern-day adaptive capacity in a postcolonial urban center in the Caribbean – Georgetown, Guyana. Focusing on the Dutch and British colonial periods of governance, it shows the ways in which these colonial periods have shaped the physical and social structures of the city, and influenced many of its present-day processes and institutions, some of which are incapable of reducing the city's vulnerability to climate risks and impacts, including sea-level rise, coastal inundation, and flooding. It finds that the maintenance of critical infrastructure for building adaptive capacity such as the colonial era seawall and drainage system has been inconsistent, largely due to financial constraints. And although various international organizations have financed other large-scale hard infrastructure projects for sea and river defenses, community-based drainage projects have proven to be more successful in mitigating flood risks, illustrating the effectiveness of contemporary grassroots interventions. Beyond these, this article highlights the need for more long-term resilience and transformational measures, particularly relating to knowledge- and meaning-making, and to financing and strengthening local institutions, in order to improve the city's adaptive capacity both now and in the future.

1. Introduction

From pre-Columbian times to the present, the physical geography of what is now known as the Caribbean has been “one of the dominant and inescapable [endogenous] influences on the pattern[s] of life and society in the region” (Knight, 1990, p. 3). The islands “produce powerful influences on people”, and their “topography and geology [...] have been major influences on the types of societies which have developed there since” (Knight, 1990, p. 3). Also incorporating mainland countries such as Belize, Guyana and Suriname, the countries in the Caribbean exhibit geophysical commonalities and share geo-political identities (Robinson, 2018; Robinson & Wren, 2020). Important aspects of the region's geography, therefore, have economic, social, political, and environmental significance (Buddan, 2001). Likewise, its political life has significance for its geography (Buddan, 2001).

There is an almost uniform experience of colonization and capital exploitation in the Caribbean that is primarily based on slavery and sugar plantation economies (Beckford, 1972; Williams, 2001). Yet, the pronounced and lengthy colonial impact involving the conquest of territories by different and often rival European powers (e.g. British,

French, Dutch, Danish, Spanish, and Swedish), has served to fracture the region (Besson, 2002, ch. 9). The plantation logic undergirds contemporary forms of capitalism through extractive industries such as mining and tourism that are fueled by infrastructural development (Beckford, 1972; Griffin, 2016; Sheller, 2018). There is variability in national and sub-national governance structures with racial, ethnic and linguistic divisions (Bonilla, 2015), alongside an unquestionable ability to effectively organize as small island coalitions in various international fora, including for advancing environmental and development priorities such as climate change adaptation (Foley et al., 2023). The region's small places and spaces further create special circumstances and challenges (Foley et al., 2023), with physical characteristics determining the nature and extent of natural resources and orchestrating tensions over the distribution of benefits to various social groups (Mistry et al., 2009; Robinson & Butchart, 2022). Its strategic location in terms of trade and proximity to North and South America exposes countries to the political influences of great historical and contemporary powers (Bernal, 2017, ch. 10), making it susceptible to exogenous forces, pressures, and control. Within the region, urban problems are on the rise (Aguilar and López Guerrero, 2022). Scholars are increasingly questioning the root

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causes of urban vulnerability, including how historical forces, pressures and control exerted through colonialism and its structures affect(ed) the planning, design, production and management of urban settlements and urbanization (Mycoo et al., 2021).

This article examines the ways in which colonial governance has shaped the physical and social structures, as well as the present-day processes and institutions relating to climate change adaptation in a postcolonial urban center in the Caribbean – Georgetown, Guyana. Georgetown is the capital city, and has an urban population hovering around 61% (Mycoo & Bharath, 2021). Located in Region 4 (Demerara-Mahaica), it lies at the mouth of the Demerara River, and is bordered on its north by the Atlantic Ocean (see Figs. 1 and 2). The flat, low-lying coastal plains that give ground to the city are several meters below sea-level at high tide (Mycoo, 2014; Pelling, 1997). Georgetown's coastal and riverine location combined with the land's impervious clay soils make the area highly vulnerable to flooding (Edwards et al., 2005). Its settlements and roughly 200,000 residents are protected from various climate risks and impacts by a 165-year-old, 280-mile-long seawall, and a network of canals with sluices that were built as early as the 1700s (Vaughn, 2022). Its metropolitan area is immediately surrounded by agricultural land, the structure, ownership and management of which are largely based on a slave plantation system that existed from the sixteenth to nineteenth century (Beckford, 1985). Its geographic characteristics are fundamentally a product of the complex colonial history of its coast, necessitating a deeper investigation into the coevolution of environmental, social, political, and economic factors impacting the city's modern-day adaptive capacity.

This article presents six arguments that better explain the city's adaptive capacity alongside a case study illustration of an earlier conclusion drawn by Mycoo (2017, p. 75), that “economic, environmental and social vulnerabilities become exaggerated [in the Caribbean region] because of [...] governance, political institutions and land settlement history”. We thematically analyzed a variety of data, including previous historical and contemporary accounts of urban life in Georgetown published in the academic literature (e.g. De Barros, 2003; Edwards et al., 2005; Mycoo, 2014; Pelling, 1997), official government



Fig. 1. Location of Georgetown in Guyana.
(Source: <http://www.citypopulation.de/en/guyana/>)



Fig. 2. Georgetown at the mouth of the Demerara River.
(Source: Dan Lundberg/Wikimedia Commons under Creative Commons License 2.0)

documents (e.g. development and poverty reduction strategies, and the population and housing census), and databases (e.g. GuyNode Spatial Data Portal). Thematic analysis involves closely examining the data to identify and report common themes and patterns, and allows for the organization and description of the data in rich detail (Braun & Clarke, 2006). It is well suited for work with a “social justice motivation—be it ‘giving voice’ to a socially marginalized group, or a group rarely allowed to speak or be heard in a particular context” (Braun et al., 2019, p. 849). We followed the six steps recommended by Braun and Clarke (2006) – familiarizing ourselves with the data, including reading and re-reading sources, generating initial codes, searching for themes, reviewing the themes, defining and naming themes, and producing this report. The arguments we make relate to the city's (1) climate risks and impacts, (2) historical development, (3) urban form and socio-economic processes, (4) municipal- and national-level institutions relating to urban planning and adaptation, (5) particularly vulnerable sub-populations within the context of broader social settings, and (6) long-term resilience and transformation. By exploring these issues within a development context more broadly, the article demonstrates how historical foci can help shape understandings of the influence of formal processes and institutions on driving and constraining contemporary climate change adaptation practices.

2. Contextualizing urban adaptive capacity in the Caribbean

Given the Caribbean's historical geography, this article draws on Caribbean Dependency Thought to better contextualize adaptive capacity in postcolonial Georgetown. Caribbean Dependency Thought articulates the impacts of plantation accumulation regimes—its threads of epistemic dependency, and dependency as peripheral capitalism help explain the ‘importation’ of colonial economic and social structures, along with how financial aspects of adaptive capacity are bound up with global political economic inequalities (Girvan, 2006). For Best and Levitt (2009), this plantation economy exists across time and sectors, producing new extractive industries such as mining and manufacturing that are owned by foreign corporations that control investments, technologies, supply chains, and decision-making (also see Vaughn, 2020). For Beckford (1972, 1985), it exists across space where agriculture-dominant plantation economies are characterized by elites' monopolization of land, distortions in resource allocation, and the dynamic underdevelopment effects of the plantation system, resulting in persistent poverty. The emergent plantation society is a synthesis of race and class that creates a ‘special case’ for understanding social formation histories in the region (Beckford, 2000). Rodney (1981), focusing on race and class in Guyana, classified those of African and East Indian

origins as Black, and showed how both groups were dominated by a white class that controlled the means of production. This categorization has been critiqued by Dupuy (1996, p. 114) for robbing “the Caribbean working and dominant classes of their distinctiveness and their integrity by homogenizing them”. Furthermore, “the racism of the ethnically differentiated workers had an existential basis in the relative positions that they occupied in the system of production”, as did “the colonial ruling and planter classes” vis-à-vis “the Guyanese petite bourgeoisie [gaining ...] control of the state and private business interests” after independence (Dupuy, 1996, p. 119). The resulting competition between these classes and their conflicting interests have fueled racially-based social tensions, including over urban land (Rodney, 1981), which persist today (Bahadoor, 2023; Cordis, 2019; also see Lombard & Rakodi, 2016 for an analysis of urban land conflict in different cities across the developing world).

A localized analysis of urban adaptive capacity in the Caribbean first requires an exposition of adaptive capacity, which has been defined in different ways. For Flórez Bossio et al. (2019, p. 2), whose work on the dimensions of urban adaptive capacity is also used to frame this article, it is the “ability to perceive, cope with, prepare for, and adapt to disturbances and uncertain social-ecological conditions”. For the Intergovernmental Panel on Climate Change (IPCC, 2022, pp. 2899), it is the “ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities or to respond to consequences”. Irrespective of definition, there is an emphasis on a system’s ability to manage and respond to shocks, establishing links to global-scale phenomena such as climate change, and to the behavior and collective action of localized processes and institutions pursuing resilience (Gerges et al., 2023). Resilience has an “essentially contested nature” (Grove, 2018, p. 62). For Brand and Jax (2007), it is a learned adaptive capacity that facilitates interdisciplinary research into how human and environmental relations can or should be organized and managed. For the IPCC (2022, pp. 2920–2921), it is “the capacity of interconnected social, economic and ecological systems to cope with a hazardous event, trend or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure”. Among Caribbean adaptation policy- and decision-makers, however, there is no consistency in how it is interpreted or implemented, with the same being true for transformation (Saxena et al., 2018). Therefore, in its “political pliability”, resilience can be seen as offering opportunities to transform modern life, “not revolutionize” it as the opportunities to do so in practice are limited (Grove, 2018, p. 269 & 274).

Flórez Bossio et al.’s (2019) framework for understanding urban adaptive capacity has three dimensions – (1) adaptive capacity characterization, (2) external factors mediating adaptive capacity, and (3) dynamics of adaptive capacity. The first dimension covers the attributes of adaptive capacity, the agents responsible for its implementation and their ability to do so, alongside the city’s range to adapt (Flórez Bossio et al., 2019). In this article, we focus on the less-explored characterizations such as the city’s previous experience with hazards, infrastructure, and governance, alongside the interplay of these (following Mycoo et al., 2021). The second dimension involves processes and institutions, which are seen as the structural shapers of adaptive capacity (Flórez Bossio et al., 2019). Multi-level processes occurring at and across the global, regional, national and local levels shape actors’ ability to deal with climate change, and traits of the urban system are shaped by place-based processes (also see Birchall et al., 2023; Mistry et al., 2009). Both process types influence the system’s vulnerability (also see Birchall et al., 2023). Institutions are “the wider set of [formal or informal] rules, norms and agreements that structure human interactions” (cited in Robinson et al., 2023, p. 251). We explore how various processes and institutions guide or inhibit behavior and collective action (following Robinson et al., 2023). The third dimension covers “the constant time-space interactions between social entities and their socio-natural context which mediates how [adaptive capacity] is practiced in a given moment and its effects over time” (Flórez Bossio et al., 2019, p. 6).

We point out “where [particularly vulnerable] groups tend to have higher levels of sensitivity and lower levels of adaptive capacity to climate change” (Flórez Bossio et al., 2019, p. 6). We use this three-dimension framework to organize our six arguments that better explain the role of Georgetown’s colonial past in shaping its climate future.

3. Characterizing Georgetown’s adaptive capacity

3.1. Climate risks and impacts

Colonial-era economic activity and territorial control led to the establishment of Georgetown at its current site – a port built on a coastal flood plain that lies up to 3.5 m below sea level that is extremely vulnerable to flooding (Edwards et al., 2005). The location was strategic—it facilitated trade, and afforded direct access to the interior of the country. Historically, Georgetown experienced extreme flooding in 1855 and 1872 (Pelling, 1999). Flooding continues to represent the greatest climate risk and impact in the city (DoE, 2019b)—the drainage network originated during colonial times, and Georgetown’s peripheral status in the colonial regime delayed the implementation of sanitation schemes and limited public infrastructure spending (see Hope, 1982). After over 150 years of operation, the drainage infrastructure operates at reduced capacity (DoE, 2019a). Drainage via the gravity-controlled sluice gates is only possible during low tide (DoE, 2019b). Sea-level rise further reduces the effectiveness of the city’s coastal protection infrastructure, as the risk that the gates will not open increases. Other key climate risks include storm surges, changing rainfall patterns, and drought (Filho et al., 2019). Impacts associated with these risks include outbreaks of waterborne diseases, heat waves, loss of livelihood, water and food insecurity, and damage to the built environment (Filho et al., 2019). Future climate projections indicate that temperatures and sea-levels in Guyana will continue to rise, and the intensity of precipitation events will increase (DoE, 2019b).

The United Nations Strategy for Disaster Reduction classifies Guyana as a high flood risk country with greatest flood vulnerability experienced within the coastal zone where Georgetown is located (DoE, 2019b). Households and city engineers have noted a higher frequency of flooding events than in previous decades (Mycoo, 2014; Vaughn, 2022). These events have exceeded the capacity of Georgetown’s existing drainage system (DoE, 2019b). A significant flooding event occurred in January 2005 when the heaviest rainfall in Guyana was recorded (DoE, 2019b). Initially, it began on December 24, 2004, when torrential rains resulted in serious flooding along the coastal region. By early January, there were reports that some Georgetown neighborhoods such as Sophia were still flooded as a result of the incessant rainfall. Flood waters reached their peak around January 17, when a high lunar tide and unusually heavy rains combined to inundate areas occupied by nearly half the country’s population. Data obtained from the Georgetown Botanic Gardens station shows that rainfall totaled 1108.2 mm in that month—over five times the January average of the following fourteen years (mean = 218.23 mm) (MoA, 2019). Region 4, where Georgetown is located, along with Regions 3 (Demerara-Essequibo Islands) and 5 (Mahaica-West Berbice) were declared disaster areas (Sutherland, 2020) (also see discussions in Moulton & Machado, 2019 about the scale and implications of post-hazard physical ruin). Rainfall subsided after January 19, which allowed a significant amount of the water to drain off higher grounds (Sutherland, 2020). However, as rains continued until the first week of February, many coastal areas remained flooded (Sutherland, 2020).

The extent and depth of flooding during the January 2005 event are shown in Fig. 3—the eastern region of Georgetown experienced the worst flooding, with flood waters reaching over 3 m. Livestock and other animals were killed by the rising, sewage-contaminated waters (Sutherland, 2020). Farmlands across the coastland were drenched (Sutherland, 2020). Food supplies ran low, and shopkeepers and



Fig. 3. Illustration of the disproportionate extent and depth (in meters) of flooding in Georgetown (represented by section 416—indicated by black box) in January 2005

(Adapted from Guyana [Lands and Surveys Commission, 2013](#), p. 89).

vendors increased food prices ([Sutherland, 2020](#)). Households reported that they received no flood warning or evacuation plans ([Mycoo, 2014](#)). Flood impacts included damages to houses and businesses, income loss from non-attendance at work, and loss of school days ([Mycoo, 2014](#)). Total economic damages rose to US\$465 million, 60% of Guyana's annual gross domestic product ([DoE, 2019b](#)). Later in the year, in October 2005, an extreme wave event along the coast damaged several sea defense structures and flooded low-lying coastal areas, further compounding the economic losses experienced after the January floods ([Van Ledden et al., 2009](#)).

As [Fig. 3](#) also shows, vulnerability to flood impacts is not evenly distributed across Georgetown (as delineated by the black box). Low-income households and informal settlements displayed the highest vulnerability, and continued shortfall in the provision of formal public and private housing exacerbates this vulnerability ([Mycoo, 2020](#); [Pelling, 1999](#)). For example, the informal settlement of Sophia is located in the eastern region of Georgetown (located in the red zone within the black box in [Fig. 3](#)), which is a flood prone area ([Mycoo, 2014](#)). Many low-income houses in Sophia are located below road levels, causing flood waters to drain off roads and enter households ([Mycoo, 2014](#)). Roads flooded during the January 2005 event left Sophia residents marooned for days until flood waters subsided ([Mycoo, 2014](#)). This is not to suggest that the informality of low-income communities such as Sophia independently increases flood risk (e.g. see [Banks et al., 2020](#); [Lombard, 2015](#)). These residents experience the greatest direct and indirect impacts of flooding because their livelihoods are more vulnerable to flooding and susceptible to disruption ([Mycoo, 2014](#)). Moreover, it should suggest that attention is needed on the ongoing economic and political decision-making practices that lead people to live in such precarious situations (see [Banks et al., 2020](#); [Lombard, 2015](#); [Robinson, 2018](#)).

Present-day vulnerability to climate risks and impacts in Georgetown is also exacerbated by inadequate technical and financial capacity to improve critical coastal and drainage infrastructure. These conditions result from limited financing and institutional capacity, impacting how the city perceives, copes with, prepares for, and adapts to climate risks and impacts. Past state failure and limited finance produce doubt among Georgetown households that state institutions can guarantee successful adaptation to climate change ([Filho et al., 2019](#); [Mycoo, 2014](#); also see [Hope, 1982](#)). Thus, in some instances, climate risks and impacts in Georgetown stem more from failure in service provision than an increase in population that leads to environmental quality degradation and increased environmental hazards ([Pelling, 1999](#)). Infrastructure and housing shortages further complicate the city's vulnerability (and thus, its adaptive capacity) to sea-level rise, coastal inundation, and flooding, which represent the primary impacts to which it must adapt ([Pelling, 1999](#)).

3.2. Historical development

Georgetown's geographic characteristics and its vulnerability to climate risks and impacts are fundamentally a product of the complex colonial history of the Guyanese coast. The Dutch were the first European power to make permanent settlement on the Guyanese coastline, beginning in 1580. At the time, few Amerindians lived on the coast, which was primarily composed of mangrove swamps ([Edwards et al., 2005](#)). To make the coastline productive for large-scale agriculture, notably for sugar and rice, the Dutch facilitated major coastal transformation ([Pelling, 1999](#); also see [Beckford, 1985](#)). This transformation relied on African slave labor, which the Dutch imported to carry out the construction of drainage networks, irrigation systems, and seawalls, giving way to plantation lands ([Beckford, 1985](#); [Pelling, 1999](#); [Vaughn, 2022](#)). The present-day site of the city was instituted as a ward of Stabroek in 1748, a port to support the Dutch colony then administered from Borselen Island – a few miles upstream on the Demerara River ([De Barros, 2003](#); [Smith, 1962](#)). In 1781, the British established a town at the mouth of the river when they captured the territory from the Dutch. Around the river, plantations were created where slaves cultivated cotton, cacao, and indigo. During a brief period of Dutch-allied French control that followed (1782–1784), the French strategically shifted the colonial capital to Longchamps in 1782, but the Dutch reclaimed the area in 1784, renaming the town Stabroek after the President of the Dutch West India Company ([De Barros, 2003](#); [Smith, 1962](#)). Stabroek quickly encompassed former estates, and grew even more rapidly during the transition into the nineteenth century, largely due to the influx of British colonists and capital, which were accompanied by an increase in coastal infrastructure and cultivation made possible by increased slave labor ([Diaz-Cayeros, 2022](#), ch. 26; [Smith, 1962](#)). By 1803, the British had effective control over Stabroek and the Dutch colony of Demerara ([Edwards et al., 2005](#)). The city was officially renamed Georgetown in honor of King George III in 1812 ([De Barros, 2003](#)).

Both the Dutch and the British built a plantation economy that forced the Guyanese economy to be dependent on cash crops such as sugar and coffee ([Ishmael, 1993](#)). The British, who controlled Guyana from 1803 to 1966, were especially dependent on the coastal regions near Georgetown to produce sugar ([De Barros, 2003](#)). After the full abolition of slavery in 1838, Georgetown continued to grow as many freed slaves moved to the city ([Smith, 1962](#)). The concurrent declining importance of the sugar industry informed the growing colonial administrative and political centralization in the city, which was expanding physically and symbolically ([De Barros, 2003](#); [Smith, 1962](#)). During the first half of the twentieth century, infrastructural developments (particularly roads and telecommunications) and challenges (notably, power outages) defined Georgetown along with growing ethno-political strife ([Smith, 1962](#)). In the post-colonial period following Guyanese independence from the

British in 1966, Georgetown remained the nation's primate city (Edwards et al., 2005). For the first few decades after independence, Georgetown's urban housing market saw a capacity enlargement; however, severe housing shortages have become an emblem of the city ever since (Edwards et al., 2005; Heins, 1978). Uncontrolled urban expansion into unserviced areas became apparent in the 1990s, a decade in which the city also saw major ethnic violence grounded in colonial-era politics (Pelling, 1999). Amidst economic, ethno-political, and environmental crises, Georgetown has strikingly low governance and planning capacity (Hope, 1982; Mycoo, 2014; Pelling, 1999). However, in the past decade or so, increasing attention to improving neglected infrastructure has become apparent (Bourne, 2019a, b; DPI, 2019a).

4. Identifying the external factors mediating adaptive capacity in Georgetown

4.1. Urban form and socio-economic processes

Georgetown's urban form is bound up with social hierarchies originating from its construction under the Dutch, and perpetuated by the 'divide-and-rule' policies of the British. The city was planned during the Dutch colonial period from 1580 to 1803, growing out of the Dutch plantations system of rectangular blocks and canals (Ishmael, 1993). The plantation system of crops like sugar and rice, powered by slaves from Africa and later indentured servants from India, that ensued under the Dutch and then the British, shaped the city's physical development patterns as it grew across dissolving plantation plots. Evidence of Dutch colonization is apparent today in the architecture and infrastructure of the city (Edwards et al., 2005). Its crumbling sea wall and canals speak to this colonial period (Edwards et al., 2005) (see Figs. 4 and 5). Impacts of British colonization, beginning in 1803, are more apparent in the social, political, and economic stability of Georgetown, where 'divide and rule' tactics created tensions between a mixed-race society that persist today (Edwards et al., 2005). Guyana's politically-ethnicized social systems have led to an underdeveloped civil society, which along with significant financial issues, can be linked to colonial rule (Heins, 1978; Pelling, 1999).

The current demographics of Georgetown can be traced back to the city's colonial periods, with rectangular plantation plots having been transformed into neighborhoods (Diaz-Cayeros, 2022, ch. 26). The plantation-based model of economic and social development pursued under British colonial rule (1803–1966) created spatial inequality among colonial elites, Afro-Guyanese, and Indo-Guyanese. This fueled



Fig. 4. Part of the seawall that shelters Georgetown from the Atlantic Ocean. (Source: David Stanley/Flickr under Creative Commons License 2.0)



Fig. 5. Drainage canal along Cowan Street in Georgetown. (Source: David Stanley/Flickr under Creative Commons License 2.0)

racially-based social tensions over urban land (Rodney, 1981), which hindered the collective development of urban institutions. During this period, conflicts between Afro- and Indo-Guyanese emerged because of tensions over employment and wages on the sugar estates, the emerging residential patterns when Africans began leaving the sugar estates to seek employment on the coast, and colonial authorities' redistribution of land (Rodney, 1981). European government officials dominated the northern part of city closest to the sea wall, while the poorer Afro-Guyanese populations lived in the southern parts of the city (Heins, 1978). Later into the period, northern neighborhoods such as Kingston, and North and South Cummingsburg, were considered upper class residential areas, while Werk-en-Rust, in the middle of the city, was populated mostly by the Indo-Guyanese working class (De Barros, 2003). The 'divide-and-rule' tactics implemented by the British, which hierarchically favored Indo-Guyanese, was in response to the colony's increasing diversity (Edwards et al., 2005). These national policies shaped the internal development of Georgetown through breaching cultural plurality in favor of the European elite minority (De Barros, 2003; Pelling, 1999). Today, many of these socio-economic conditions persist (Edwards, 2005). Since the 1990s, much of the urban expansion has been in the southern and eastern parts of the city, due to increased informal settlements (Edwards, 2005). For example, in 1990, around 400 people captured land in Sophia, which had been primarily used for rice cultivation, to build houses (Mycoo, 2014, 2020). As a result, about 31% of the country now lives in marginal neighborhoods (Hidalgo Dattwyler, Paulsen Espinoza, & Paulsen Bilbao, 2022), and the growth in the number of housing units has also impacted the local government's ability to deal with drainage issues due to limited access to these systems (DPI, 2019a).

It was during the British colonial period (1803–1966) that Georgetown and the rest of Guyana were transformed from what was seen as "the savage coast" into a capitalist system (Pelling, 1999). The focus on agricultural production and resource exploitation has remained central to Guyana's economy, and most of its national income comes from exporting goods (Beckford, 1985; DoE, 2019b). Plantation-based economies inhibited economic diversification while forcing the country's economy to be highly dependent on the success of other nations' economies (Beckford, 1972; Girvan, 2006). The exploitative nature of this type of economy was made worse by the London-based company, Booker Brothers, McConnell & Company, which controlled 80% of the country's sugar plantations (Heins, 1978). Ten years after independence in 1976, Guyana's government nationalized Booker Brothers (Heins, 1978), which was in line with calls from Beckford (1972) and others to nationalize foreign-owned plantations and advance comprehensive land

reform in order to transfer productive resources for the use of the masses. Since most of the company's industries were located in Georgetown, the city saw economic growth throughout that decade (Edwards, 2005). But now that the old colonial planter class was no longer dominant and the major foreign-owned and controlled sectors of the economy had been nationalized, Rodney's (1981) argument that the Guyanese petites bourgeoisies were merely mediating foreign interests and hence were nothing more than 'white-hearted black men' was no longer valid (also see Dupuy, 1996). With economic conditions worsening in the 1980s due to government corruption, however, Guyana had to look towards structural adjustment loans from the International Monetary Fund, which worsened the country's dependence on foreign capital (Guyana Chronicle, 2016).

4.2. Municipal- and national-level institutions relating to urban planning and adaptation

Specific colonial-era institutions (laws and policies) relating to housing and town planning have had significant but not sole impacts on the extent of modern-day adaptive capacity in Georgetown. Of particular note are the Colonial Development and Welfare Act, the Town and Country Planning Act and the Housing Act. Prior to 1940, Caribbean governments experienced funding shortages for housing (MoF, 1996; UNHSP, 1996). To ease these financial constraints, the British Government passed the Colonial Development and Welfare Act,¹ which provided Caribbean governments with financial assistance for housing on the condition that legislation met British authorities' housing standards (MoF, 1996; UNHSP, 1996). The subsequent Town and Country Planning Act and the Housing Act would govern physical planning and housing in Guyana, respectively. The Central Housing and Planning Authority was established in 1948 under the Housing Act—after (in accordance with the Colonial Development and Welfare Act) British authorities recommended the establishment of a housing authority (UNHSP, 1996). Its formation marked the institutionalization of urban planning in Guyana (Government of Guyana, 2000), and it would administer both the Town and Country Planning Act and the Housing Act, and would address housing needs, and control future land uses, development standards and building codes (Mycoo, 2014) (see Pugh, 2006, ch. 2 for a discussion of how Anglophone Caribbean countries have been maintained through various planning procedures and Acts). In 1995, the Authority embarked on a major housing program to address extreme housing shortages across the nation, aimed at regularizing informal settlements (Mycoo, 2014). Under the Housing Policy, large tracts of former sugar plantations were converted into housing developments (Mycoo, 2014). Moreover, the policy aimed to amend the Town and Country Planning Act and the Housing Act to meet the city's contemporary needs, and to design and implement building codes (UNHSP, 1996). However, new developments lacked drainage infrastructure, blocked existing waterways, and prevented drainage maintenance (Mycoo, 2014; Vaughn, 2022). The haphazard development that the policy initiated negatively influenced the adaptive capacity of individuals and neighborhoods in the city.

Colonial-era institutions aside, a severe lack of institutional support for housing and weak municipal enforcement compound the undermining of Georgetown's housing standards (Edwards et al., 2005). Under the Municipal and Districts Councils Act and the Local Democratic Organs Act, municipal councils are responsible for the provision of basic services, such as sanitation, road maintenance, and drainage—all of which Georgetown has struggled to provide (Government of Guyana,

2000; Vaughn, 2022). In the city, 30 councilors are responsible for providing these services (MoC, 2019). Municipal councils are expected to obtain financial resources through tax collection (Government of Guyana, 2000). However, existing tax rates are based on out-of-date parameters that have not considered inflation, increased property values, or new property developments (Government of Guyana, 2000). The latter is especially relevant to Georgetown given the growth of informal settlements. Over time, institutions like the Municipal and Districts Councils Act have led to inadequate infrastructure provision, such as reduced drainage capacity and access to sanitary infrastructure, impacting the ability of Georgetown to cope, prepare, and adapt to climate change. These institutions have also failed to regulate urban expansion into unserved areas, increasing vulnerability to flooding (Mycoo, 2014).

Up to 2019, Guyana did not have any national-level laws governing adaptation. However, there are policies and strategies that guide adaptation action. The Green State Development Strategy, which represents Guyana's primary adaptation effort and an attempt to overcome colonial impacts that hinder adaptive capacity in Georgetown, promotes economic diversification and infrastructure improvements as key elements of building adaptive capacity (DoE, 2019b). It also marks a fundamental shift away from economic dependence on a plantation economy, and an effort to cope with experiences of environmental hazards that stem directly from Guyana's colonial history. It does this by proposing an assessment of Georgetown's drainage conditions that would prioritize clearing drains, repairing sluices, and installing emergency pumps, and emphasizing an economic transition towards the oil and gas industry, which is set to become Guyana's largest sector (DoE, 2019b). Considering these, it is likely that the abandonment of the plantation economy and future oil revenues will increase the Government's ability to build adaptive capacity in Georgetown. Since Guyana gained independence in 1966, governance in Georgetown has been colored by the struggle of its people to define and create institutions that fit the unique attributes of its multi-cultural society (DoE, 2019a). As a result and in order to increase adaptive capacity in the city, it will be important to address social issues alongside institutional constraints.

5. Further unpacking the dynamics of Georgetown's adaptive capacity

5.1. Particularly vulnerable sub-populations within the context of broader social settings

Poor economic conditions and prospects have impacted many of the living conditions in the city and inhibited the local municipality's ability to moderate related issues such as water, sanitation, and waste management (Government of Guyana, 2000). Since independence in 1966, the drainage system has remained and has largely been neglected leading to increased flooding in the city (Mycoo, 2014, 2022, ch. 25; Vaughn, 2022). In 1992, only 9% of Georgetown's population had their trash properly disposed, forcing many residents to throw their waste into drainage structures, clogging them (Pelling, 2003). Many residents have transformed the unenclosed ground floor of their homes into enclosed units to increase their income through rentals (Mycoo, 2014). These newly enclosed units are increasing the number of people in the city, making them more vulnerable to climate risks and impacts. More recently, higher income households have raised the level of their yards or have paved them, resulting in more impervious surface, increasing the city's vulnerability to flooding (Mycoo, 2014).

Historically, Georgetown's adaptation strategies have been highly dependent on an outdated infrastructure system, and the Government has had a difficult time finding appropriate adaptation techniques due to limited financing (Hickey & Weiss, 2012). Many of the current sea defenses and important infrastructure along the coast date back to the Dutch colonial period (Hickey & Weiss, 2012; World Bank, 2013), though these structures have historically been used across the Caribbean

¹ The Colonial Development and Welfare Act also allowed for the expansion of rice production in nearby areas (e.g. Plaisance), which required the development and financing of "new systems of drainage, irrigation, and coastal defense [...] with minimal financial input from the villages themselves" (Mullenite, 2019, p. 506).

to protect coastal urban settlements from sea-level rise (Mycoo, 2022, ch. 25). While improvements to coastal protection infrastructure are a key element of the country's Green State Development Strategy (DoE, 2019b), flood walls and other hard engineering structures are costly. For example, the estimated costs for sea dykes in the Latin America and Caribbean region is US\$7.1 billion per year (Mycoo & Donovan, 2017). This has led the Guyanese Government to look to regional and international funders to support projects geared towards increasing adaptive capacity. Both the Caribbean Development Bank (CDB) and the World Bank, for example, have funded sea defense and flood management projects in Georgetown and other coastal areas of Guyana. However, these projects have been implemented fairly slowly. For example, the CDB funded a US\$30.9 million Sea and River Defense Resilience project in 2016, but the first section of the project, which is not located in Georgetown, had not been completed up to 2019 (DPI, 2019b).

The issues with internationally-financed adaptation projects, including the downsides of relying on foreign capital and knowledge, have encouraged Georgetown to develop and implement more community-based initiatives to limit the impacts of flooding due to drainage issues (Mycoo, 2014). In many instances, drains have been neglected for decades and, in them, massive piles of garbage and silt have accumulated (DPI, 2018b). Many Georgetown neighborhoods are maintaining and cleaning their own drains because regular maintenance of the drains within the city is limited (Mycoo, 2014). After city elections in 2015, the new local government prioritized drain cleaning (DPI, 2019c). Officials created alternative drainage works, and employed local community members (DPI, 2018a). The drainage project in North Ruimveldt, for example, was part of a larger emergency drainage project led by the Department of Public Infrastructure, which worked with the Neighborhood Democratic Councils, which act as the administration for designated areas, to improve the recovery and resilience of flood prone neighborhoods (DPI, 2018a). Neighborhoods with drainage issues such as West Ruimveldt, Albouyston, Sophia, Subryanville, and others in southern Georgetown have also benefited from community-based drainage cleaning projects (DPI, 2017). These efforts have been deemed successful by the Department of Public Infrastructure because there has not been a major flooding event in Georgetown since 2015 (DPI, 2019a).

5.2. Long-term resilience and transformation

Georgetown's adaptive capacity is the result of long-term processes, and deep transformations relating to knowledge- and meaning-making, and financing and strengthening local institutions are required. Acutely weak financing remains a key hindrance to Georgetown's success in its climate change adaptation efforts (Edwards, 2005; Mycoo, 2014; Pelling, 1999; Robinson, 2020). Transforming the city will require major changes in current financing paradigms, which are hindered by factors linked to colonial and postcolonial economic structures (Pelling, 1999; Trotz, 2010). Better measures of international financing are necessary for building long-term resilience (Gomes, 2014; Hickey & Weiss, 2012); so too for ease of access to international adaptation financing (Kalaidjian & Robinson, 2022; Robinson, 2018).

Though there are a number of international financing projects targeting both infrastructural and programmatic climate change adaptation measures in Georgetown, more comprehensive measures are needed (Mycoo & Donovan, 2017). One step might be adding Georgetown to the Inter-American Development Bank's Emerging and Sustainable Cities program, which is "a non-reimbursable technical assistance program providing direct support to national and subnational governments in the development and execution of city action plans" (IDB, 2019, online; Mycoo & Donovan, 2017). This could include committing more funds explicitly for strengthening the city's flood-defense infrastructure, including from the country's emerging oil and gas industry, which is projected to double or triple in size (Bazilian & Mahdavi, 2019). This projected growth, however, is at odds with

global climate mitigation efforts. Equally, the potential risks of such expansion are increasingly being documented in the literature (e.g. see Syne, 2021), and scholars have expressed concerns over the impacts to Indigenous peoples and landscapes (e.g. see Cordis, 2021). What is certain, however, is that strong institutions and a diversified economy are required to avert dangerous economic and political possibilities, including political destabilization and economic crash (Bazilian & Mahdavi, 2019).

Climate reparations have been proposed to enable 'creditor countries' such as Guyana and other small island developing states to strengthen adaptive capacity by funding disaster risk reduction and related activities—similar arguments for climate risk and reparation ecology have been made for nearby countries such as Brazil and Colombia (see Lampis et al., 2022). The Caribbean Community Reparations Commission has started mobilizing for reparations, centered around repairing the wrongdoings of slavery (Kaieteur News, 2018; Ragobee, 2018). The Commission's ten-point plan focuses on "reparations as a development strategy", the goal of which is "to use reparations payments to deal collectively with pressing economic and educational problems facing the citizens in the Caribbean that trace their origins to the underdevelopment imposed by slavery, slave trading, native genocide, and economic exploitation by the European nations" (Ten Point Program for Reparations, 2014, p. 483). In the case of Guyana, the Dutch and British Governments are called on to repair the country's 'stunted' development and to fill in national debt, which would represent a portion of the broad and nuanced post-colonial demands for reparations (CRC CARICOM Reparations Commission, n.d.). Interestingly, in December 2022, the Dutch Government apologized for its role in the slave trade (Government of the Netherlands, 2022). The apology, which was a recommendation of a government-appointed advisory board, has been critiqued for being insufficient—it was mostly geared towards Suriname, the former colonies that make up the Kingdom (Aruba, Curacao and Sint Maarten), and the special Dutch municipalities (Bonaire, Saba, and Sint Eustatius) in the region. However, it did not explicitly address Guyana or the other countries in the region in which the Dutch had shorter and/or interrupted periods of colonization such as the Virgin Islands (NPR, 2022). Additionally, the apology was not accompanied by any restitution or plan for financial compensation (NPR, 2022). Though pressures are mounting for this injustice to be corrected, it is likely that the experiences of the Dutch overseas territories and former colonies with repair will be different (see discussions in Misiedjan, 2022).

Though financing is a crucial element in transforming Georgetown's adaptive capacity, bottom-up social changes are equally important. In British colonial Georgetown (from the late 1800s onward), collectivism between Afro- and Indo-Guyanese was the backbone of anti-colonial movements (Hinds, 2011; Smith, 1962). The city's public spaces, including the seawall, were vital to economic self-determination and the gathering of both dominant ethnic groups in unity against the colonial administration (De Barros, 2003; Vaughn, 2022). British divide-and-rule tactics strategically subdued this collectivism and fostered violent ethno-political divides (Pelling, 1999; Trotz, 2010). Importantly, British authority did not go unchallenged in the city – Georgetown arose as a critical arena of political contestation and organization (De Barros, 2003; Hinds, 2011; Smith, 1962). Notable instances included the 1823 slave rebellion (Smith, 1962), ethnically-unified labor riots in 1905 and 1924 (De Barros, 2003; Hinds, 2011), and the formation of numerous non-British political and ethnic organizations (De Barros, 2003; Sanders, 1987). As divisive social governance grew, ethnicized pre-national politics erupted violent tensions in the city, most glaringly manifested in the riots that killed around 700 people between 1962 and 1964 (De Barros, 2003).

Following the devastating January 2005 floods, grassroots women's activism in Georgetown defied postcolonial social structures by mobilizing a novel collective platform (Trotz, 2010). Organizations such as Red Thread and Guyanese Women Across Race focused on building

solidarity with women across racial divides in order to provide ground-up relief efforts and later to engage in collective knowledge-making in criticizing the Government's response and the dominant narratives of flooding that were being used (Trotz, 2010). Although the Government marginally modified their actions after direct interrogation by organizing groups, long-term networks as well as a new collective platform—based on the “essential component” that flooding has played in the history of livelihoods in Georgetown—shifted the grounds for communities in the city (Trotz, 2010, p. 116).

This kind of transformational collectivism is needed in tandem with municipal- and national-level institutional strengthening, which should be mutually supportive. By producing more coherent claims, a collective platform will allow the Central Housing and Planning Authority, for example, to develop and better enforce equitable building codes (Mycoo, 2014). Collectivism will also support the efficacy of vital monitoring programs for adaptation initiatives (Mycoo, 2014; Mycoo & Donovan, 2017). Coherent community platforms and partnerships with urban institutions and organizations are likely to allow for better streamlining of funds towards community-led initiatives, hopefully sourced through transformed financing paradigms (Pelling, 1998). The success of these approaches relies on better collaboration between public agencies and ministries (DoE, 2019a; DPI, 2018a), alongside the mainstreaming of adaptation initiatives into long-term development programming (see Robinson, 2019; Robinson et al., 2022). Finally, collectivism cultivates resilience among civil society and residents, which will be important for increasing adaptive capacity in the case of institutional failure.

6. Conclusion

Building urban adaptive capacity to climate change requires taking a holistic look at all the factors that have shaped a city's existence, including historical ones, alongside its various political, socio-economic, and environmental dynamics (Adamson et al., 2018). Though not enough research exists on how history—particularly colonial history—has shaped disproportionate vulnerability to climate impacts in the Global South in the first place, a historical approach can aid in understanding the evolution of formal institutions and their influence on adaptation practices today, uncovering societal and cultural relations to better contextualize adaptation, and recognizing the history of concepts that inform environmental processes (Adamson et al., 2018).

This article provides a case study illustration of an earlier conclusion drawn by Mycoo (2017, p. 75), that “economic, environmental and social vulnerabilities become exaggerated [in the Caribbean region] because of [...] governance, political institutions and land settlement history”. It argues that Georgetown's history, fundamentally grounded in its colonial origins, informs the essence of its adaptive capacity to climate change, and shows how the physical aspects of the city's vulnerability were influenced by the Dutch colonial period, and socially, politically, and economically by the British colonial period. It makes six arguments. First, that colonial-era economic activity and territorial control led to the establishment of Georgetown, a strategic port built on a coastal flood plain that lies up to 3.5 m below sea level, creating extreme vulnerability to flooding. Second, that Georgetown's geographic characteristics and its vulnerability to climate risks and impacts are fundamentally a product of the complex colonial history of the Guyanese coast. Thus, climate change adaptation actions are inseparable from the city's colonial history. Third, that its urban form is bound up with social hierarchies originating from the city's construction under the Dutch, and perpetuated by the ‘divide-and-rule’ tactics of the British. Fourth, that multiple colonial-era laws and policies, including the Colonial Development and Welfare Act, the Town and Country Planning Act, and the Housing Act, continue to constrain the city's modern development. However, these institutions are not the only factors. Fifth, poor economic conditions and prospects have impacted many of the living conditions in the city and inhibited the local municipality's

ability to address related issues such as water, sanitation, and waste management. Sixth, given that Georgetown's adaptive capacity is the result of long-term processes, deep transformations relating to knowledge- and meaning-making, and to financing and strengthening local institutions are required.

With compounding urban challenges and the socio-economic fallout from the COVID-19 pandemic (Mycoo, 2022, ch. 25), further studies of adaptive capacity not only in Georgetown but also in the wider Caribbean region should hold importance to how history shapes the present and future. While this article drew on a variety of data (e.g. previously-published accounts of urban life in Georgetown, official government documents, and databases) to support its six arguments, interview-based research done on the ground in Georgetown could be promising in reaffirming local priorities and gaining a more profound understanding of how the city's colonial history has shaped its adaptive capacity. More importantly, such an approach could foster collaborative brainstorming of how long-term resilience and transformational measures can be practically and efficiently pursued—both from an institutional and community point of view. Primary data collection of this nature would be fundamentally aligned with the politics of self-determination in which this article is grounded.

Author statement

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Declaration of competing interest

None

Acknowledgements

The authors, who report no conflict of interest, wish to thank Manny Gimond and Kara Kugelmeyer for research assistance, and the anonymous reviewers for their generous and instructive feedback. They also thank Colby College and Perry World House for covering the article processing charge.

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