

Institutional Analysis of Coastal Vulnerability to Climate Change in Eden District Municipality, Western Cape Province, South Africa

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1 Part I: System Structure - Collective action

The local municipalities of Mossel Bay, George, Kynsa, and Bitou are located in the Garden Route along the south coast of South Africa in the Eden District municipality, Western Cape province. The study area encompasses human developments along the coastline that stretch from the mouth of the Gouritz River in the west to the village of Natures Valley in the east. This case study is based predominantly on fieldwork conducted in 2014/2015 and catalogues (1) the discourse and practices prevalent in the local development industry related to their knowledge and perceptions of the buffering capacity of coastal foredunes to mitigate climate change vulnerabilities in coastal communities; and (2) the individual perceptions of property owners and community members that may give rise to maladaptive conservation behaviors in the Garden Route. Research findings reveal that the Eden District action situation is dominated by a poorly structured institutional framework which facilitates individual mitigation action by (affluent) property owners which, through vulnerability transfer, effectively undermines coastal ecosystem functioning and the collective ability of the communities to ameliorate the adverse effects of global climate change. The natural infrastructure is the terrestrial (including coastal and riparian) landscapes and river networks (shared).

This report is one of three coastal social-ecological systems (SESs) examined in collaboration with researchers in Britain, France, and South Africa as part of the Multi-Scale Adaptations to Climate Change and Social-Ecological Sustainability in Coastal Areas (MAGIC) research project funded by a Belmont grant. Information on the two other case studies, as well as the synthesis report of all three SESs, are located in the database as follows: Cornwall, Britain - case no. 297, Languedoc, France - case no. 298, and the synthesis analysis of all three sites - case no. 310.

1.1 The Commons Dilemma

- **The potential over-appropriation/poor coordination of appropriation problem:** The root of the potential over-appropriation problem lies in the 1950s through 1970s drive by the South African government to offset economic losses due to a decrease in tourism by increasing revenues through public land sales to private landowners. This led to the extensive development of human settlements in coastal foredune areas that are at high risk of sea surges and erosion, and is resulting in building

collapse or submersion of properties in sand. Although the 1998 National Environmental Management Act protected some coastal dune areas from new development, it did not stop building on private estates. Homeowners affected by disaster rebuild under historical property rights claims and without insurance coverage. The effects of over-appropriation of coastal land is often diffusely distributed to other landowners and/or the community at large.

- **The potential under-provisioning of public infrastructure:** The lack of coordination of coastal zoning, historical building conservation, and environmental protection laws and regulations is leading to the improper application of rules at the local level. Failure to fill local government positions in a timely manner due to budget shortfalls is contributing to a lack of oversight and enforcement of existing laws. The implementation of municipal Integrated Development Plans (IDPs), which are valid for a 5-year time period but must be reviewed annually, has created a perpetual IDP revision process with no serious implementation of those plans. This under-provisioning of the public infrastructure is facilitating private, unregulated mitigation action by individual (affluent) homeowners that is exacerbating coastal foredune degradation and leading to a concomitant increase in community vulnerability to storm surges, saltwater intrusion into sub-surface freshwater aquifers, and rising sea levels.

1.2 Biophysical Context (IAD)

- **Natural infrastructure:** The lack of coordination of coastal zoning, historical building conservation, and environmental protection laws and regulations is leading to the improper application of rules at the local level. Failure to fill local government positions in a timely manner due to budget shortfalls is contributing to a lack of oversight and enforcement of existing laws. The implementation of municipal Integrated Development Plans (IDPs), which are valid for a 5-year time period but must be reviewed annually, has created a perpetual IDP revision process with no serious implementation of those plans. This under-provisioning of the public infrastructure is facilitating private, unregulated mitigation action by individual (affluent) homeowners that is exacerbating coastal foredune degradation and leading to a concomitant increase in community vulnerability to storm surges, saltwater intrusion into sub-surface freshwater aquifers, and rising sea levels.

In the case of the **Mossel Bay and George local municipalities:** the coastal area is heavily developed degrading existing dune systems to accommodate beachfront property development. Estuaries at the mouths of three rivers are surrounded by development which is built directly on and covering the dune system. In the **Knysna local municipality**, dunes have been forcibly stabilized via vegetation. The resulting bypassing of the headland system has drastically increased the erosion risk of properties built in the coastal zone. In **Bitou local municipality** coastal development is not quite as pronounced as in Mossel Bay and Knysna, however, commercial dune development is occurring on Beacon Island which has decimated the coastal dune, and two communities along the western boundary of the municipality are at risk of flooding due to mismanagement of storm water and sea surges.

- **Hard human-made infrastructure:** The Garden Route remained fairly isolated from Cape Town in the west and the inland areas until the 1940s when its rising

attraction as a holiday destination justified greater **public hard infrastructure** investment to improve and build roads, bridges, the railway system, and a port (Mossel Bay). **Mossel Bay, George, and Knysna local municipalities:** Property owners are implementing hard private infrastructure (e.g. retaining walls and sand bags) to protect their homes.

Public hard human-made infrastructure is constrained by devolution of governance and lack of funding to local communities which limits local climate change mitigation/adaptation strategies, including a more robust restructuring of public infrastructure networks. Furthermore, local intervention has often served to magnify or shift the problem from one sector to the next. For example, a formal agreement between South African National Parks (SANParks) and a number of residents living along the banks of the Touw River, situated within George Municipality, stipulates that homeowners must be protected from flooding. This has led to a management protocol that requires the regular artificial breaching of the river mouth by bulldozer when water levels exceed a critical height. Such interventions are known to severely disrupt the ecology of the Touw River and its estuary. The building of a desalination plant in Mossel Bay has increased the available freshwater supply, but its pipes also disrupt the sediment movement of sand impacting the formation and integrity of the coastal dunes, thereby heightening community vulnerability.

1.3 Attributes of the Community (IAD)

- **Social Infrastructure** Development professionals express a lack of control over development decision-making procedures and argue that clients (homeowners), local authorities, and policymakers have little knowledge of coastal development issues. Since development professionals are contractually obligated to their clients, this lack of knowledge continues to foster inappropriate new development and rebuilding of older structures, including encroachment in the 5-meter state land coastal zone by private property owners (building of private retention walls, gardens, etc.). Furthermore, development professionals point to complex and time-consuming application processes (zoning, building, retaining walls, etc.) that are fostering the circumvention of existing coastal development rules and illegal building of homes in risk-prone areas. The fact that rules are not being enforced and illegally-built structures are only subject to a fine, not demolition, has led to the regularization of illegal coastal development (inferred).

Interviews conducted in a second study indicate social fractures between long-term residents, who have a sense of place and sensitivity for ecology, ecosystem functioning and community, and newcomers, who are predominantly affluent seasonal residents and are perceived by locals as lacking a sense of place. This perception is fostered by seasonal residents insensitivity to local conditions, such as when they build large cement structures in areas with picturesque views that are highly vulnerable to extreme weather events. Furthermore, many seasonal residents fear of crime and disturbance by impoverished locals expresses itself in a fortification of their residences with high fences and/or walls, security systems, and private guards all of which are designed to (illegally) restrict access to public beaches for the benefit of the affluent. A focus on preservation as a dominating conservation paradigm of the white minority also appears to have detrimental effects on the ability of subsistence fishermen and other

local populations to engage in sustainable and subsistence use of formerly public areas, such as fishing and bait-collection areas along estuaries and parts of the open sea.

- **Human Infrastructure** Study findings suggest that development professionals appear to have sufficient knowledge of dune system functioning and appropriate storm water and development design in coastal areas, which indicates a good level of general human infrastructure (inferred). Development professionals argue that the level of general human infrastructure of policymakers and individual homeowners is not adequate. There is no information in the text with regard to collective action forums to facilitate the necessary knowledge generation and sharing that development professionals argue is missing.

1.4 Rules in Use (IAD)

- **Position Rules:** At this time, no critical position rules have been identified.
- **Boundary Rules:** At this time, no critical boundary rules have been identified.
- **Choice Rules:**
 - Policymakers must enforce existing coastal zoning, environmental, and conservation legislation.
 - Policymakers may fine homeowners for illegal development in coastal sand dunes.
 - Policymakers may require homeowners to remove illegal structures from coastal sand dune areas.
 - Development professionals must abide by existing coastal zoning, environmental, and conservation legislation.
 - Development professionals must also abide by the terms of the contractual obligations to their clients.
 - Coastal development must comply with the National Conservation Act of 1989, the National Environmental Management Act of 1998 (environmental protection), and historical property rights legislation.
- **Aggregation Rules:**
 - Individual homeowners mitigation action is contributing to a vulnerability transfer to other property owners and to the community at large (e.g., sandbags and retention walls displace storm surge and foredune degradation to other private and public properties, and/or containment of sand dunes prevents sand accretion in other areas of the dune fields.
 - Electoral process at the District level determines the qualifications of electoral representatives in office which, in turn, impacts the appointment of qualified planning office and environmental coordinators.
- **Scope rules:**
 - Continued building of private estates in Mossel Bay municipality in violation of the National Conservation Act and/or the National Environmental Management Act may be increasing vulnerability to climate change in these coastal communities.

- The exploitation of legal loopholes by development professionals and/or landowners in order to continue building near and on coastal foredunes is creating asymmetrical vulnerabilities to extreme climatic events.
- **Information Rules:** There are existing building and zoning application processes that outline development in coastal areas.
- **Payoff Rules:**
 - Homeowners who illegally build structures in coastal zones generally only pay a fine and the structure is not demolished, i.e., the net benefit of rule breaking facilitates the regularization of illegal home construction among development professionals and their clients.
 - Wealthy homeowners affected by disaster rebuild under historical property rights claims even though they can no longer insure their property, i.e. the benefit of living in the coastal area outweighs the financial risk of owning an uninsured property.

1.5 Summary

Development professionals in the Eden District municipality appear to be knowledgeable about dune system functioning and appropriate storm water and coastal development design, but complain about a lack of control over development decision-making processes. Whether such control would lead to better development given the contractual obligations to their clients which seem to conflict with existing rules is a question unaddressed in the thesis. The effectiveness of the existing institutional framework governing coastal development in the four local municipalities is undermined by an overall lack of understanding of the connections between development, conservation, and historical building preservation rules, which is fostering the selective application and enforcement of one particular rule without consideration of rule violation clashes with other laws and impacts on the local SES. For example, a historical law that granted harbor development to subsistence fishermen was utilized to approve the development of an ecologically damaging yacht port in clear violation of the National Environmental Management Act (NEMA). Moreover, while NEMA has protected some coastal dune areas from development, it has not stopped private estate developments. Furthermore, the apparent lack of knowledge and enforcement of the 5-meter state land coastal zone has led to the development and degradation of public coastal dunes through the encroachment of private property owners into the zone (building of retention walls, gardens, etc.). Development rule circumvention, and regularization of illegal development through fine payment is further weakening the Eden District municipality SES.

Aside from a dual socio-economic structure that favors the interests of the affluent over poorer segments of the population and views tourism as the main economic driver (inferred), budgeting conflicts and lack of funding is hampering the filling of crucial local government positions, the implementation of existing rules and regulations, the development of planned retreat and coastal setback lines, and is creating a lack of public services (housing, jobs, refuse removal, potable water), the latter of which is leading to informal settlements in sand dune areas.

Finally, recent research is indicating community fracturing between local and seasonal residents aligning along economic and possibly racial fault lines which may indicate a resur-

gence of former Apartheid policies (inferred). The wealthy appear to be using their financial assets to preclude access to public areas of the coast for their private benefit while at the same time their fortress developments increase vulnerability to extreme weather events within communities.

2 Part II. Dynamic Analysis - Robustness

2.1 Update on the Commons Dilemma

This report represents the original case study analysis. Accordingly, there is no update on the commons dilemma in the Eden District municipality coastal region. As of 2015, research into this study site is ongoing.

2.2 Exogenous Drivers (social, political, economic), Capacities, and Vulnerabilities

Exogenous drivers:

...to and of the Resource (link 7 to R):

Impacts of global climate change include increases in average temperatures (mean, max., and min.); decreases in annual precipitation and concomitant increased risk of drought; increases in extreme weather events (sea surges and flooding) and severity of both (including cyclones and storm-related flooding), as well as increased frequency of "cut-off low" events (a closed low in the upper troposphere has become completely detached from the basic westerly creating cold fronts and stormy weather which can linger over a region for several days).

...to and of the Public Infrastructure (link 7 to PI):

Hard/physical infrastructure: Damage to human-built public infrastructure, including roads, railways, ports, harbors, airports, public and private buildings, energy and water delivery systems due to severe weather events. Soft infrastructure (rules, regulations): International laws influence South African coastal development and environmental protection laws.

...to and of the Public Infrastructure Providers (link 8 to PIP):

International best practice - influence of UN and Southern African Development Community (SADAC) recommendations. Budgeting conflicts and lack of funding.

...to and of the Resource Users (link 8 to RU):

Racial/ethnic inequality - legacy of the Apartheid system. Urbanization (movement of rural populations to peri-urban informal settlements). Dual economies and disparity in socio-economic equity between affluent white minorities and poor urban populations (black and colored).

2.3 Robustness Summary

The robustness to climate-change-induced severe weather events of the Mossel Bay, George, Kynsa, and Bitou municipalities SESs is challenged by individual decision-making that undermines the ability of public hard and soft infrastructure to adapt to and mitigate the effects of extreme weather events related to global climate change. Furthermore, the institutional framework governing coastal development in these municipalities is poorly coordinated, underfunded, and likely unable to be responsive to rapidly changing environmental

conditions. Despite having a good understanding of coastal dynamics, development professionals claim their hands are tied due to contractual obligations to their (less-knowledgeable) clients and convoluted and cumbersome governance structures.

3 Part III. Case Contributors

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