Institutional Analysis of Coastal Vulnerability to Climate Change in Cornwall, United Kingdom

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1 Part I: System Structure - Collective action

Cornwall is located in southwest England on the Cornish peninsula. It stretches between the cities of Bude and Plymouth in the north and Penzance and Falmouth in the south. The study area encompasses numerous communities of various sizes in the coastal and inland areas, including within the Tamar catchment along the rivers Camel, Fowey, Looe, as well as coastal lagoons and basins, and a mix of freshwater and brackish wetlands. The Cornwall study site is catalogued by an action arena in which: (1) governance structures wrestle with conflicting biodiversity and anthropogenic goals; while (2) government austerity measures and lack of aggregation rules result in temporal policy tradeoffs and impede attempts at creating polycentric governance structures (inferred); and (3) dual socio-economic structures and global climate change undermine social and biophysical cohesion. The resource system (natural infrastructure) consists of the terrestrial (including coastal and riparian) landscapes, associated watersheds and topography. The key resource relevant to the commons dilemma faced by Cornish communities are the affordances provided by urban, rural, and agricultural spaces, freshwater resources, and the interconnected processes and self-generating mechanisms of biodiversity.

This report is one of three coastal social-ecological systems (SES) examined in collaboration with researchers in Britain, France, and South Africa as part of the Multi-Scale Adaptations to Climate Change 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: Languedoc-Roussillon, France - case no. 298, Eden District, South Africa - case no. 299, 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 Cornwall case study is characterized by an institutional framework (soft infrastructure) that aims to alleviate poverty, improve economic prospects, and comply with European Union (EU) biodiversity conservation directives. However, statutory rules and non-statutory guidelines created to address these issues often focus on divergent and short-term goals and are applied inconsistently and in a conflicting manner. This has resulted in:

- *Overappropriation of space:* New development/rebuilding in areas of vulnerability to severe weather events due to sustainable economic development goals and low income

housing needs (e.g., Planning Policy Statement 25 (PPS25) sequential risk-based approach allows development in flood risk areas provided there are no alternatives and development is deemed safe).

- *Poor (inconsistent) coordination of hard public infrastructure adaptation efforts:* Temporal policy trade-offs due to non-statutory status of Shoreline Management Plan which facilitates policy emphasis on short-term, less costly hold-the-line policy implementations, such as improving the existing dike in Penzance, instead of pursuing long-term solutions which would relocate the A-30 highway and railway inland.

- *Poor (inconsistent) coordination of soft infrastructure:* European biodiversity directives and related domestic legislation are conflicting with no intervention coastal policies, e.g., freshwater grazing marshes created by hard public infrastructure (coastal defense systems) must be maintained or alternative bird habitat found before dikes can be removed to restore historic salt marshes.

The potential under-provisioning of public infrastructure:

- Government austerity measures have aimed the greatest cuts at the local government level. The resulting funding shortfalls have decreased local public services and slowed or halted repair and maintenance of hard public infrastructure; e.g., reduction in public transportation and healthcare services in smaller villages, such as Bude and Boscastle, fostering geographic isolation. Furthermore, decreased fiscal resources for disaster response is shifting the burden of responsibility for disaster recovery from the state to individuals, leading to social disparity and vulnerability transfer to the poor.

- No statutory recourse to government compensation for homes lost to storms/coastal erosion or funding for relocation of those living in areas vulnerable to climate change.

- No county income tax (only council tax) which is limiting Cornwall Council from generating enough income to close the funding gap created by central government cuts.

- "Biscuits or barriers" policy—coastal defenses maintained in areas of high economic value while poorer communities are more likely to be subject to no intervention policies.

- Government reorganization under Decentralization and Localism Act 2011 combined with fiscal reductions has halved positions in coastal management agencies eroding capacity to carry out coastal risk management functions.

- Frequency of flood occurrences coupled with an exemption to water quality regulation standards during such emergencies is incentivizing circumvention of water quality standards in general.

1.2 Biophysical Context (IAD)

- **Natural infrastructure:** Cornwall lies on a peninsula that is bounded on the north by the Atlantic Ocean and on the south by the English Channel. No inland area is further than 20 miles from the sea. Cornwall's coastline extends over 400 miles; 160 of those miles are designated as areas of special scenic and environmental value. The

northern part of the peninsula is generally more rugged and characterized by cliffs, steep valleys and dunes. In contrast, the southern coast is dominated by sheltered beaches and tree-lined estuaries. Eleven of the twelve Areas of Outstanding Natural Beauty in Cornwall are on the coast and include the estuaries of the Fal, Helford, Fowey, and Camel rivers. Due to its biophysical characteristics, the region is particularly susceptible to climate change, including sea level rise, severe storm events, and coastal erosion.

- **Hard human-made infrastructure:** *Public hard human-made infrastructure* includes the public utilities infrastructure, public transportation, roads, and coastal defense systems (sea walls, groynes, rock armor). The maintenance, relocation, or development of these infrastructures is constrained by a devolution of governance and lack of funding to the Cornwall Council and local communities hamstringing local climate change mitigation/adaptation strategies.

  Private hard human-made infrastructure is subject to asymmetrical vulnerabilities to severe climate change events. Newcomers, who often are second home owners, have greater access to financial resources and may be less invested in affecting change or engaging in adaptation strategies at the community level, but more likely to engage in private defenses that transfer vulnerability to others.

1.3 Attributes of the Community (IAD)

- **Social Infrastructure** Many Cornwall communities report a strong sense of community cohesion/resilience due to place attachment and, in some instances, the social memory of a shared flood event (e.g., Boscastle). Even communities without a shared experience of an adverse environmental event, often perceive themselves to be unified and self-reliant. However, feelings of empowerment and agency to affect change are being challenged by community fragmentation between "outsiders" and "locals." This may be due to (1) Cornwall having the largest number of second home addresses used for holidays in the U.K.; and (2) the demand for second home properties driving up housing prices and effectively pricing many locals out of living in their communities. These factors may be contributing to a dual economic structure and concomitant financial and social asymmetries.

  Many communities also express a lack of trust and absence of a strong relationship with representatives of non-local institutions. Furthermore, they feel disempowered by top-down government actions which ignore community input and concerns, including managed retreat and no intervention policies that disregard locals' sense of place and belonging and force them to battle the authorities if they chose to stay and defend their property from the sea.

- **Human Infrastructure** The general existing human infrastructure with regard to climate change and its impacts on future severe storm events is unknown. However, the increased frequency and regularity of severe storm events has likely raised the general awareness of many Cornish to climate change and its local outcomes. At the same time, traditional land/flood management knowledge continues to exist in some villages (e.g., Boscastle) which, combined with the shared memory of a past flood event, may indicate a good community understanding with regard to mitigation strategies for future adverse storm events. The Cornwall Community Resilience

Network—a partnership between Cornwall Council, the Cornwall Community Flood Forum (an NGO), and individual communities—sponsors community disaster preparedness events to communicate and disseminate information on climate change and its potential effects on communities, it is unknown whether these events represent effective collective action forums. Effort allocation decisions may be constrained by financial inability and lack of government support that would allow individuals to sell at-risk properties and relocate inland.

1.4 Rules in Use (IAD)

- **Position Rules:** *Constitutional level:* Government officials at the Department of Environment, Food, and Rural Affairs (Defra); *Collective choice level:* Environment Agency (EA) staff; Cornwall Council (Local Authority) staff; South West Regional Flood and Coastal Committee members, Area Flood and Coastal Committee members, Cornwall and Isles of Scilly Coastal Advisory Group (CISCAG) members. *Operational choice level:* Inspectors, engineers, builders.

- **Boundary Rules:** The authority of government, operating authorities and executive advisory bodies with regard to coastal management issues overlap in many areas, e.g. EA, Cornwall Council, and Coastal Committee monitor, maintain, construct and improve sea and tidal defenses and other coast protection work.

- **Choice Rules:**

  - Policymakers may provide funding for local climate change mitigation strategies.
  - Local population may co-fund legislative flood defenses with local/parish council.
  - PPS25 must restrict inappropriate development in areas of flood risk but spatial planning under PPS25 is linked to SMP and may allow development in flood risk areas when no lower risk sites are available and development is necessary and safe.
  - Policymakers may choose to ignore long-term planning strategies of non-statutory Shoreline Management Plan (SMP) and engage in short-term climate change mitigation strategies, e.g., rebuild storm defenses instead of relocating public roads inland.
  - Current bird habitat must be preserved or alternative habitat must be provided.

- **Aggregation Rules:** EA is tasked with a strategic overview role over all flood (coastal and inland) and coastal erosion risk management, but there is no evidence of aggregation rules that would coordinate soft infrastructure implementation in instances where laws conflict (biodiversity protection v. development; long-term planning policies under SMP v. development under PPS25).

- **Scope rules:**

  - Defra Minister influences/constrains annual coastal management projects through confirmation process that generates a "sanctioned list" of approved projects.
  - Government austerity measures are inhibiting local climate change mitigation strategies.

- **Information Rules:**
  - Traditional land/flood management knowledge continues to exist in some communities (e.g., Boscastle).
  - Collective action forums exist for knowledge generation and exchange between community members, policymakers and key regional institutions and NGOs.
- **Payoff Rules:**
  - Policymakers' decision-making influenced by "short-term political cycle" concerns instead of long-term climate change adaptation goals.
  - Focus on tourism as the primary vehicle for regional economic growth contributing to socio-economic inequity and impairing climate change mitigation/adaptation strategies (inferred).

1.5 Summary

In 2008, the British government restructured the institutional framework organizing coastal development and flood/coastal erosion management by transferring strategic oversight for all activities related to the coast to the Environment Agency. At the same time, existing coastal groups were consolidated into fewer and larger groups to form more strategic centers of operation at the local and regional level. It appears the intention was to streamline costs and create more efficient and adaptable (polycentric) governance processes to develop locally sensitive policies, while local units remained accountable to general national goals via EA oversight.

Contrary to policymakers' intent, the Cornwall SES is characterized by several weaknesses in the interactions between the key elements in its system. An increased demand for urban/agricultural space due to population increase is conflicting with the biophysical necessity of no intervention/managed retreat actions in many coastal areas (link 1). There is little evidence of robust cross-scale interactions between citizens and government officials (Link 2) which is leading to feelings of disempowerment and inability of citizens to adapt to changing biophysical conditions (Link 6). Lack of aggregation rules to coordinate and guide a complex, multi-level institutional framework characterized by overlapping and often conflicting laws is reducing functional (system performance) and response (resilience) diversity within the SES reducing its polycentric potential (Links 3 and 5). Furthermore, missing aggregation rules, funding cuts, and the non-statutory status of the Shoreline Management Plan are facilitating temporal trade-offs in which policymakers implement short-term hard infrastructure fixes, instead of long-term mitigation strategies (e.g. strengthening existing dikes, instead of relocating public highway inland) (links 3 and 5). If these conditions persist, global climate dynamics and socio-economic changes are likely to further destabilize the feedback loops in this system making it less robust and increasing vulnerability of those less likely to cope; the poor and the marginalized.

2 Part II. Dynamic Analysis - Robustness

2.1 Update on the Commons Dilemma

This report is based on a preliminary study analysis, since research at the Cornwall study site is ongoing. Accordingly, there is no update on the commons dilemma.

3 Part III. Case Contributors

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