

## Sentinel Territories: A New Concept for Looking at Environmental Change

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*In this essay, the authors develop the concept of “sentinel territories,” or environments where humans can perceive early warning signs of environmental change. Sentinel territories can illuminate common features of spaces where environmental issues emerge and be used as a tool to advance environmental policies.*

This paper attempts to broaden the notion of “sentinel devices,” borrowed from science and technology studies (STS) scholars, to develop the concept of “sentinel territories.” Sentinel territories are spaces where early-warning signals of environmental threats can be observed. When disasters cannot be predicted, sentinels can signal them at the moment they arise and open the way to mitigating lines of action. Sentinel territories can be interpreted as forms of military mobilizations or as forms of democratic participation, depending on the framing of the alert.

Keck and Lakoff (2013), two anthropologists who study medical and epidemiological research, have remarked that “many of the threats that we now find most alarming—climate change, environmental radiation, emerging diseases, toxic chemicals—are not immediately perceptible to human senses” (Keck and Lakoff 2013, p. 2). They developed the concept of “sentinel devices” in order to describe early warning systems in which living beings are equipped to perceive threats in advance. In a special issue of *Limn*, different types of sentinel devices have been studied, such as collapsing bee swarms, polar bears with GPS or unvaccinated birds in poultry farms or natural reserves.<sup>1</sup>

The political sociology of public problems (Spector and Kitsuse 1973; Neveu 2016) leads us to ask: how does a signal perceived by a sentinel device transform into a permanent “sentinel post” and then lead to the mobilization of social groups (Keck 2020)? In environmental conflicts, the main issue for groups often consists in making the trouble “perceptible” (Tonnelat 2012), in order to mobilize local actors and influence institutions and decision makers. Our hypothesis is that for an environmental struggle to be effective, it needs to be embedded in a territory, such as *zones à défendre* (ZADs) in France.<sup>2</sup> This hypothesis on sentinel territories builds on the figures of “alarm raisers” and whistleblowers investigated by the pragmatic sociology of risks (Chateauraynaud and Torny 1999, 2005). But sentinel territories’ concern with space, territories, and borders gives it a physical dimension that distributes the questions of public justice and scientific truth to a whole environment.

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<sup>1</sup> This paper is based on discussions held during the interdisciplinary seminar “Human Challenges in Extreme Environments: Sentinel Territories and Tipping Points” co-hosted in Tucson in 2019 by the international mixed research unit (*unité mixte internationale*, or UMI) iGLOBES (Interdisciplinary and Global Environmental Studies) and the Udall Center for Studies in Public Policy of the University of Arizona.

<sup>2</sup> The *zone à défendre* (“zone to be defended”), or ZAD, in Notre-Dame-des-Landes, near the city of Nantes in western France, is a rural agricultural area that was successfully occupied by environmental activists for more than 30 years in order to protect it against destruction by an airport project. The term ZAD has now become a common appellation for movements of occupation against construction projects deemed useless and dangerous for the environment (Mauvaise Troupe 2014).

## From sentinel devices to sentinel territories

Sentinel devices belong to what has emerged as the field of technologies of preparedness. While modern states have used techniques of prevention to act on their population by the calculation of risks, contemporary global health has used techniques of preparedness to mitigate the effects of events with low probability and catastrophic consequences (Lakoff 2008, 2017). These techniques have been generalized from nuclear deterrence to all kinds of natural hazards at the end of the Cold War. Sentinels can be contrasted with indicators and prognosticators as different technologies to anticipate the future and make visible the invisible. While the prognosticator relies on a series of numbers built by the modern state, and the indicator on the datasets of neoliberal governance, sentinels rely on warning signals sent by living beings in specific locations (Keck and Lakoff 2013).

The notion of sentinel territory brings together two usually separate understandings of the word “sentinel”. On the one hand, sentinel devices constitute apparatuses equipped to monitor environmental change. They can incorporate living beings with an agency, but they nevertheless give them a rather passive role, as screens on which change can be read or as soldiers on a sentinel post. On the other hand, sentinels can also be active agents. They can not only raise alarm about incoming change but also react in order to mitigate risk of coming disasters. This can be true of animal or plant species, but it is most visible among human groups mobilized around a specific environmental issue.

In this way, the term “territory” in English is closer to the meaning of the French notion of *territoire*. According to Barreteau *et al.* (2016), while this term was mainly used by ethologists from the 1920s to the 1960s, *territoire* has been used by geographers to describe a socially inhabited space, including political and ideological dimensions of space. In our definition of a “sentinel territory,” the term “territory” includes not only spatial dimensions but also social and moral references. It encompasses a sense of place, which underlines and reflects the agent’s consciousness of the environment and of his or her place within it.

More recently, Boelens *et al.* (2016) have proposed a specific definition of a hydrosocial territory from a critical political ecology point of view. Their approach brings three main insights to the notion of “sentinel territory.” First, as these authors noted, the notions and strategies of how to make a territory diverge profoundly among actors, just like the territorialities that are produced. Second, the “limits and the scales of a territory are neither natural nor fixed, but are produced through frictions between social practice, environmental processes and structural forces” (Boelens *et al.* 2016, p. 5). And finally, a territorialization process could be seen as “a battle of divergent (dominant and non-dominant) discourses or narratives, consolidating a particular order of things as its central stake” (*ibid.*, p. 6).

**Figure 1. Gate to the Gabe Zimmerman Davidson Canyon Trailhead, Pima County, Arizona**



This very popular destination for residents of the Tucson area who enjoy the shade of cottonwood trees growing along the Cienega Creek is also a place of active monitoring for birdwatchers, river protection and restoration activists from the Watershed Management Group and the Cienega Watershed Partnership. The canyon is threatened by the Rosemont copper mine project a few miles upstream. © Stéphane Tonnelat, 2018.

### **Describing a “sentinel territory”**

A few specific features characterize sentinel territories. First, a sentinel territory has to face one or more potential threats, such as viruses, toxic pollution, nuclear radiation, floods, drought, or global warming. These threats—a combination of hazards and vulnerabilities—may endanger one or more of the features of this territory, including water resources, human health, or biodiversity. Some iconic endangered items can be more specifically targeted, such as cultural heritage or endemic species with potentially high emotional value.

Second, a sentinel territory must also include monitoring devices and agents, humans and not, wary of approaching dangers. The monitoring devices can be water gauges, air pollution, or unvaccinated chickens—all devices that could be used by public authorities and scientific experts, but not easily available to the general public. Their data could be published online, but difficult to understand for non-experts. The most important feature of a “sentinel territory” is the existence of “sentinel posts”: places, scenic viewpoints, and historical landmarks where the general public can become aware of incoming danger or change because of a high visibility due to historical and geographical reasons. Hong Kong, for instance, is a sentinel post for pandemic influenza because it is a contemporary hub of communication close to south China as the “workshop of the world,” but it also has a cultural tradition, which connects the perception of epidemics with the imagination of ghosts (Keck 2019).

Third, sentinel devices and sentinel posts are not sufficient to create a sentinel territory. As Tonnelat (2012) has stated, “the divergence between the perceptive dimensions of experience of a

problem and the institutional dimensions that are supposed to solve it” can prevent an issue from becoming a public social problem. However, the signals sent by sentinel devices and the narratives built on sentinel posts may at some point converge. Our hypothesis is that this convergence happens through a process of “territorialization” consisting in forming a community based on a sense of place. This process can be seen at different scales, with divergent narratives. It can be built upon pre-existing boundaries (watersheds, protected areas), but not necessarily. Sentinel territories have a varied topology, including borders, interfaces, frontlines (in contact with the perceived threat) and rear land.

The sociology of public problems (Spector and Kitsuse 1973) can help us identify different stages in the building of a sentinel territory. A “monitoring device” first makes managers/scientists aware of a threat (1)—it could also start with people feeling sick, as in the example of Love Canal or with a catastrophe like Hurricane Katrina in New Orleans. Next, a sentinel post makes a threat visible (2), public (3) and experienced (4). And, finally, the potentially impacted space becomes a territory with the involvement of a community (5).

### **Sentinel territories distribute preparedness capacities beyond expert knowledge**

A sentinel territory is meant as a descriptive concept to identify common features of spaces where environmental issues emerge. But it could also be a tool to advance environmental policies. Following disasters, calls for change are often heard. But in most cases, once the situation is seemingly back to normal, not much happens. Sentinel territories are spaces where changes brought by disasters become permanently visible (such as mountain areas witnessing the retreat of glaciers) and transformed into “social problems” by institutions that account for them. Randle (2019), for example, has shown how the snowpack of the high Sierras acts as a sentinel territory for climate in Southern California. In New Orleans, Tonnelat (2012) has studied how inhabitants have played a sentinel role after Katrina by rediscovering and monitoring the bayou. Vera *et al.* (2019) analyzed how community members in Karnes County, Texas, a region of oil extraction, have become sentinels watching for an increasing risk of cancer.

The city of Wuhan in the Hubei province of China had been chosen as a sentinel post for coronaviruses after the SARS crisis in 2003. It proved efficient to detect Covid-19, but failed to contain the pandemic because local authorities silenced whistleblowers. If a sentinel is successful when it enrolls many actors in its daily work of monitoring, it fails when most actors remain skeptical of its warnings. Can sentinels fail by sending the wrong signal? Can they be proven wrong when they raise alarm by crying wolf? Can adverse parties, such as governments and companies, silence them? One of the most difficult questions is to understand whether the success of a sentinel depends on the number of actors enrolled or on the adequacy of the signal: is it because the signal is adequate that actors follow the sentinel, or is it because it is successful that it becomes adequate in performing the reality of a threat? We believe an answer to these questions could be provided by the building of sentinel territories, a step up from lone sentinels and sentinel posts.

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