Abrupt changes - To what extent are tipping points a concern in coping with global change?

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**Paired Perspectives on Global Change**

**T**ipping points have entered common discourse in a range of applications: the uprisings of the Arab Spring, the narrative of sporting events, the evolution of consumer sectors, the rhythm of political campaigns, the threat of space junk, and the collapse of financial systems. An increasingly frequent application concerns the changing climate (Russell and Nyssa 2009). Some climate tipping points irreversibly change social structures, and the form of this change determines the ultimate effect on climate damages. Unsustainable tipping points involve climate change impacts. First, consider New Orleans or Bangladesh. The infrastructure in these regions is increasingly stressed due to higher sea levels, water stress, crop failures, or extreme weather events (de Sherbinin et al. 2001). Shifting populations have increased the pressure on water supplies. Second, and perhaps more troubling, climate change might induce large-scale migrations due to higher sea levels, water stress, crop failures, or extreme weather events (de Sherbinin et al. 2011). Shifting changes have triggered massive changes throughout world history, and future migrating populations could trigger internal or external conflicts and bring new challenges of assimilation and adjustment. For example, climate change could enhance water scarcity in South Asia, and recent conflicts in Darfur and other parts of Africa might have been exacerbated by environmental problems. Other societal tipping points are desirable. First, a breakdown in low-carbon technology might be necessary to change the dynamics of the energy system (Hoffert et al. 2002). If solar cells or hydrogen (de Sherbinin and Nyssa 2009) become available, the world could be weaned off fossil fuels. This represents a large positive tipping point. Second, enabling a greenhouse gas emission policy should create constituencies for further policy. Ambitious policies currently lack defined winners to lobby for their enactment, but moderate policies could develop this constituency by conferring valuable property rights in tradable permits or by nurturing a low-carbon industrial sector. Third, on the international level, a climate coalition that includes enough countries might be able to raise remaining countries’ cost of holding out (Barrett 2003). Finally, we may still reach a further tipping point in climate awareness (see figure 1). Drawing on examples ranging from the diffusion of rumors to trends in smoking, some argue that social networks allow beliefs and behaviors to spread quickly once they reach a critical mass (Gladden 2000). Inciting unsustainable tipping points could raise public concern about the climate to such a threshold. Similar to how the first exposure to the horror of nuclear weapons has so far kept the world from further nuclear warfare, reaching the first unsustainable climate tipping point may end up making future tipping points less likely by spurring preventive action. From economic analysis of tipping points in the physical climate system, we have shown that the best policy response to a tipping possibility depends on two questions: (1) Can we affect whether a tipping point occurs? (2) If we knew a tipping point was about to occur, would we want to pursue a different policy? The first question captures our ability to prevent or spur a tipping point, while the second captures our desire to hedge against the possibility that it occurs. Because the undesirable tipping points depend on our present and future emission decisions, they provide additional incentive to reduce emissions. These undesirable tipping points also increase the payoffs to adaptation policies that reduce society’s exposure to a changing climate. In contrast, desirable tipping points favor policies that make them more likely: funding research into low-carbon technology, pricing carbon sooner rather than later, and building climate awareness. If these desirable tipping points end up spurring significant emission reductions, they might even hold the key to avoiding undesirable ones.

**Selected references**


Hoffert M et al. (2002) ‘If solar cells or hydrogen (de Sherbinin and Nyssa 2009) become available, the world could be weaned off fossil fuels. This represents a large positive tipping point.’

Barrett CT (2003) ‘If solar cells or hydrogen (de Sherbinin and Nyssa 2009) become available, the world could be weaned off fossil fuels. This represents a large positive tipping point.’

Steffensen JP et al. (2008) ‘These observations prove that the climate system did, and therefore can, tip and reorganize internally within years and cause strong and fast regional temperature changes.’

Partin JW et al. (2007) ‘Perhaps the warming of the south finally pushed the ITZC north again?’


Hoffert M et al. (2002) ‘If solar cells or hydrogen (de Sherbinin and Nyssa 2009) become available, the world could be weaned off fossil fuels. This represents a large positive tipping point.’

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**Figure 1** The response of the U.S. public to survey questions about global climate change (Perer Research Center for the People & the Press, Niskel and Milyon 2007)