

Specialised Concept 14: THRESHOLDS

- A threshold is a critical level which, if crossed, brings a significant change. In systems theory, it has a similar meaning to 'tipping point'. Once a threshold has been passed, it may be impossible to restore a system to its previous equilibrium state due to the accelerated and possibly irreversible changes which have begun.
- According to the latest scientific thinking on climate change, a global mean surface temperature (GMST) rise in excess of a 1.5°C threshold will lead to widespread and irreversible environmental changes. GMST need only rise slightly above this threshold to trigger a series of accelerating changes and 'knock-on effects'. For example, wide-scale thawing of frozen ground in high latitudes would lead to the release of vast quantities of methane, a powerful greenhouse gas. This in turn would lead to more atmospheric warming and thus even more widespread thawing of frozen ground. This is called a positive feedback loop. Events would spiral out of control resulting in runaway global warming. In this scenario, warming will continue even if anthropogenic (human) emissions of carbon are curbed entirely by government efforts. To use an everyday saying, it will be impossible to 'put the genie back in the bottle'.
- Another example is when poor land management leads to irreversible soil erosion. Vegetation can grow back if pressure is temporarily removed or reduced. However, if cattle are allowed to graze on vegetation without interruption, even the most hardy and resilient grasses will eventually die out. In the absence of vegetation to protect and bind it together, soil will be eroded by the action of rain and run-off. With the soil gone, plants cannot re-colonise. To avoid this permanent loss of vegetation and soil, it is vitally important that farmers move cattle away periodically, thereby allowing plants to recover before a threshold is crossed. Here, the threshold idea is linked with the 'carrying capacity' concept (the maximum population an area of land can support).
- Over-fishing is one further example of thresholds in physical geography. A marine ecosystem will collapse if fleets leave insufficient fish in the sea to reproduce the next generation. This happened at Canada's Newfoundland Grand Banks cod fishery in 1992. The fishing industry increased its catch of fish (think of this as a system output) far more quickly than the natural replacement rate of young fish being born (a system input). As a result, a threshold was eventually crossed, and the entire stock of fish became lost forever.
- Thresholds and tipping points are highly relevant to human geography, too. For example, the decline of a rural settlement may cross a threshold point of no return if a vitally important service closes, such as the post office, village shop or local primary school, as follows:
 1. In the 1960s, many rural villages in the UK experienced out-migration. In some settlements, village schools and shops closed when local population sizes fell below a critical threshold value.
 2. Migration patterns reversed in the 1970s as some people quit deindustrialising urban areas and relocated to rural places (this is called counterurbanisation). They headed for villages whose shops and schools had not been closed. In contrast, villages that had already lost vital services often continued to lose more people.
 3. In summary, those villages whose population had not fallen below a critical threshold size in the 1960s were able to attract incomers in the 1970s (we might even argue their equilibrium was restored). But in cases where the threshold had been crossed, it was impossible to reverse what had already happened.

Concept connections

Changing places

Places have real and perceived identities that can be represented in different media such as film and literature. These representations may play an important role in the place rebranding process.

Global governance

Representations of places, societies, and environments are easily shared and spread on a worldwide scale by global information flows.

Changing landscapes

Old photos, paintings and other representational forms of qualitative data help scientists study physical landscape changes over time.

Thinking like a geographer about... REPRESENTATION

1. If global temperature rise crosses the 1.5°C threshold, what other irreversible or accelerating environmental changes could occur?
2. What important 'high threshold' services could be provided to a town or city if its population grows above a certain size?

How far do you agree with the following statements?

- 'It is better for a rebranded rural area to have too few visitors, rather than too many visitors.'
- 'It is impossible to repair the damage once a system's threshold has been crossed.'