Coláiste na Tríonóide, Baile Átha Cliath
Trinity College Dublin
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FOUNDATION SCHOLARSHIP EXAMINATION 2024/25

TR062 Geography and Geosciences

General Paper (Paper 3)

Selected theme: Tipping points in the Earth system

The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report defines a tipping point as a "critical threshold beyond which a system reorganizes, often abruptly and/or irreversibly". In other words, tipping points are elements of the Earth system in which seemingly small changes can initiate significant shifts. We often consider such shifts to represent a 'tip' from one stable system state into another, profoundly different state. For example, a block of ice may persist as temperatures rise from -40ºC to 0ºC, but will begin to melt once temperatures rise by only a fraction of a degree above 0ºC. In this scenario, although the ice remains stable throughout a 40ºC rise in temperature, it is only the final bit of warming – only a fraction of a degree - that induces system change. Such shifts in state, once initiated, may take place over days, weeks, decades, or centuries; once the tipping point has been reached, however, the process is set in motion.

The concept of tipping points applies across the wider field of geography and the Earth sciences as we consider the evolution of natural systems through time, in the past, present, and in our shared future. Students should engage with the literature below to deepen their understanding of tipping points as a lens through which to view the behaviour of natural systems, and the implications such processes may have on the Earth system and human societies both today and in the future. These readings will strengthen your understanding of modern Earth system processes and recognized tipping points, as well as the role of humans in both advancing - and blunting - our progress toward potential thresholds.

Recommended readings:

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Weijer, W., Cheng, W., Drijfhout, S.S., Fedorov, A.V., Hu, A., Jackson, L.C., Liu, W., McDonagh, E.L., Mecking, J.V. and Zhang, J., 2019. Stability of the Atlantic Meridional Overturning Circulation: A review and synthesis. Journal of Geophysical Research: Oceans, 124(8), pp.5336-5375.