Coláiste na Tríonóide, Baile Átha Cliath
Trinity College Dublin
Ollscoil Átha Cliath | The University of Dublin

FOUNDATION SCHOLARSHIP EXAMINATION 2023/24

TR062 Geography and Geosciences

General Paper (Paper 3)

Selected Theme:

Climate adaptation vs. mitigation

As the impacts of climate change become more apparent, communities around the world are increasing their efforts to implement effective policies to 1) adapt to and 2) mitigate the effects of changing climate conditions. Climate adaptation policies are centred on adjusting to current and future climate impacts. Mitigation policies are focused on reducing the severity of future impacts, generally though lowering net greenhouse gas emissions to the atmosphere.

Both adaptation and mitigation efforts endeavour to reduce harm to communities and natural systems. And in both cases, implementing effective policy is predicated on a robust understanding of the Earth system. In particular, understanding the physical basis of climate change and the mechanisms that propagate climate impacts around the world are key first steps in developing effective policies to address changing climate. However there are also clear distinctions between these two policy tracks. Are ultimate goals, and perhaps the philosophical motivation, of these policies distinct? Is one strategy more prudent or achievable than the other? What information do we need in hand in order to mitigate or adapt to future climate changes, or do we in fact have all the information we need? What adaptation or mitigation strategies are most effective, and can they be universally applied? Are there lessons from the Earth system that we can apply toward implementing effective policy, whether toward mitigation or adaptation?

Students should engage with the literature below to deepen their understanding of the links between physical geography, geology, and

human geography that inform Intergovernmental Panel on Climate Change (IPCC) reports and ultimate adaptation/mitigation policy suggestions .

Recommended readings:

Nicholls, R. J., Brown, S., Goodwin, P., Wahl, T., Lowe, J., Solan, M., Godbold, J. A., Haigh, I. D., Lincke, D., Hinkel, J., Wolf, C., & Merkens, J. L. (2018). Stabilization of global temperature at 1.5°C and 2.0°C: Implications for coastal areas. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 376(2119). https://doi.org/10.1098/rsta.2016.0448

Oppenheimer, M., B.C. Glavovic , J. Hinkel, R. van de Wal, A.K. Magnan, A. Abd-Elgawad, R. Cai, M. Cifuentes-Jara, R.M. DeConto, T. Ghosh, J. Hay, F. Isla, B. Marzeion, B. Meyssignac, and Z. Sebesvari, 2019: Sea Level Rise and Implications for Low-Lying Islands, Coasts and Communities. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate . Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 321-445. https://doi.org/10.1017/9781009157964.006.

van den Hurk, B., Bisaro, A., Haasnoot, M., Nicholls, R. J., Rehdanz, K., & Stuparu, D. (2022). Living with sea-level rise in North-West Europe: Science-policy challenges across scales. Climate Risk Management, 35(August 2021). https://doi.org/10.1016/j.crm.2022.100403

Tierney, J.E., Poulsen, C.J., Montañez, I.P., Bhattacharya, T., Feng, R., Ford, H.L., Hönisch, B., Inglis, G.N., Petersen, S.V., Sagoo, N. and Tabor, C.R., 2020. Past climates inform our future. *Science*, *370*(6517), p.eaay3701.

IPCC, 2023. AR6 Synthesis Report - Summary for Policymakers. 2023. Available to download at: https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf

Sandweiss, D.H., Maasch, K.A., Burger, R.L., Richardson III, J.B., Rollins, H.B.

and Clement, A., 2001. Variation in Holocene El Niño frequencies: Climate records and cultural consequences in ancient Peru. *Geology*, *29*(7), pp.603-606.

DeMenocal, P.B., 2001. Cultural responses to climate change during the late Holocene. *Science*, *292*(5517), pp.667-673.

Beerling, D.J., Kantzas, E.P., Lomas, M.R. et al. Potential for large-scale CO_2 removal via enhanced rock weathering with croplands. Nature 583, 242–248 (2020). https://doi.org/10.1038/s41586-020-2448-9

Smith, P., Adams, J., Beerling, D. J., Beringer, T., Calvin, K. V., Fuss, S., Griscom, B., Hagemann, N., Kammann, C., Kraxner, F., Minx, J. C., Popp, A., Renforth, P., Vicente Vicente, J. L., and Keesstra, S., 2019. Land-Management Options for Greenhouse Gas Removal and Their Impacts on Ecosystem Services and the Sustainable Development Goals. Annual Review of Environment and Resources 44:1, 255-286

Westra, S., Fowler, H.J., Evans, J.P., Alexander, L.V., Berg, P., Johnson, F., Kendon, E.J., Lenderink, G., and Roberts, N.M., 2014. Future Changes to the intensity and frequency of short-term duration extreme rainfall. Reviews of Geophysics, 52(3), pp.522-555.

Donat, M.G., Lowry, A.L., Alexander, L.V., O'Gorman, P.A. and Maher N. Lowry, 2016. More extreme precipitation in the world's dry and wet regions. Nature Climate Change, 6, pages 508–513.

Breitburg, D., et al., 2018. Declining oxygen in the global ocean and coastal waters. Science, 359 (6371), https://doi.org/10.1126/science.aam7240

Keeling, R.F., A. Kortzinger and N. Gruber, 2010. Ocean deoxygenation in a warming world. Annual Review of Marine Science, 2: 199-229. https://doi.org/10.1146/annurev.marine.010908.163855

Clark, D. E., Oelkers, E. H., Gunnarsson, I., Sigfusson, B., Snæbjornsdottir, S. O., Aradottir, E. S., and Gıslason, S. R., 2020. CarbFix2: CO_2 and H_2S mineralization during 3.5 years of continuous injection into basaltic rocks at

more than 250°C. Geochimica et Cosmochimica Acta, 279, 45-66. https://doi.org/10.1016/j.gca.2020.03.039.

Snæbjörnsdóttir, S. O., Sigfússon, B., Marieni, C., Goldberg, D., Gislason, S. R., & Oelkers, E. H., 2020. Carbon dioxide storage through mineral carbonation. Nature Reviews Earth & Environment, 1, 90–102. https://doi.org/10.1038/s43017-019-0011-8.