Tracking adaptation to climate change using big data

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Project summary

Adaptation has become a core element of climate change policy and research, and figures prominently in the UN Paris Agreement (Lesnikowski et al., 2017; Magnan and Ribera, 2016). Global funds to support adaptation in low and middle income nations have begun to be disbursed and adaptation financing is expected to significantly increase by 2020, with $100bn pledged (Donner et al., 2016). National governments in high income nations have also identified the importance of adaptation, including across Europe, and have begun to invest in specific actions (Biesbroek et al., 2010; Jude et al., 2017). Strategic allocation of adaptation funds and assessment of adaptation progress will require measurement of whether pronouncements on the need for adaptation are translating into action (Ford et al., 2015a; Magnan, 2016; Magnan and Ribera, 2016). The importance of developing systematic and standardized means of assessing adaptation from which future progress can be monitored and evaluated, including the creation of baselines and indices, has been identified by the UN, national governments, and the private sector. Longitudinal assessment in particular, is critical for assessing national investments in adaptation, facilitating policy learning and the sharing of best practices between nations, promoting accountability and transparency of adaptation financing, and for guiding national adaptation planning (Arnott et al., 2016; Lesnikowski et al., 2016). Despite this, there has been little consideration of how to track adaptation systematically across nations, and we thus have limited and fragmented evidence on adaptation progress globally (Berrang-Ford et al., 2014; Ford and Berrang-Ford, 2016).

In response to this challenge, the Tracking Adaptation to Climate Change Collaboration (TRAC3) was created to facilitate new and innovative research that improves our understanding of adaptation to climate change around the world (www.trac3.ca). A key focus of TRAC3 is the development of novel approaches and indicators for assessing adaptation progress across nations globally. First generation work has used national reporting on adaptation action as a basis for creating a global adaptation index for nations globally, but is constrained by limited and biased reporting, and an absence of dataset on adaptation actions (Araos et al., 2016; Berrang-Ford et al., 2014; Epule et al., 2017; Ford et al., 2015b; Ford et al., 2015c; Lesnikowski et al., 2016; Lesnikowski et al., 2013; Lesnikowski et al., 2015; Lesnikowski et al., 2011; Panic and Ford, 2013). Herein we are seeking a student to help pioneer the use of methods rooted in computer science/big data to identify, document, and characterize what nations, regions, and sectors are doing on adaptation as a basis for creation a second generation global adaptation index. The student will work with the supervisors bringing and further developing skills such as latent semantic analysis (word2vec), topic modelling (LDA), web scraping methods, and supervised machine learning to document, retrieve, and analyze data on adaptation policies contained in official government documents, primarily laws, and ministry or executive actions at the national level. The work will directly feed into the global climate policy stocktaking process as part of the Paris Agreement, as well as regional efforts to examine adaptation policy (e.g. through European Environment Agency, World Bank, UNDP).

Fit to NERC science

The project is aligned with NERCs focus on 'societal challenges,' specially 'managing environmental change' by developing rigorous, systematic, and transparent approaches for assessing progress on adaptation at the national level globally. It links to a number of NERC 'Innovation Activities,' including on 'risk management' by examining what steps nations are taking to build resilience into assets, operations,

supply chains, and communities; and 'environmental data' via its focus on using computer science/big data methods for policy analysis. The project also links to a number of NERC research programs, including: 'Analytical science and technology' through its focus on assessing vast amounts of online data on adaptation actions; and 'Future Climate for Africa' by documenting and examining how African nations are responding to environmental change, and comparing to nations globally. The project is highly interdisciplinary connecting social science policy research and computational analytics, and thus more broadly fits into NERCs remit to train the next generation of researchers with skillsets that transcend traditional disciplinary silos

Student profile

The prospective student should have, or expect to receive, a first class BSc degree, or a distinction at Masters level, in computer science or associated discipline. They will be expected to have strong computational analytics skills and be interested in developing their skillset in an interdisciplinary setting that will require them to think outside traditional disciplinary silos. Experience in climate change/environmental change related projects is an asset, or policy evaluation in general, with the supervisors supporting training on climate policy. A range of funding sources are available for the project which the candidate can apply to in collaboration with the supervisors.

Skills and training

As argued by the supervisors (Dupuis and Biesbroek, 2013; Ford and Berrang-Ford, 2016; Ford et al., 2016; Swart et al., 2014), there is limited methodological diversity in the adaptation research field with most studies employing small-n, qualitative approaches. Responding to this gap, the student will work with the supervisors to integrate computer science approaches into cross-national global-scale adaptation evaluation. The need to use such approaches in the human dimensions of climate change field was recently promoted by the supervisors in an article in *PNAS* (Ford et al., 2016), yet this article was primarily conceptual in nature and the student will help pioneer, test, and refine these approaches. The student will be expected to build bridges with the Leeds Institute for Data Analytics to further advance their computational analytics skills in a policy analysis context. The supervisors will provide training on climate policy in general and adaptation in particular, proving a strong grounding in the theory of adaptation evaluation, with student training taking place in the context of international interdisciplinary partnership with academics from diverse backgrounds (Yale, UCLA, McGill, Wageningen), government (e.g. UNFCCC, UNEP), and NGOs (e.g. IIED, ND-GAIN). The student will have the opportunity to take a leadership role in advancing the TRAC3 network, working in collaboration with other students in the UK and internationally. The student will be supported and mentored to publish their work in journals, and attend and present at leading conferences.

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