



# The Irvine Atlas

St Andrews Undergraduate Journal of  
Geography and Sustainable Development

Volume 2, Issue 1    Nov 2019





# Editorial Board

Imogen Armstrong  
Abbie Fairclough

## Editors-in-chief

Charlotte Evans  
Lea Fourchault  
Marisa Hensey  
Joanna O’Flynn

**Human Editor**  
**Sustainable Development Editor**  
**Physical Editor**  
**Features Editor**

Frances Mackinnon  
Jessey Read

**Head of Layout**  
**Layout Team**

Michaela Habartova  
Morven MacSwan  
Salah-Dean Satouri

**Recruitment Officer**  
**Publicity Officer**  
**Publicity Officer**

Tom Saunders  
Chandler Yorke-Edgell

**Secretary**  
**Treasurer**

Mina Anderson  
Emilia Cardente  
Eleanor Fraser  
John Michael Gregg  
Akshika Kandage  
Rebekah Kaufman  
Charlotte Marquand  
Hanna Mirgorodski  
Delaney Murray  
Bhavya Palugudi  
Amy Roberts  
Neel Solow  
Catriona Stewart  
Sabina Sulikova  
Charlotte Tang  
Owain Taylor  
Stephanie Wong

## Content Editors

Fiona Bruce  
Natasha Colvine  
Rosie Landon  
Samiyah Lunat  
Alicia Marley

## Copy Editors

Fiona Banham  
Conner Morison

## Post-Graduate Advisors

## Letter from the Editors

We are very excited to announce the second volume of *The Irvine Atlas*. Carrying this journal from infancy into its second year was an honourable, yet daunting, undertaking. The journal has grown into a well-organised and well-loved publication, and this growth has occurred alongside the growth of the editorial board. Having had more than half of the committee graduate over the summer, we were significantly depleted, but the response from people who wanted to get involved was overwhelming. Our hardworking committee is now comprised of a fantastic group of students who come from a diverse range of academic years and domains. We can draw parallels between ourselves and the representation of the broad range of topics within geography and sustainable development that the journal aims to uphold. Being undergraduates, the process of publishing and upkeeping this journal continues to be a learning process for everyone involved. We hope that it will continue to flourish and adapt each year, as it is passed on to the next eager group of students.

Reading through the articles submitted to this issue, we learned a lot ourselves. The articles span a wide range of topics and epistemological frameworks, showcasing the breadth of the fields of geography and sustainable development. In this issue of *The Irvine Atlas*, there are a number of topics which have been explored by more than one article. We believe that this offers an opportunity to show how a single topic can be investigated and interpreted in a range of different ways when multiple voices are included. The feature articles include work in non-traditionally academic formats which we hope will also inspire people to view geography and sustainable development from new perspectives.

We would like to give thanks to Dr Matt Sothern for his ongoing support, as well as Graeme Sandeman for publishing the journal on the School of Geography and Sustainable Development website. Furthermore, our thanks are extended to the SGSD Office and the Print and Design Office staff, who have accommodated our every request. We would also like to extend our gratitude to the authors of the articles included in this issue. A special thanks goes to those who have now graduated but have continued to stay in contact and take time out of their days to make required revisions. We would like to thank the authors of the feature pieces which were written or adapted specifically for the journal, and to all of the photographers who submitted their astonishing work to our photo competition (it was an almost impossible task to pick just four to publish!).

Our editorial board are of course indispensable, each member contributing to a team which boasts an overall wealth of skills and experiences. We thank you all ardently for the time and hard work which you have lent to ensuring the publication of this issue. We would like to specifically note the work of Conner and Fiona, our postgraduate advisors, who have frequently offered us time out of their hectic schedules to give their invaluable help and advice. Of course, none of this would be possible without the endless support and inspiration given by the dedicated Geography and Sustainable Development professors, lecturers and tutors.

Despite this issue being delayed, we believe that the time and work put into it is reflected in its quality. To the reader: whether you gain a new academic perspective, develop a passion for a certain topic, or simply have fun exploring the work of your peers, we hope that you find this issue an enjoyable read.

Abbie Lily Fairclough and Imogen Anne Armstrong  
Co-Editors in Chief

The image shows two handwritten signatures in black ink. The signature on the left is 'AFairclough' and the signature on the right is 'Imogen Anne Armstrong'. Both are written in a cursive, flowing style.

# Table of Contents

6	Photo Competition, Winner	
8	Challenges associated with predicting future levels of migration due to climate change	Chris Smith
14	Demographic, Socio-Economic and Contextual Correlates of Life Satisfaction	Lucy Thomson
22	A Critical Analysis of a Post-9/11 Interview with Delia Young-Ali	Luke Fiveash
26	Should Geographers be alarmed about current trends in economic inequality?	Benjamin Lintern
30	How alarming is Regional Inequality in the UK to the Geographer?	Geraint Morgan
36	A critical assessment of the extent to which geographers should be alarmed about the current spatial trends of economic inequality throughout Glasgow	Bethany McDade
42	An investigation into the link between population growth and sustainable development.	Kerri Samson
44	CSR Reporting in Fashion Industry	Elsa Kivinen
48	Critical Reflection Essay on Food Waste	Alexandra Imberh
52	Food Waste Essay	Bethany Carol
56	What is divestment's role in a just transition and does it represent a legitimate means of reaching a global low carbon future?	Meggie Beattie
60	An exploration of the future implications of background climate change, discussed within a POSTnote format	Alusha Romanisyn
64	POSTnote on Sea Level Change around the British Isles	Kathryn Hastie
68	An Exploration of Ruddiman's Early Anthropogenic Hypothesis	Lara Williams
72	Understanding The Biogeography Of 'Natural' Systems Only Remains Important In The Anthropocene In Conjunction With Understanding 'Modified' Systems.	Joanna O'Flynn
76	The Practical and Moral Dynamics of Invasive Species Management in Scotland: the Case of the American Mink	Fiona Banham
80	Tephra Layer Thickness Variations Can Indicate an Approaching Ecosystem Bifurcation in Geomorphologically Fragile Landscapes	Conner Morison
84	Photo Competition, Runners up	
86	Interview with Daphne Biliouri-Grant co-ordinator for the 'Towards a Plastic Free St Andrews' initiative	Annabel Personeni
88	Antarctica fieldtrip – A research expedition and life-changing adventure	Iga Józefiak





**(Left): The Young Monarch of Glen Etive (Right): Three Degrees of Inquisitiveness.** Taken in February 2019. A promise of a dusting of snow was all the motivation I needed for an early morning escape from St Andrews. I found myself and my camera in Glencoe, where a solitary single track invited me to explore further down one of the tributary glens - namely one of James Bond fame; Glen Etive. Welcomed by the baying of deer so ever young and graceful in their highland home, there was certainly no objection to my intrusion. I was their sole guest for the morn and a source of peculiarity at that. As if by royal appointment, I took these photographs. They are fitting memories which will serve to remind me of home forevermore. Photos by Ewan Harvey

# Challenges associated with predicting future levels of migration due to climate change.

*Chris Smith, Fourth Year Geography*

**Abstract** – Climate change has the potential to increase overall levels of migration throughout the world. However, the extent to which climate change can be attributed as an individual catalyst of mobility is fiercely debated. For any reliable prediction, there must be an understanding of the unpredictability of migration, the unpredictability of climate change and the need to view migration as a multi-causal phenomenon. As such, the creation of one single theory to explain climate change induced migration has so far proved elusive. Consequently, recent studies use a context specific approach to assess and predict the relationship between migration and climate change.

## Introduction

Accurately predicting future levels of migration is challenging. Migration outcomes depend on the interplay of many factors including demographic, economic, social, political and environmental changes. As a result, it can be difficult to attribute an increase – or decrease – in migration to changes in any one factor. Considering this, most academic literature on the topic agree that climate change has the potential to increase overall levels of migration (Burrows and Kinney, 2016). However, the importance of climate change as an individual catalyst of future migration levels is fiercely debated (Piguet, 2013). This is compounded by the potential impacts of climate change itself being fraught with uncertainty (Gemmene, 2011). Furthermore, any prediction would have to decide who counts as an “environmental migrant”, which poses a significant challenge itself. In reviewing these themes, this essay will assess the challenges associated with predicting future levels of migration due to climate change.

## The Alarmist Approach

In the late 1980s and early 1990s, modern academic literature began to focus on the relationship between the environment and migration (Brzoska and Fröhlich, 2016). Myers, one of the foremost and early contributors to the topic, estimated that up to 200 million people could become “environmental refugees” by the middle of the 21st century, as “global warming takes hold” (Myers, 2002: 609). This is a strikingly high figure – approximately 2% of the projected global population in 2050 (Stern, 2006). Said figure was composed largely through the speculation

that rising sea levels, combined with an increase in severe weather events (particularly droughts and floods), would overwhelm and disrupt subsistence communities throughout the world and spark a rapid increase in mobility (Myers, 1997; 2002). A plethora of academic and government literature has supported Myers’ calculations, much of which has been criticised for its heavy focus on international migration, driven exclusively by environmental stress, and for its oversimplification in determining the “environmental refugee” (Castles, 2002; Piguet, 2013).

Illustrative of what is commonly referred to as “the alarmist approach” (Morrissey 2012), Figure 1 below shows how the German Advisory Council on Climate Change (WGBU, 2007) identified climate “hotspots”, then plotted predicted migrant trajectories leading away from these centres and towards the global north – including Europe, North America, Japan and Australia. The alarmist methodology has been criticised for simply mapping areas deemed to be most adversely affected by climate change, calculating the number of people living there, and then assuming that a given percentage will be forced to migrate internationally (Brzoska and Fröhlich, 2016; Piguet, 2013). These highly speculative ‘ballpark’ predictions are almost certain to be wrong and can only be explained by adopting an overly simplistic and direct relationship between environmental change and migration (Castles, 2002; Morrissey 2012). Indeed, Castles (2002) wrote that the image of the environmental refugee “is simplistic, one-sided and misleading. It implies a mono-causality which very rarely exists in practice” (2002: 8). In addition, the concept of “environmental refugees” has connotations of urgency and unavoidability, which is not usually the case in practice (Piguet, 2010). Consequently, the prevailing attitude amongst academics today is to conduct their research using a migration systems approach that steers away from bold predictions, instead producing more nuanced and context-specific interpretations of the relationship between migration and climate change (Burrows and Kinney, 2016). As such, most of the academic work discussed in the remainder of this essay has employed some form of the migration systems approach.

## The Uncertainty of Climate Change

Any migration prediction would have to account for the great uncertainty that exists surrounding the im-



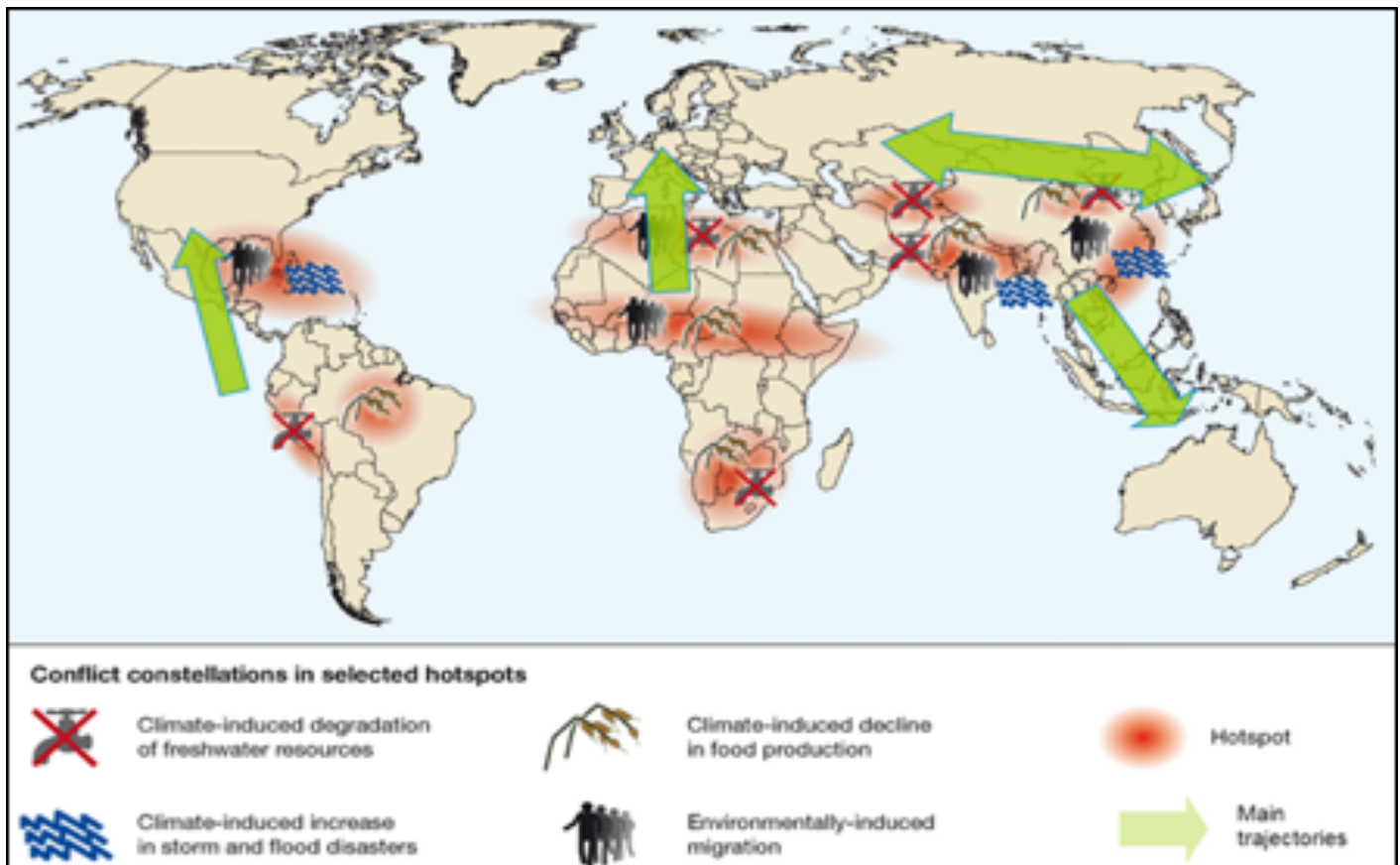


Figure 1 – Example of alarmist “climate refugee” literature (WGBU, 2007).

pact of climate change. As Gemenne (2011) has discussed, most global migration forecasts related to environmental change – such as those made by Myers – have assumed that global temperature rise will be limited to 2°C. However, Betts et al. (2011) estimate that temperatures could rise by up to 4°C by the end of the century. This disparity could have major consequences regarding the severity and scale of environmental change, and any predictions on migration trends thereof (Gemenne, 2011). Political instability in recent times only adds to this uncertainty. For instance, any potential success of the momentous (and legally binding) Paris Agreement of 2015 – that aimed to keep additional warming below 1.5°C – was severely undermined when the United States withdrew from the arrangement in 2017. This decision by one of the world’s most scientifically advanced nations (and primary contributor of global CO<sub>2</sub> emissions) is a reminder that the political willpower required to address global climate change is still not guaranteed (Brzoska and Fröhlich, 2016; Burrows and Kinney, 2016).

### Short and Long-term Environmental Change

Not all climate change induced migration is the same. Environmental shocks such as floods or hurricanes typically invite large-scale relief efforts that can alleviate people’s cause to migrate permanently (Burrows and Kinney, 2016). For instance, any migration that does occur after natural disasters – such as in the af-

termath of the 2004 Indian Ocean “Boxing Day” Tsunami – is usually temporary, from rural to urban areas, and typically remains localised within the affected region (Mueller et al., 2014). Disaster relief efforts often make it easier for people to return home and rebuild, limiting any potential conflicts that may arise if their displacement was of a longer duration. Thus, natural disasters are more localised events that typically only have short-term impacts, whereas long-term environmental changes – such as the reduction in the reliability of Asian monsoon rains, for example – have the potential to impact over one billion people (Rebetez, 2011).

Long-term environmental change such as this can occur at vastly different scales, and population responses are rarely the same (Mueller et al., 2014). Desertification in the Sahel, for instance, may mean that pastoralists have to give up or change their migratory patterns, which increases the likelihood of conflict with sedentary populations (Brzoska and Fröhlich, 2016). This conflict may, in turn, encourage additional migration as violence and ethnic tensions can make life intolerable for those involved – particularly in minority groups. Therefore, any migration predictions based on climate change have to take into consideration the type, scale, and pace of environmental change. Each of these variables impacts who will be affected and what their response to the environmental stress will be, meaning migration is

only one of many possible reactions (Rebetez, 2011).

### Climate Change as One of Many Factors

As well as disrupting pre-existing migratory patterns, climate change may also increase the likelihood, or severity, of conflict-related causes of migration. These include other mitigating factors such as wealth inequality or corruption (Brzoska and Fröhlich, 2016). Such factors are often influenced by other large-scale phenomena and societal transformations (other than climate change) that could challenge the status quo in unquantifiable ways. For instance, no migration prediction could have foretold the rise of social media that facilitated the Arab Spring – a political revolution that went on to spark the outbreak of the Syrian Civil War, and kickstart the European migrant ‘crisis’ (Khondker, 2011). Prior to this conflict, there was strong evidence to suggest that a reduction in fresh-water availability in the Levant (caused by a series of severe droughts) would make societal breakdown more likely, although as Gleik (2014) has argued, it took the political ramifications of the Arab Spring to manifest these difficulties. Thus, most of the refugees fleeing the Syrian conflict are not counted as environmental migrants, as the importance of environmental factors as the catalyst for these migratory shifts are overshadowed by the more animated and short-term factors relating to the political turmoil.

### Challenges of Categorising Migration

Figure 2 shows Renaud et al.’s (2011) attempt to define the environmental migrant. The two broad categories include those who are forced to move explicitly because of environmental change – the “environmentally forced migrant” – and those to whom other factors share a prominent role – the “environmentally motivated migrant”. Determining this accurately on a case-by-case basis can be incredibly difficult (Renaud et al., 2010). To complicate matters further, changes to the global economy could have significant ramifications for any migration prediction. Nevins (2007) has discussed how the implementation of neoliberal trade policies such as the North American Free Trade Agreement (NAFTA), has exacerbated the economic conditions that lead to migration in Mexico. NAFTA’s deregulation and tariff removals destabilised commodity prices, disproportionately affecting agricultural labourers and smallholders lowering their income (Nevins, 2007). This policy also made many people more vulnerable to additional shocks to their livelihoods, such as the intense droughts over the past decade (Nawrotzki et al., 2015; Nevins, 2007). As Reuveny (2007) has noted, if a society offers few economic

opportunities, people with the means to do so will attempt to seek out a better life. While climate change may have significantly contributed to their decision to move, in many scenarios, they would still be categorised as “economic migrants”. This is a challenge to the validity of any migration prediction, as the classification of migrants can often be highly subjective.

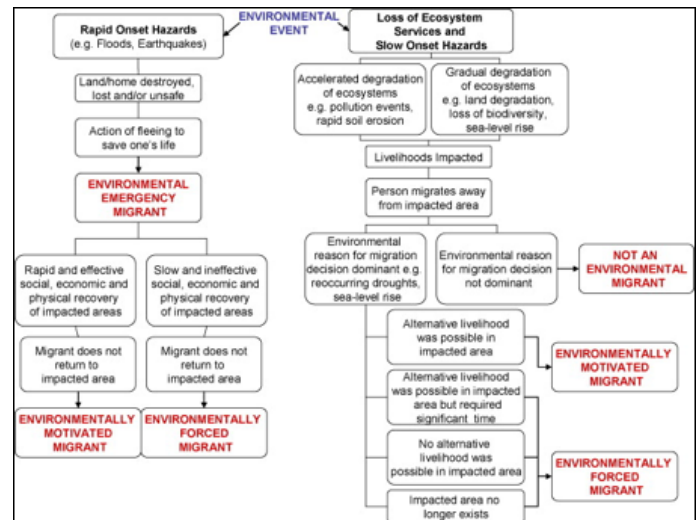


Figure 2 – The complex process of defining the environmental migrant (Renaud et al., 2010)

### Climate Change can Stall Migration

Climate change has the potential to reduce, as well as increase, levels of migration (Gray, 2011; Piguet, 2013). For instance, a multivariate analysis carried out by Gray (2011) found that as soil quality decreased, permanent migration was noticeably reduced in Uganda, as individual members of households could no longer afford travel expenses. Thus, increased environmental instability (as linked to climate change) has the potential to create what the UK Government Office for Science (2011) has called “trapped populations”. In such cases, limited capital prohibits migration, creating an immobility paradox where the poorest and most vulnerable are unable to move and adapt to environmental change (Gray, 2011). This is just one of many examples where the relationship between climate change and migration is not necessarily unidirectional. In relation to this, Burrows and Kinney (2016) implore us to view migration as a key adaptation strategy used to reduce human suffering, as opposed to seeing it as a problem that always needs to be corrected.

With this in mind, migration driven by gradual changes in the environment often occur in regions where mobility is already common (Kniveton et al., 2008). For example, in the same study mentioned earlier, Gray (2011) found that comparable levels of soil degradation in neighbouring Kenya increased lev-

els of temporary labour-related migration. In Kenya, this localised (typically rural to urban) form of migration was already a key adaptation strategy used in the region by families wishing to diversify their sources of income and protect against crop failures. Environmental degradation that reduced crop yields meant that more members of families would move to work in the cities to make up for the difference (Gray, 2011). Similarly, in an investigation in the Chitwan Valley in Nepal, Massey et al. (2010) found that reduced agricultural productivity (caused by gradual environmental deterioration) was far more likely to promote local moves than long-distance travel. In both cases, migration can reduce pressure on the donor country (or locality), while also providing remittances that are often more effective than international aid or infrastructure projects (Brzoska and Fröhlich, 2016). In the long term, as more people migrate away, they alleviate the pressures that drove them to migrate in the first place, and so additional outmigration could potentially decrease (Ibid). This supports Findlay and Geddes' (2011) conclusion that it would be preferable to investigate the degree to which environmental forces are contributing to existing mobility patterns, rather than exclusively research how individual environmental changes can produce new mobility patterns.

## Conclusion

In conclusion, this essay has identified and discussed the many challenges involved in predicting future levels of migration due to climate change. Broadly, these challenges include the unpredictability of migration, the unpredictability of climate change, and the complex relationship between migration and the environment. Mobility must be viewed as a multi-causal phenomenon, whereby environmental instability is but one of many factors that characterises migration. Thus, at the present time, it is very difficult to imagine one general theory that accurately measures the relationship between climate change and migration on a global scale. As a result, there is a need for more long-term quantitative studies that utilise a context-specific migration systems approach. Through this approach, we may be able to address the challenges associated with predicting future levels of migration due to climate change and produce more reliable migration predictions for the future. As the 21st century progresses and the magnitude of the threat posed by climate change remains uncertain, the value in better understanding the relationship between environmental change and migration has therefore never been more important.

## References

- Brzoska, M. and Fröhlich, C. (2016) *Climate change, migration and violent conflict: vulnerabilities, pathways and adaptation strategies*. *Migration and Development*, 5(2), 190-210.
- Burrows K, Kinney P. L. (2016) *Exploring the Climate Change, Migration and Conflict Nexus*. *International Journal of Environmental Research and Public Health*, 13(4), 443.
- Betts, R. A., Collins, M., et al. (2011) *When could global warming reach 4°C?* *Philosophical Transactions of the Royal Society A*, 369, 67–84.
- Castles, S. (2002) *Environmental change and forced migration: Making sense of the debate*. *New Issues in Refugee Research – UNHCR Research Paper No. 70*.
- Findlay, A. & Geddes, A. (2011) *Critical views on the relationship between climate change and migration: some insights from the experience of Bangladesh*. In: Pigué, E., Pecoud, A. & Guchteneire, P. (eds.) *Migration and Climate Change*, Cambridge, Cambridge University Press, 138-159.
- Gemenne, F. (2011) *Why the numbers don't add up: A review of estimates and predictions of people displaced by environmental changes*, *Global Environmental Change*, 21S, S41-S49
- Gleick, P. H. (2014) *Water, Drought, Climate Change, and Conflict in Syria*. *American Meteorological Society*, 6, 331-340.
- Gray, C. (2011) *Soil quality and human migration in Kenya and Uganda*. *Global Environmental Change*, 21 (2), 421–430.
- IPCC (2014) *Climate Change 2014: Synthesis Report*. Core Writing Team, Pachauri R.K. and Meyer L.A. (eds.), IPCC, Geneva, Switzerland. Available online: <http://www.ipcc.ch/report/ar5/syr/> [Accessed on 27 October 2018].
- Khondker, H. H. (2011) *Role of the New Media in the Arab Spring*. *Globalizations*, 8(5), 675-679.
- Kniveton, D., Smith, C. and Wood, S. (2011) *Agent based model simulations of future changes in migration flows for Burkina Faso*. *Global Environmental Change*, 21 (1). S34-S40.
- Massey, D., Axinn, W. and Ghimire, D. (2010) *Environmental change and out-migration: evidence from Nepal*. *Population and Environment*, 32 (2–3), 109-136.
- Morrissey, J. (2012) *Rethinking the 'debate on environmental refugees': From 'maximalists and minimalists' to 'proponents and critics'*. *Journal of Political Ecology*, 19(1), 36–49.
- Mueller, V., Gray, C., & Kosec, K. (2014) *Heat Stress Increases Long-term Human Migration in Rural Pakistan*. *Nature climate change*, 4, 182-185.
- Myers, N. (1997) *Environmental refugees*. *Population and Environment*, 19(2), 167–182.
- Myers, N. (2002). *'Environmental refugees: a growing phenomenon of the 21st century'*. *Philosophical Transactions of the Royal Society of London B*, 357, 609-613.

Nawrotzki, R. J., Hunter, L. M., Runfola, D. M. & Riosmena, F. (2015) *Climate change as a migration driver from rural and urban Mexico*. Environmental Research Letters, 10(11), 1-9.

Nevins, J. (2007). *Dying for a cup of coffee? Migrant deaths in the US-Mexico border region in a Neoliberal age*. Geopolitics, 12(2), 228-247.

Piguet E. (2010) *Climate and Migration: A Synthesis*. In: Afifi T., Jäger J. (eds) Environment, Forced Migration and Social Vulnerability, Berlin & Heidelberg, Springer, 73-85.

Piguet, E. (2013) From “Primitive Migration” to “Climate Refugees”: *The Curious Fate of the Natural Environment*. Migration Studies in Annals of the Association of American Geographers, 103(1), 148-162.

Rebetez, M. (2011) *The main climate change forecasts that might cause human displacements*. In: Piguet, E., Pecoud, A. & Guchteneire, P. (eds.) Migration and Climate Change, Cambridge, Cambridge University Press, 37-48.

Renaud, F. Dun, O. Warner, K. Bogardi, J. (2011) *A decision framework for environmentally induced migration*. International Migration, 49(S1), e5-e29.

Reuveny, R. (2007) *Climate change – Induced migration and violent conflict*. Political Geography, 26, 656–673.

Stern, N. (2006) *The economics of climate change – The stern review*. Cambridge, Cambridge University Press.

The Government Office for Science (2011) *Foresight: Migration and global environmental change*. London. Available online: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/287717/11-1116-migration-and-global-environmental-change.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/287717/11-1116-migration-and-global-environmental-change.pdf) [Accessed on 26 October 2018].

United Nations, *Paris Agreement* (2015) Available online: [https://unfccc.int/sites/default/files/english\\_paris\\_agreement.pdf](https://unfccc.int/sites/default/files/english_paris_agreement.pdf) [Accessed on 27 October 2018].

WGBU (2007) *World in Transition: Climate Change as a Security Risk*. Available online: <https://www.wbgu.de/en/flagship-reports/fr-2007-security/> [Accessed on 31 March 2019].



# Demographic, Socio-Economic and Contextual Correlates of Life Satisfaction

*Lucy Thompson, Fourth year Geography*

**Abstract – When striving for a healthier and happier society it is important to understand individuals’ life satisfaction. This research assesses several demographic, socio-economic and contextual correlates of life satisfaction using data from the UK Household Longitudinal Study. The percentage of individuals satisfied with their life varies substantially among different population groups. Logistic regression models show the odds of reporting positive life satisfaction are higher for individuals who are older, employed or retired, partnered or widowed, healthy, socially integrated and satisfied with their neighbourhood, compared with the other categories in these variables. Importantly, when controlling for the other variables, sex, ethnicity, educational attainment and parenthood status are found to be insignificant correlates. This study is the first to assess a range of potential correlates to better understand life satisfaction among the UK population.**

## Introduction

This research aims to understand whether a range of demographic, socio-economic and contextual factors are correlated with life satisfaction. Previous research has explored many correlates of life satisfaction. However, this will be the first study to incorporate a wide range of variables and assess their marginal effects on life satisfaction among adults in the United Kingdom, using a cross-sectional dataset from the UK Household Longitudinal Study. This analysis will use a nested multivariate logistic regression model, with positive or negative life satisfaction constituting the binary outcome. It is hypothesised that positive life satisfaction has several demographic, socio-economic and contextual correlates. Generating greater understanding of the correlates is vital to enable policy measures to support wellbeing to be appropriately targeted at people experiencing lower rates of life satisfaction.

## Literature Review

### Life Satisfaction

Life satisfaction, subjective wellbeing (SWB) and happiness all reflect how individuals view their own lives but have subtly different meanings. Veenhover (2011) proposes that life satisfaction reflects how individuals view their lives over the long term, whereas SWB and happiness measures represent a more transient feeling. Many secondary datasets measuring social

inequalities ask people to rate their lives using one of these subjective measures (Hart et al, 2017). Life satisfaction can be described as a single measure which shows an individual’s evaluation of their “conditions based on their unique expectations, values and previous experiences” (Diener et al, 1999: 277). While this lack of objectivity could be viewed as problematic, arguably this makes these measures especially valuable.

Due to this complexity, the determinants of life satisfaction are still poorly understood (Veenhover, 2011). Diener et al (1999) highlighted that personality is a significant correlate, with optimistic individuals reporting higher life satisfaction. This could be attributed to a person’s outlook on life facilitating personal happiness, or a tendency to generously score their own wellbeing. Geographers are particularly well-placed to explore the role of context on individuals reported life satisfaction. Generally, people live in ‘pursuit of happiness’ and therefore individuals’ ability to work towards their goals within their context is likely to be an important predictor of life satisfaction (Luhmann and Hennecke, 2017).

### Individual characteristics

Some existing research has attempted to quantify the role of a range of characteristics in determining life satisfaction. Collette (1984) reported insignificant differences between life satisfaction among men and women. However, Kambhampati et al (2011) found that the determinants of life satisfaction were different between the sexes, making it an important control variable. This study also found that the determinants were different for people of different ages. Age can also be associated with other factors, such as income and health, and was therefore included in analysis. Longitudinal research conducted by Realo and Dobewall (2011) in Eastern European and Scandinavian countries evidenced a curvilinear association between age and life satisfaction, with people experiencing lowest life satisfaction during the middle years of their life. Ethnicity has also been found to be an important variable, with minority groups experiencing lower life satisfaction (Knies et al, 2016). In the British context, this equates to non-white individuals being disadvantaged in terms of life satisfaction. Knies et al (2016) found several mediating factors through which this relationship operates. Individuals who are part of an ethnic mi-

nority group are at greater risk of being unemployed and are more likely to have poor social networks, which have been found to affect life satisfaction.

Studies have found that socio-economic status – a widely used marker of an individual’s position within society – is also associated with life satisfaction. This is typically indicated by variables showing educational attainment, occupation and income (Duncan et al, 2002). Diener et al (1999) reported a small statistically significant relationship between an individual’s educational attainment and their wellbeing, which is likely to affect life satisfaction. Previous research has also indicated a strong relationship between health and life satisfaction among adults. Diener et al (1999) suggest that the relationship between life satisfaction and health is complex given its bi-directional causal nature. Poor health makes life more challenging and could limit engagement with society, which makes life less satisfying for many people. However, individuals who report poor life satisfaction might be more likely to view their health poorly, making the association a product of subjective attitudes rather than a ‘real’ association.

### **Contextual factors**

All individuals live within a unique context, which is shaped by many elements of their life, including their home and family circumstances. For children, important influences include parental characteristics and siblings. For adults, partnership and parenthood status usefully identify differences in individuals’ family context. Wilson (1967) found that married individuals reported higher wellbeing. Wider context is also important and being unpartnered is most strongly associated with lower wellbeing in countries with family-orientated societies, such as Italy (Diener et al, 1999). A positive association between number of children and life satisfaction was observed for married individuals in Britain (Angeles, 2010). However, the effect of parenthood on life satisfaction is debated in the literature and there are contradictory findings. A widely cited review paper by McLanahan and Adams (1987) reported that parents generally have lower wellbeing than non-parents. Pollmann-Schult (2014) highlights that empirical papers published since this review also support this conclusion. However, the positive influence of parenthood on life satisfaction can be temporary, peaking around the time of birth (Myrskylä and Margolis, 2014).

The community within which people live is another important context. An individual’s satisfaction with

the social and physical characteristics of their area can be significantly associated with their life satisfaction (Sirgy and Cornwell, 2002). Social interaction within their community is also important (Brown et al, 2015; Hart et al, 2018). The significance of residential context specifically is highlighted by several papers (Sirgy and Cornwell, 2002; Shields and Wooden, 2003; Shields et al, 2004). Shields and Wooden (2003) point out that there are issues with the subjectivity of neighbourhood satisfaction, as individuals who view their neighbourhood negatively are more likely to view their lives negatively.

### **Data and Methods**

The dataset used for this analysis is the UK Household Longitudinal Study (UKHLS), also known as the Understanding Society study, which assesses social and economic change across the UK (UKHLS, 2018). It is a longitudinal dataset which has collected data annually since 2009. This analysis uses the Teaching Dataset, which is a cross-sectional subset of the third wave collected over 2011 and 2012 (King-Hele, 2014). These data were collected through a combination of interviews and self-completed surveys resulting in a total sample size of 45,903 (King-Hele, 2014). Given that some self-completed variables were included in the analysis, the `c_indscub_xw` weight was applied. This weight accounted for the sampling strategy and made the data representative of the population.

The key binary outcome variable used in this analysis was life satisfaction. In the questionnaire, respondents were asked to rate their satisfaction with life overall on a scale from completely dissatisfied to completely satisfied (University of Essex, 2017). This was recoded into a binary variable by excluding all the values in the central ‘neither satisfied nor dissatisfied’ category and grouping those who stated they were somewhat, mostly and completely satisfied/dissatisfied. Those who did not specify an answer were excluded.

The dataset contains a wide range of variables which could account for whether individuals have positive or negative life satisfaction. The twelve variables were chosen on the basis of the literature discussed above. Many of the variables were recoded prior to analysis to exclude missing values and group into fewer, meaningful categories. The final sample size was 24,452 once individuals with a missing value for one of the chosen variables were excluded.

Given there was a curvilinear relationship between age and positive life satisfaction, the continuous vari-

able was recoded into a categorical variable with ten-year categories. Additionally, individuals younger than thirty and older than eighty-nine were excluded. Eighteen ethnic groups were recoded into five, according to the groupings used in the survey questionnaire (University of Essex, 2017). The variable showing individuals' highest qualification level was recoded from six categories to four. Similarly, individuals' current economic activity was recoded into five main categories and values were excluded if they did not fit into one of these categories. Self-reported health was also included, using the existing categories. To account for family structure, partnership status was recoded into four categories and parental status was included in its existing binary form. The correlation of social integration and neighbourhood satisfaction with life satisfaction was assessed by the inclusion of three dichotomous variables. These were whether an individual goes out to socialise, is a member of an organisation and their satisfaction with their neighbourhood. An index variable was also created to show satisfaction with local services representing the role of institutional elements of their neighbourhood on satisfaction specifically. Four variables showing ratings of their local primary school, medical, leisure and public transport services were used to create an additive variable scoring overall rating of services as poor, fair and excellent.

This study used a logistic regression model to assess the odds of being satisfied with life for individuals in each category for twelve independent variables. The distribution of individuals who reported satisfaction and dissatisfaction with life across the categorical variables was calculated. Bivariate analysis was then conducted to assess whether the covariates showed a statistically significant association with life satisfaction, and therefore contributed to explaining the outcome distribution. The other assumptions of logistic regression were also checked prior to conducting the regression analysis. A series of five nested logistic regression models were constructed, incrementally including more variables which could account for individuals' life satisfaction. The odds ratios show the odds of positive life satisfaction for individuals in a category in relation to the reference category. However, this is not comparable with other variables, or between models, so predicted probabilities were calculated to quantify the probability of reporting positive life satisfaction. Goodness of fit tests were conducted to assess the model fit, and to confirm the explanatory power of the variables that were included in the models. Sensitivity analysis

was used to check the robustness of the analysis.

## Results

### Descriptive Analysis

Overall, 81% of the sample reported positive life satisfaction. The distribution of these individuals among different groups can be seen in Table 1, and Pearson's chi2 values confirmed that all the variables were significantly associated with life satisfaction ( $p < 0.001$ ), apart from sex ( $p = 0.63$ ). However, sex was kept in analysis to ensure that none of the observed relationships were confounded by sex differences. Theory and bivariate analysis were used to justify the inclusion of these independent variables. Two-way contingency tables and Pearson's chi2 values were calculated showing that none of the variables were too closely correlated to be included independently in the analysis. Additionally, each of the variables were coded to ensure no categories contained fewer than thirty values. The one assumption of logistic regression which could not be checked was that the variables are measured without error. This analysis uses an existing secondary dataset, and this was beyond the scope of the project. Additionally, many variables are subjective and therefore cannot be objectively measured.

### Regression Analysis

The nested logistic regression models in Table 2 show

	Satisfied (%)	Dissatisfied (%)	Total (%)	Sample Size
<b>Sex</b>				
Male	81.2	18.8	100.0	11,169
Female	80.7	19.3	100.0	14,523
Total	80.7	19.1	100.0	25,692
<b>Age</b>				
30-39	80.1	19.9	100.0	5,411
40-49	77.3	22.7	100.0	6,204
50-59	76.6	23.4	100.0	5,152
60-69	84.5	15.5	100.0	4,945
70-79	89.1	10.9	100.0	2,962
80-89	88.2	11.8	100.0	1,018
Total	80.9	19.1	100.0	25,692
<b>Ethnic group</b>				
White	81.7	18.3	100.0	22,730
Mixed	76.4	23.6	100.0	313
Asian / Asian British	76.4	23.6	100.0	1,586
Black / African / Caribbean / Black British	72.6	27.4	100.0	906
Other Ethnic Group	72.2	27.8	100.0	151
Total	80.9	19.1	100.0	25,686
<b>Highest qualification</b>				
Degree level	83.9	16.2	100.0	9,881
School exams	79.5	20.5	100.0	9,418
Other qualification	78.1	21.9	100.0	2,731
No qualifications	78.7	21.3	100.0	3,662
Total	80.9	19.1	100.0	25,692
<b>Economic activity</b>				
Employed	82.0	18.0	100.0	14,845
Unemployed	61.1	39.9	100.0	1,011
Retired	87.2	12.8	100.0	7,291
Looking after family or home	77.7	22.3	100.0	1,544
Long-term sick or disabled	38.7	61.3	100.0	886



Total	80.9	1.1	100.0	25,577
<b>Self-rated health</b>				
Excellent	88.2	11.8	100.0	4,265
Very good	86.5	13.5	100.0	9,108
Good	81.8	18.2	100.0	7,059
Fair	70.9	29.1	100.0	3,817
Poor	46.3	53.7	100.0	1,443
Total	80.9	19.1	100.0	25,692
<b>Partnership status</b>				
Single	70.0	10.0	100.0	2,579
Partnered	83.3	16.7	100.0	18,866
Separated	71.5	28.5	100.0	2,526
Widowed	85.1	14.9	100.0	1,717
Total	80.9	19.1	100.0	25,688
<b>Parent</b>				
Yes	82.9	17.1	100.0	8,874
No	79.9	20.1	100.0	16,818
Total	80.1	19.1	100.0	25,692
<b>Go out socially</b>				
Yes	82.4	17.6	100.0	22,415
No	70.6	29.4	100.0	3,277
Total	80.9	19.1	100.0	25,692
<b>Member of an organisation</b>				
Yes	83.9	16.1	100.0	14,915
No	76.7	23.2	100.0	10,777
Total	80.9	19.1	100.0	25,692
<b>Likes present neighbourhood</b>				
Yes	82.0	18.0	100.0	24,479
No	59.2	40.8	100.0	1,191
Total	80.9	19.1	100.0	25,670
<b>Satisfaction with local services</b>				
Poor	71.7	28.3	100.0	2,209
Fair	81.8	18.2	100.0	14,408
Excellent	83.3	16.7	100.0	4,346
Total	81.0	19.0	100.0	20,963

Table 1: Distribution of sample across each variable included in analysis.

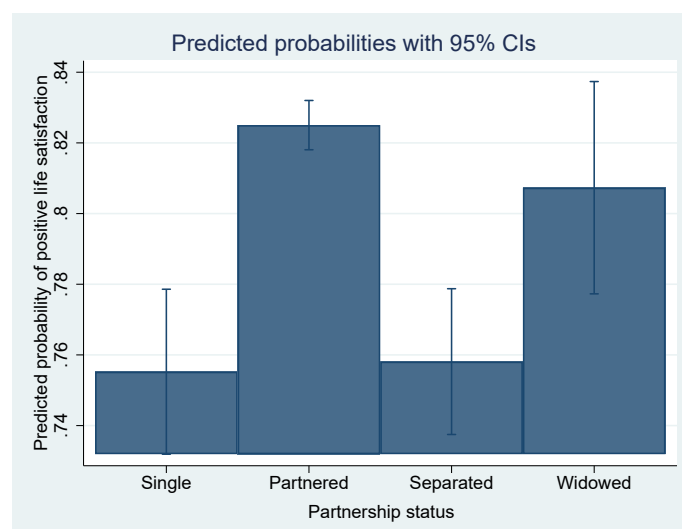
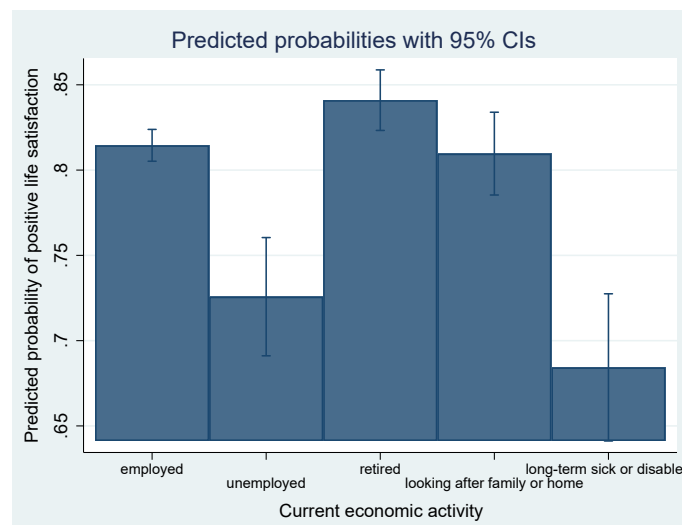
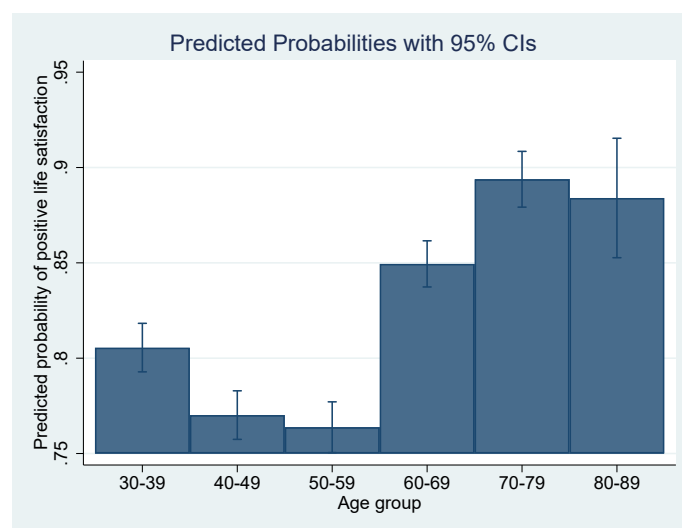
that the odds of reporting positive life satisfaction vary substantially between people in different categories. Groups of variables were added incrementally from Model 1 (base model) to Model 5 (full model).

	Satisfied (%)	Dissatisfied (%)	Total (%)	Sample Size
<b>Sex</b>				
Male	81.2	18.8	100.0	11,169
Female	80.7	19.3	100.0	14,523
Total	80.7	19.1	100.0	25,692
<b>Age</b>				
30-39	80.1	19.9	100.0	5,411
40-49	77.3	22.7	100.0	6,204
50-59	76.6	23.4	100.0	5,152
60-69	84.5	15.5	100.0	4,945
70-79	89.1	10.9	100.0	2,962
80-89	88.2	11.8	100.0	1,018
Total	80.9	19.1	100.0	25,692
<b>Ethnic group</b>				
White	81.7	18.3	100.0	22,730
Mixed	76.4	23.6	100.0	313
Asian /Asian British	76.4	23.6	100.0	1,586
Black/African/Caribbean/Black British	72.6	27.4	100.0	906
Other Ethnic Group	72.2	27.8	100.0	151
Total	80.9	19.1	100.0	25,686
<b>Highest qualification</b>				
Degree level	83.9	16.2	100.0	9,881
School exams	79.5	20.5	100.0	9,418
Other qualification	78.1	21.9	100.0	2,731
No qualifications	78.7	21.3	100.0	3,662
Total	80.9	19.1	100.0	25,692
<b>Economic activity</b>				
Employed	82.0	18.0	100.0	14,845
Unemployed	61.1	39.9	100.0	1,011
Retired	87.2	12.8	100.0	7,291
Looking after family or home	77.7	22.3	100.0	1,544
Long-term sick or disabled	38.7	61.3	100.0	886

Table 2: Logistic Regression table showing the odds ratios (OR) and standard errors (SE) for variables in each of the five models: Model 1: demographic control variables, Model 2: +socio-economic variables, Model 3: +family variables, Model 4: +social integration variables, Model 5: +neighbourhood satisfaction variables.

The results from the full model (Model 5 in Table 2) were converted into predicted probabilities to enable

quantifiable comparisons to be made. The predicted probabilities were graphed, and where there was a statistically significant difference in reporting positive life satisfaction between variable categories are shown in Figure 1 and Figure 2. Overlapping confidence intervals showed an insignificant difference between reported life satisfaction in the different categories for the other four variables. These were sex, ethnicity, highest qualification and parenthood status. This is also indicated by the odds ratios shown in Table 2.



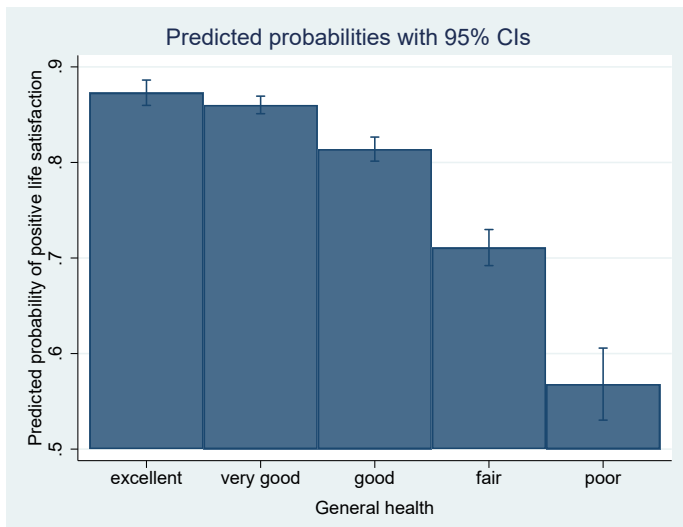


Figure 1: Graphs showing the predicted probabilities of positive life satisfaction for individuals across four demographic, socio-economic and family variables which show statistically significant differences.

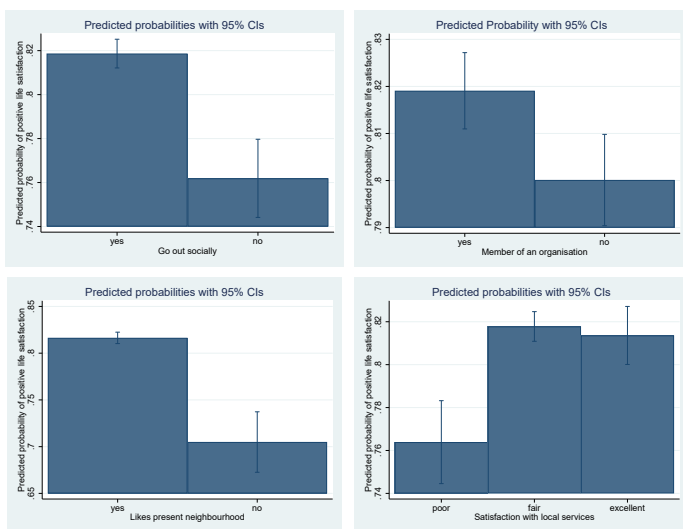


Figure 2: Graphs showing the predicted probabilities of positive life satisfaction for social integration and neighbourhood satisfaction variables.

### Model Fit

The model fit was tested using the goodness of fit statistic, though technical issues meant the weight could not be applied to this analysis. The results showed that the full model fitted the data better ( $p < 0.001$ ) than the base model ( $p = 0.27$ ). This proves that the independent variables included in the models significantly account for the distribution of positive life satisfaction among the sample.

### Sensitivity Analysis

The models were repeated to ensure that the results were not attributable to the coding of the outcome variable. The central 'neither satisfied nor dissatisfied' category was grouped into the satisfied and dissatisfied categories respectively, and it was found that this change in coding did not notably change

the results. Additionally, the parameters of the additive index showing satisfaction with local services were changed, and this did not alter the significance or pattern of association with the outcome.

### Discussion

The results support the hypothesis that satisfaction with life is correlated with demographic, socio-economic and contextual factors. Table 2 shows that differences in the odds ratios between men and women, and parents and non-parents remain small and insignificant through all the models, even when controlling for other factors. While the bivariate analysis showed a statistically significant relationship between ethnicity and highest qualification, and life satisfaction, the strength of this association diminished when other variables were controlled for. There were no statistically significant differences in the predicted probabilities for people in different ethnic and educational categories in the full model. This suggests that the initial difference can be accounted for by differences in other variables. For example, in the base model, the odds of an individual belonging to the Black/African/Caribbean/Black British ethnic group reporting positive life satisfaction are 32% lower ( $p < 0.001$ ) than for White individuals. However, the odds reduce to 22% lower ( $p < 0.05$ ) than White British in the full model when a range of variables are accounted for. The most substantial change in the odds ratio is between models 2 and 3 suggesting that this ethnic group has lower odds of reporting positive life satisfaction than ethnically White individuals due to differences in partnership status. This supports the findings of Knies et al (2016), which suggest that ethnicity affects life satisfaction through several mediating factors.

The other eight variables show statistically significant associations with life satisfaction when controlling for all the other variables displayed in Table 1. As shown by Figure 1, there are significant differences in life satisfaction between the different age groups. This matches the finding that people in early and mid-adulthood have poorer life satisfaction than older people (Realo and Dobewall, 2011). People in their 70s and 80s have almost twice the odds of reporting positive life satisfaction than people in their 30s, with a predicted probability of individuals reporting positive life satisfaction of almost 0.9 for the two oldest age groups. The results show that the odds of people who are employed, retired or not working due to looking after their home or family reporting positive life satisfaction are significantly higher. These situations could be viewed as more 'positive'

than being unemployed or out of work due to long-term sickness or disability and could help meet the human desire for purpose in life, consequently promoting satisfaction with life. However, there is potential for reverse causality as negative life satisfaction could be inhibiting potential to work, linking this to unemployment. Disparities between individuals with different partnership statuses were also found, with the odds of single or separated individuals reporting positive life satisfaction being much lower than for partnered or widowed individuals. This indicates that being partnered is correlated with greater life satisfaction in the UK. The high probability (0.81) that widowed individuals will report positive life satisfaction could be attributed to the fact that individuals have to have been married to be widowed and this generally enriches people's lives (Wilson, 1967). The large confidence interval could be explained by the variable effect of widowhood on life satisfaction depending on age, as suggested by Diener et al (1999).

A very strong gradient is evident between self-rated health and life satisfaction. The odds of an individual who rates their health as poor reporting positive life satisfaction are 83% lower than someone who rates their health as excellent. However, given both these variables are subjective, there could be other factors involved as people who view their life negatively overall may also view their health negatively. Paoletti et al (2006) find that people with a tendency to worry typically report lower life satisfaction as their perception of their day-to-day life is poorer. Correspondingly, they found that people with greater optimism and higher self-esteem report higher life satisfaction, regardless of other characteristics. This is not considered in this study and could account for some of the association between health and life satisfaction.

Figure 2 shows the predicted probabilities of people reporting positive life satisfaction based on their response to questions about their social integration and satisfaction with their neighbourhood. As expected, based on research by Hart et al (2018), going out socially and being a member of an organisation was significantly associated with life satisfaction, with a predicted probability of 0.82 for individuals who engaged with either of these activities. This suggests that social integration within society enriches people's lives, contributing to positive life satisfaction. Additionally, the perspective gained by interacting with people could contribute to an enhanced view of their own life as some others are likely to be worse off. Neighbourhood satisfaction is also important, as

shown by the odds of people who are satisfied with their neighbourhood reporting satisfaction with life overall being twice as high as those who are dissatisfied with their neighbourhood. However, these are all subjective variables and could be subject to the bias, previously discussed in relation to health.

This analysis is limited to drawing correlations between variables and life satisfaction. However, use of longitudinal data would allow causal relationships to be analysed and determine whether these variables promote positive life satisfaction, or if there is reverse causality. The inclusion of a variable to control for personality, such as tendency to worry, would introduce an additional element to this research and account for individuals with a negative outlook on their health, neighbourhood and life overall. The use of subjective variables was valuable for answering the research question as they captured individuals' unique perception of their surroundings. However, introducing objective measures, such as neighbourhood crime rates, would complement these subjective variables. An interesting extension to this study would be to explore individuals' characteristics in relation to those living around them (in their family or neighbourhood) and assess whether their relative situation is a significant determinant of life satisfaction.

## **Conclusion**

The odds of reporting positive life satisfaction are higher for individuals who are older, employed or retired, partnered or widowed, healthy, socially integrated and satisfied with their neighbourhood. These patterns suggest that individual and contextual characteristics could be determinants of life satisfaction, though causality can only be theorised. This analysis found that sex, ethnicity, educational attainment and parenthood status were insignificant correlates, when the other variables were controlled for. This study complements existing research showing that there are several demographic, socio-economic and contextual correlates of life satisfaction for adults in the UK. Geographers contribute a valuable perspective by considering the importance of context for individuals' lives. This study adds to a body of literature which can inform effective policy and initiatives to promote overall life satisfaction.

## References

- Angeles, L. (2010) 'Children and Life Satisfaction' *Journal of Happiness Studies*, 11(4), p.523-538.
- Brown, J. L., MacDonald, R. and Mitchell, R. (2015) 'Are people who participate fully in cultural activities more satisfied with life?' *Social Indicators Research*, 122, p.135-146.
- Collette (1984) 'Sex Differences in Life Satisfaction: Australian Data' *Journal of Gerontology*, 39(2), p.243-245.
- Diener, E., Suh, E. M., Lucas, R. E. and Smith, H. L. (1999) 'Subjective Well-Being: Three Decades of Progress' *Psychological Bulletin* 125(2), p.276-302.
- Duncan, G. J., Daly, M. C., McDonough, P. and Williams, D. R. (2002) 'Optimal Indicators of Socioeconomic Status for Health Research' *American Journal of Public Health*, 92(7), p.1151-1157.
- Hart, E. A. C., Lakerveld, J., McKee, M., Oppert, J., Rutter, H., Charreire, H., Veenhoven, R., Bárdos, H., Compernelle, S., De Bourdeaudhuij, I., Brug, J. and Mackenbach, J. D. (2018) 'Contextual correlates of happiness in European adults' *PLoS ONE*, 13(1), p.1-17.
- Kambhampati, U., Guista, M. D. and Jewell, S. (2011) 'Gender and Life Satisfaction in the UK' *Feminist Economics*, 73(3), p.1-34.
- King-Hele, S. (2014) 'Understanding Society Wave 3, 2011-12: Teaching Dataset – User Guide' *UK Data Service*, Version 1.0.
- Knies, G., Nandi, A. and Platt, L. (2016) 'Life Satisfaction, Ethnicity and Neighbourhoods: Is There an Effect of Neighbourhood Ethnic Composition on Life Satisfaction?' *Social Science Research*, 60, p.110-124.
- Luhmann, M., and Hennecke, M. (2017) 'The motivational consequences of life satisfaction' *Motivation Science*, 3(1), p.51-75.
- McLanahan, S, and Adams, J. (1987) 'Parenthood and Psychological Well-Being' *Annual Review of Sociology*, 13, p.237-257.
- Myrskylä, M. and Margolis, R. (2014) 'Happiness: Before and After Kids' *Demography*, 51(5), p.1843-1866.
- Paolini, L., Yanex, A. P. and Kelly, W. E. (2006) 'An Examination of Worry and Life Satisfaction Among College Students' *Individual Differences Research*, 4(5), p.331-339.
- Pollmann-Schult, M. (2014) 'Parenthood and Life Satisfaction: Why Don't Children Make People Happy?' *Journal of Marriage and Family*, 76(2), p.329-336.
- Realo, A. and Dobewall, H. (2011) 'Does life satisfaction change with age? A comparison of Estonia, Finland, Latvia, and Sweden' *Journal of Research in Personality*, 45(3), p.297-308.
- Shields, M. and Wooden, M. (2003) 'Investigating the Role of Neighbourhood Characteristics in Determining Life Satisfaction' *Melbourne Institute of Applied Economic and Social Research*, Melbourne Institute Working Paper No. 24/03.
- Shields, M., Wheatley Price, S. and Wooden, M. (2004) 'Life satisfaction and the economic and social characteristics of neighbourhoods' *Journal of Population Economics*, 22, p.421-433.
- Sirgy, M. J. and Cornwell, T. (2002) 'How Neighbourhood Features Affect Quality of Life' *Social Indicators Research*, 59, p.79-114.
- University of Essex (2017) 'UK Household Longitudinal Study, Mainstage Questionnaire, Wave 3' Available at: [https://www.understandingsociety.ac.uk/sites/default/files/downloads/documentation/mainstage/questionnaire/wave-3/Understanding\\_Society\\_Wave\\_3\\_Questionnaire\\_v03.pdf?q=bb854fdf4c4b0873cbff562f3ebae7619fbe48f5](https://www.understandingsociety.ac.uk/sites/default/files/downloads/documentation/mainstage/questionnaire/wave-3/Understanding_Society_Wave_3_Questionnaire_v03.pdf?q=bb854fdf4c4b0873cbff562f3ebae7619fbe48f5) (Accessed: 19/11/18)
- UK Household Longitudinal Study (UKHLS) (2018) 'About the Study' Available at: <https://www.understandingsociety.ac.uk/about/about-the-study> (Accessed: 21/11/18)
- Veenhoven, R. (2011) 'Happiness: Also Known as "Life Satisfaction" and "Subjective Well-Being" in Land, K. C., Michalos, A. C. and Sirgy, M. J. (ed.) *Handbook of Social Indicators and Quality of Life Research*, p.63-77.
- Wilson, W. R. (1967) 'Correlates of avowed happiness' *Psychological Bulletin*, 67(4), p.294-306.



# A Critical Analysis of a Post-9/11 Interview with Delila Young-Ali

*Luke Fiveash, Fourth Year Geography*

**Abstract** – This article is a critical review of an interview transcript between Delila Young-Ali and a journalist, James Ridgeway. The analysis demonstrates Delila’s active construction of the terrorist as the ‘Other’, following the wrongful imprisonment of her husband, Said, during the immediate aftermath of the 9/11 attack. This neatly relates to constructions of the ‘good’ and ‘bad’ Muslim. Said is a ‘good’ Muslim in relation to, and opposition of, the terrorist. This article demonstrates the motivations behind why Delila distances her husband, Said, from the portrayal of a terrorist. This includes an overriding sense of victimisation, which percolated through to themes of patriotism, identity, marriage, religion as well as judicial inequality. The importance of analysing both physical lexicon and the interview structure for knowledge production is revealed. It is, however, hoped that whilst this article does serve to unveil the significance of both, it also demonstrates the importance of not over-analysing every detail for some strain of theoretical significance; that no approach is a one-size-fits-all and theory can at times obfuscate the truth through rose-tinted glasses.

## Introduction

A semi-structured interview conducted by James Ridgeway with Delila Young-Ali was chosen for analysing the ‘geographies of difference’<sup>1</sup>. The interview covers Delila’s experience of the wrongful imprisonment of her husband, Said Ali, on terrorism-related charges shortly after 9/11. This concerns the moment of his arrest through to his eventual release, 105 days later. Rather than identifying and comparing thematic differences and similarities across multiple primary sources, this critical analysis first reveals the construction of difference through the flow of the interview, before analysing Delila’s language in alluding to different forms of ‘Othering’. No contextual information is given regarding the purpose of the interview, when and where it was conducted, and who James Ridgeway is. This would have provided a deeper level of analysis by situating the interview. That said, this critical analysis examines four separate quotes and covers themes of vic-

timisation, patriotism, identity, marriage, and the legal system. Although not the basis of this analysis, reference is made to wider academic literature. This includes the docility of patriotism<sup>2</sup>, cultural perspectives of Islam as a political category<sup>3</sup>, and debates regarding an ‘impending’ clash of civilisations<sup>4</sup> or indeed ignorance of such propensity for violence<sup>5</sup>.

## Interview Structure

James asked Delila twenty-seven questions covering topics such as the night of her husband’s arrest, friend and familial support, contact with federal agents, the judicial process, and Delila’s attitude towards the U.S. The structure of the interview allowed Delila to emphasise her responsiveness and resistance to shaping and re-shaping the context of her life. By enabling Delila to express her personal experiences and inner emotions, James ultimately became empathetic towards her sense of victimisation, which eroded the initial impartiality of the interview. In other words, the construction of difference between James and Delila gradually lessened. This is shown through the imperative opening statement, “Say my name is...”<sup>6</sup>, which establishes not only the formality of the interview process but also the detachment of the interviewer. James assumed command of the interview and Delila responded in subordinated fashion, immediately revealing an uneven power dynamic and an accompanying differentiation between interviewer and interviewee. The tone subsequently shifted to become more interrogative through the question, “Did you ever talk to any federal agent?”<sup>7</sup>, before James reassured Delila near the end of the interview with remarks such as, “I know it’s really hard to do this stuff”<sup>8</sup>, and, “You’re not cold? You are cold?”<sup>9</sup>. Indeed, James asked an increasing number of questions around the topics he felt more empathetic towards. As

2 Puar, Jasbir K., Rai, Amit S. “Monster, Terrorist, Fag: The War on Terrorism and the Production of Docile Patriots.” *Social Text* 72(3) (2002): p.117

3 Mamdani, Mahmood. “Good Muslim, Bad Muslim: A Political Perspective on Culture and Terrorism”, *American Anthropologist* 104(3) (2002): p.766

4 Huntington, Samuel. “The Clash of Civilizations?” *Foreign Affairs* 72(3) (1993): p.22

5 Said, Edward. “The Clash of Ignorance” *Nation* 273(12) (2001): p.11

6 Ridgeway, p.1

7 Ridgeway, p.6

8 Ridgeway, p.11

9 Ridgeway, p.11

1 Ridgeway, James. “Acting Patriotic Collection September 11 Digital Archive: Interview with Delila Young-Ali Conducted by James Ridgeway”. Available at: <http://911digitalarchive.org/items/show/2937> (Accessed: 11/12/18)

a result, the interview structure was determined by his emotional response to Delila's comments, hence James didn't interview at-a-distance and became heavily involved in the co-production of knowledge.

### First Quote

*"Your call has ended and say good-by. And then that was it for speaking with the attorney. And at that point he kept telling me to, you know, that I shouldn't be in...in the house"*<sup>10</sup>

Firstly, Delila is referencing the construction of difference through the investigators' presence at her house. Here, Delila is denied permission to speak to her husband's attorney and to stay in her own house, as a search is undertaken to find incriminating evidence against her husband, Said. The repetition of "and" at the start of each sentence demonstrates the way in which Delila was directed in a controlled fashion from one piece of information to the next as a passive receptor to the investigators. The forcefulness of her treatment is revealed when she must "say good-by", implying there was no possibility for hesitation to the investigators' orders without repercussions, thus intensifying the extremity of her isolation. This extremity is illustrated through her repetition of "in...in the house", emphasising her shock at being denied access to not only her own house, but to the personal belongings inside. The utmost obedience is exacted of Delila, who is assumed to have the capability to adhere accordingly, and yet at the same time the refusal to permit her access to her own home infantilises her as a defenceless homeowner to the investigators' instruction. As a result, there is a paradox at the heart of her subordination to the investigator's authority. This served to differentiate Delila as a potentially destructive individual and emboldened the sense of righteousness imbued by the investigators who felt they were taking the necessary precaution to ensure the sanctity of their investigation.

### Second quote

*"We were more patriotic than most of the people beforehand and here they are accusing my husband of doing something...being part of something that is just evil just because of who he is"*<sup>11</sup>

During this section of the interview, Delila constructs difference through the relationship between evilness and patriotism. Delila's reference to patriotism emboldens her sense of victimisation at her husband being accused of terrorism. In particular, Delila distances herself and Said from these activities through the use of the adjectival modifier "just",

<sup>10</sup> Ridgeway, p.1

<sup>11</sup> Ridgeway, p.3-4

which ensures the evilness of terrorism is unquestionably monstrous. Indeed, because Said is accused "of doing something...", Delila censors her own speech to outlaw terrorist activities as fundamentally "Other", in order to distance both her husband and herself from this portrayal. However, by imbricating herself in the production of the terrorist as "just evil", Delila inadvertently perpetuates a resultant docile patriotism. From this, those who are deemed "evil" to the patriotic citizen should be disciplined in order to prevent future security threats to the patriot. Indeed, Delila's auntie suggested the investigators would not have interrogated Said "if he wasn't somehow guilty"<sup>12</sup>, causing Delila to become repulsed by "the prejudice of my family, like my...my aunt who said that horrible thing"<sup>13</sup>. Delila, then, contributes towards promulgating the presence of an "evil Other", but becomes frustrated by the consequences of a resultant docile patriotism, especially in the context of her own family. Indeed, as Puar and Rai suggest, the docility of patriotism legitimised an anti-immigrant agenda that sought to materially and psychically prevent any further contamination of the American nation<sup>14</sup>. This is precisely the narrative that contributed towards heightened law enforcement efforts against Indians, Arabs and Muslims throughout America post-9/11, and which Delila found her family entangled in. Delila further references the construction of difference through the theme of identity. The phrase "just because of who he is" refers to the underlying prejudicial discrimination Delila believes is at the heart of the investigation into her husband. Implicit is the notion that Said's identity is principally shaped by an unchanging cultural, religious and racial background that has become weaponised through an unmerited investigation. In other words, Said becomes a de-historicised and passive receptor of an identity he is expected to conform to. Arguably, the extent to which Said conforms to "who he is" determines whether or not he is a 'good' or 'bad' Muslim, through the transformation of religious experience into political categories<sup>15</sup>. Inevitably, these political categories are hierarchically organised with the 'good' Muslim allowed to engage in a pluralistic society, while the 'bad' Muslim is interrogated and ultimately quarantined in prison if found guilty. How Said conforms to being a 'good' or 'bad' Muslim is demonstrated through his public and political behaviour. In this instance, purchasing a flight simulator game for his son combined with a family trip to the World Trade

<sup>12</sup> Ridgeway, p.5

<sup>13</sup> Ridgeway, p.9

<sup>14</sup> Puar and Rai, p.136

<sup>15</sup> Mamdani, p.767

Centre, were deemed sufficient for the Assistant District Attorney, Whitman Knapp, to call an investigation into Said's conduct. Indeed, these seemingly innocent actions were deemed non-innocent given the sense of heightened patriotism following 9/11.

### Third quote

*"What terrorist is going to marry an American? What terrorist is going to marry...at that time I was a Christian-American. I wasn't Muslim. I converted...converted to...to Islam...like, three or four years after I married my husband on my own will"*<sup>16</sup>

Nearing the end of the interview, Delila demonstrates the construction of difference within the context of marriage and identity. She uses rhetorical questions such as, "What terrorist would marry an American?" in order to speak for the terrorist, who becomes disempowered because we are left with Delila as the legitimate author. Through her generalised portrayal, Delila constructs the identity of the terrorist in relation to, and ultimately for, her husband's identity which is to be viewed as diametrically opposed to that of the terrorist's. Delila states her husband cannot be implicated in terrorism because of the willingness he showed to marry a Christian American, something she believes a terrorist would fundamentally not do as she "wasn't Muslim". By establishing her husband's identity in opposition to that of the terrorist, Delila produces these identities as fixed, bounded and binary. The terrorist's identity therefore becomes a homogenous screen through which Delila paints her narrative. Indeed, having differentiated between her husband and the terrorist, Delila further essentialises this difference through a dichotomised system of representation and intensified schematisation, later suggesting all terrorists are "militants"<sup>17</sup> who "hate Americans"<sup>18</sup>. By defining the identity of her husband as the opposite of the terrorist's, Delila is therefore able to demonstrate the futility of the investigation into his conduct, and further a narrative of victimisation. The identity of the terrorist becomes not only passive but de-historicised, in the same sense Delila earlier felt Said's identity was de-historicised and used against him regarding the Assistant District Attorney's willingness to investigate him. Delila's decision to convert to Islam is sensitive, as shown through the repetition of "converted" and her emphasis on independently deciding to become Muslim through "my own will". She challenges any notion of the entirety of Islam being wholly antagonistic to the West, even if a terrorist would never

16 Ridgeway, p.7

17 Ridgeway, p.8

18 Ridgeway, p.8

marry a Christian-American. After all, Delila and her husband are both American patriots and Muslim, which counters any naturalisation of difference between Western and Islamic civilisations. Indeed, if Islam was antagonistic then the decision to convert would have been forced, and would not have taken "three or four years". As Edward Said suggests in his rebuttal of Samuel Huntington's Clash of Civilisations, both identities and civilisations are composed of myriad currents and counter-currents than animate history and are not sealed-off entities combatting one another<sup>19</sup>. Delila independently moved from her Christian-American identity to a Muslim-American one and retained her patriotism.

### Fourth Quote

*"Meanwhile, they're withholding evidence just to prove a point: just to have this man spend a hundred and five days in a population of thirty people"*<sup>20</sup>

It was recently suggested that the future test of democracies is to not just win the support of the majority, but to also not lose the support of the minority so that a single political community prevails<sup>21</sup>. Unfortunately, from Delila's perspective the authorities kept Said in jail "just to prove a point" by "purposefully withholding evidence". Delila therefore believes there to be a vindictive injustice at the heart of the judicial system, causing her family to become 'Othered' through the transformation of courtroom proceedings into an on-going spectacle. Indeed, Delila quotes a judge as saying Said's incarceration was "ridiculous"<sup>22</sup>, and yet he remained "cautious because of what happened in September 11th"<sup>23</sup>. The sensitivity of the judicial system to the political climate therefore intensified the sense of injustice felt by Delila. Moreover, the "purposeful" withholding of information suggests Delila has already lost faith in a judicial system she believes no longer represents the interests of her family. Hence, she feels 'Othered' by the statutory bodies of the country she otherwise felt patriotic towards.

### Conclusion

This critical analysis has evaluated both the interview's structure and Delila's language in constructing difference. The topics covered in the semi-structured interview were determined by James's empathy; accounting for this has made this analysis more reflexive and transparent. Beneath the themes of patriotism, identity, marriage, religion and the legal system lay

19 Said, p.12

20 Ridgeway, p.7

21 Mamdani, p.774

22 Ridgeway, p.8

23 Ridgeway, p.8



a sense of victimisation which Delila consistently demonstrated on behalf of her family. Indeed, how this victimisation contributes to patriotism and the implications this has had for Delila and her family were revealed. Her comments touched on themes within wider academic debate including docility of patriotism and antagonism between civilisations. It is, however, important to not over-analyse each comment by placing them within an academic framework, because doing so can obscure the true meaning of the language used.

### References

Huntington, S., "The Clash of Civilizations?", in *Foreign Affairs*, Vol. 72(3), (1993).

Mamdani, M., "Good Muslim, Bad Muslim: A Political Perspective on Culture and Terrorism", in *American Anthropologist*, Vol. 104(3), (2002).

Puar, JK., Rai, AS., "Monster, Terrorist, Fag: The War on Terrorism and the Production of Docile Patriots", *Social Text*, in Vol. 72(3), (2002).

Ridgeway, J., "Acting Patriotic Collection September 11 Digital Archive: Interview with Delila Young-Ali Conducted by James Ridgeway". Available at: <http://911digitalarchive.org/items/show/2937> (Accessed: 11/12/18).

Said, E., "The Clash of Ignorance", in *Nation*, Vol. 273(12), (2001).

# Should geographers be alarmed about current trends in economic inequality?

*Benjamin Linter, Second Year Modern History*

**Abstract – This paper is prompted by the discourse that the growing gap between the poorest and richest in society is an increasing problem. The essay looks to explain how inequalities are created, where they exist in our society and why inequalities are perceived as negative. Firstly, Wales is used as a case study to investigate inequalities compared to other regions in the UK. Secondly, inequalities within Wales itself are explored. Wales is one of the poorest regions by GDP in Western Europe, so provides an interesting example to study inequalities. The analysis shows that there is economic inequality between Wales and many other regions in the UK, but interestingly shows that inequality within Wales is lower than any other region in the UK. This discovery challenges the idea that geographers should be alarmed by inequality and suggests that poverty should be more of a priority.**

There are numerous interpretations of what inequality can be defined as. One such definition is that inequality is the state of not being equal in terms of rights, opportunities, status, or wealth. Inequality can focus on aspects such as gender and ethnicity, but the main focus of this essay will be economic inequality. The Equality Trust (2017) defines inequality using the three main types of economic inequality: income inequality, pay inequality, and wealth inequality. It is important to study inequalities because they are at the heart of the idea of fairness and social justice. Many people believe that inequality is unfair, especially economically, and this idea of fairness and equality is at the fore of politics right now. In general, inequalities are falling on an international scale, but this is widely associated with increasing inequalities within nations (McCann, 2016). This essay will consider inequality on a regional scale, both between regions and within them, with a focus on Wales and the UK generally, to see whether geographers should be alarmed about current trends in economic inequality.

Firstly, to try and understand why and where these inequalities originate, we can look at different factors and economic theories. In the 1950s and '60s, the leading economic thought on why there was regional inequality was neo-classical convergence. This theory maintains that economic development relies on the free market, and that the state should adopt a free market regime and provide the pub-

lic goods (Wei, 2015). Current regional inequality is due to temporary disequilibrium between supply and demand, according to the neo-classical convergence theory. With efficient markets and factor mobility, regional inequality will lessen in the long term, with regions converging together (Wei, 2015).

However, contrary to this are the diverging economic theories such as Marx's political economy theory. This argues that regional inequality is a necessary precondition for capital accumulation. Regions and countries have cores which benefit from the periphery, as the peripheries provide reserves of labour and markets necessary for capitalism (Wei, 2015). This school of thought implies that state actions maintain and intensify regional inequality as they want capital accumulation. State governments are always looking to build up wealth, rather than focusing on regional inequalities. Therefore, wealth creation becomes their priority, leaving regional inequalities in the background.

This is further supported by the idea that state policies often play little role in regional inequality, because the macroeconomic policies offset those put in place by regional governments. For instance, in Wales, there were complaints at the local level of government that the practice of policy agreements had veered away from the local governments themselves, becoming a "hypothecation under another name" (JRF, 2017). Uniform targets are being established rather than ones that might vary from authority to authority, with each individual authority's best interests at heart. However, to deviate from this divergence model, regional governments must be strong. For example, the USA federal system means that there is strong local government which can help reduce spatial inequality. This idea is called 'New Regionalism', which emphasises capability of decentralised institutions to enable resurgence of local economies, to try and catch up with the 'wealthier' regions. A stronger regional government has more power to control the levels of inequality within that region. (Pike, Rodríguez-Pose and Tomaney, 2017). There is a middle way that combines diverging and converging economic theories, in the way of the Kuznets inverted U-model. Here, it is said that regional inequality rises during the early stages of development, as a region transitions from an agricultural society to an industrial society, but will fall once

the economy matures. It is then easier to intervene with policies to further lessen regional inequality, such as the welfare state. Due to the idea of convergence with a downward trajectory towards equality without any fluctuations or bumps, this theory does not appear to accommodate for prosperous regions that have been and are now characterised by a combination of job loss and declining labour force participation, which is another reason for economic inequality (Iammarino, Rodriguez-Pose and Storper, 2018). This is the case in the South Wales Valleys, where a significant proportion of men worked in the coal industry. When the industry was shut down by Margaret Thatcher in the 1980s, these men lost their source of income, and found it difficult to find any work which matched their skillsets. The legacy of the pit closures can still be seen today in the South Wales Valleys, as the area has a very high number of people claiming out of work benefits (National Assembly of Wales, 2015). The disagreements of scholars and multiple theories highlight the complexities and dynamics of inequality.

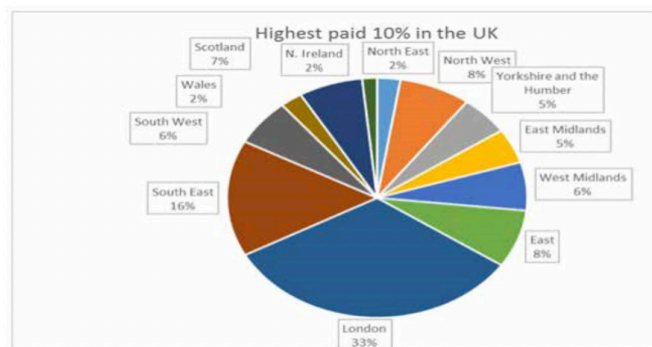
This part of the essay will look at the figures which help to see and analyse the extent of inequality in regions across the UK. Before this, looking at the UK we can see that there is a significant amount of inequality between the least wealthy 10% and the wealthiest 10% of the population. The bottom 10% have an average income of just £9,644, compared to £83,875 for the top 10%; this is nine times that of the lowest 10%. The richest 1% have incomes of, on average, £235,827, which is even significantly higher than the top 10% (Equality Trust, 2017). As well as considering overall trends of inequality across the UK, it is also vital to consider these issues at a regional scale. According to the Equality Trust (2013), as seen in Figure 1, Wales had the lowest annual pay of any region in Great Britain, with a median percentile annual pay of £19,537. Unsurprisingly, the region with the highest median annual pay was Lon-

Figure 2: Annual pay at the 10th Percentile, Median and 90th Percentile by region (2013)

Region	10 <sup>th</sup> percentile	Median	90 <sup>th</sup> Percentile
UK	£6,824	£21,905	£47,913
North East	£6,665	£19,902	£40,981
North West	£6,824	£20,520	£43,619
Yorkshire and the Humber	£6,523	£20,208	£41,621
East Midlands	£6,655	£20,466	£43,120
West Midlands	£6,665	£20,634	£44,035
East	£6,244	£21,413	£46,200
London	£9,009	£30,479	£72,459
South East	£6,549	£22,743	£50,934
South West	£5,940	£19,978	£42,647
Wales	£6,792	£19,537	£40,349
Scotland	£7,187	£21,586	£44,291

(Figure 1: Equality Trust, 2013)

Figure 4: Proportion of workers in the highest 10% of earners, by region (2013).



(Figure 2: Equality Trust, 2013)

don, at £30,479 (Equality Trust, 2013). This means the average person in London makes £10,942 more than the average person in Wales, whilst Wales also lags £2,368 behind the overall UK average. The North East of England has a very similar median annual pay to Wales; in this region, it is only £365 higher. The closest competitor of London for the top spot is the South East, which has a median percentile annual pay of £22,743.

Figure 2 shows how economic inequality can further be analysed by investigating in which regions of the UK the highest paid 10% live. Wales, for instance, has just 2% of the top 10% earners within it. This is, once more, the lowest number, shared with the regions of North East England and Northern Ireland. The South East and London boast 49% of the top 10% earners, with London having 33% alone (Equality Trust, 2013). This means that London has over 24 times the amount of top 10% earners compared to Wales. These statistics and comparisons help to show the extent of the inequalities between Wales and other regions in the UK. From the data, it is easy to see that Wales is a region suffering from these inequalities, languishing at the bottom of all wealth tables.

However, looking into inequality within Wales paints a slightly different picture. Even though Wales suffers from inequality when compared to other regions in the UK, it seems to be the most equal region in the UK. In Morelli and Seaman's (2007) paper on devolution and inequality, they demonstrate that Wales has a Gini Coefficient of 0.33560. The Gini coefficient summarises inequality data with a score of 1, meaning all wealth is held by one person, whilst a score of 0 means all wealth is equally shared. This is the lowest Gini Coefficient of all regions in the UK, strongly indicating that Wales has the lowest level of inequality within it. The region with the highest Gini coefficient – therefore indicating the highest level of inequality – was South England, which also happened to have the highest annual income. This shows that the region with the highest average income was

the most unequal, whilst the poorest region, Wales, was the most equal (Morelli and Seaman, 2007). Does this suggest that geographers should be more alarmed with questions of poverty than inequality? Wales as a region has the least inequality of any region in the UK, but poverty in Wales is higher than the UK average (National Assembly of Wales, 2015).

In order to contextualise issues of inequality, it is vital to consider the reasons for its negative image. Inequality has consequences such as increases in crime, reductions in health, increased political inequality and reduced levels of education. Firstly, there is empirical data supporting the assertion that inequality leads to increased rates of crime (Birdsong, 2015). The main explanation for these trends is that some in society may feel resentment and hostility towards those who are in a better economic position than they are, thus driving them towards criminal activities as a means of channelling this resentment. Also, those who commit crimes feel as though there are less lawful ways of obtaining scarce resources and therefore turn to crime.

Secondly, there can be negative impacts upon health. One reason for this is that those at the poorest end of the spectrum have limited availability to healthcare or healthy food. Many feel that they cannot afford healthy food which is more expensive than foods high in fat and sugar, leading to conditions such as obesity and the further negative impacts which this has upon a person's health. The wealthier in society can also afford private healthcare in the UK, which gives them access to a higher level of healthcare which the poorest cannot afford.

Thirdly, political inequality can increase due to economic inequalities. This is because the small number of people who hold the majority of the wealth have a greater influence upon government, in terms of incentives used to manipulate individuals legally or even through corruption (Birdsong, 2015). Finally, another implication of regional inequality is the reduction in educational attainment in some areas. In wealthier regions more money can be invested in the education system and those with greater wealth can afford to send their children to private schools. Poorer regions tend to have worse education systems due to underfunding, and the poorest cannot afford private school education.

There are ways to reduce regional inequalities through policy making. The most popular idea amongst geographers in this respect seems to be tax reform. Atkinson (2017) believes that income tax should be raised

with an initial rate of 25%, intermediate rates of 35-55% and a top rate of 65%, which is 20% more than it currently is for this bracket. Through this increased tax, it is then possible to distribute wealth amongst the different regions of the UK. This will then help to converge the poorer and richer regions. However, this does come with problems such as perceptions of fairness. Is it fair to take so much money away from someone who has worked hard for it in order to benefit those who do not work as hard? Alternately, is it fair that someone can earn obscene amounts of money, whilst someone who is unfit to work suffers in poverty?

Furthermore, raising the minimum wage is another policy to try and lessen inequalities between regions in the UK. Atkinson (2017) proposes bringing the minimum wage up to the current estimates of what a living wage would be. This idea could be improved further by adjusting minimum wages in certain regions to bring them closer to the richer regions. This would lessen the inequality between regions in the UK but may have a negative impact on inequality within a region.

In conclusion I believe that geographers should be alarmed at current trends in inequality, but a focus on poverty should be a priority. Inequality does have negative implications such as increased crime rates and poorer health, but I believe these problems can be fixed by tackling poverty head-on rather than focussing on inequality. For example, Wales, according to Monelli and Seaman (2007) is the most equal region in the whole of the UK. However, Wales suffers from also having the lowest average annual pay and having poverty levels above the national average. I believe that the problems of health and crime can be resolved by bringing people out of poverty. As long as the poorest are raised out of poverty, then the gap between the richest and poorest is of less concern.

## References

- Atkinson, A.B. (2017) Reducing poverty and inequality through tax-benefit reform and the minimum wage: the UK as a case-study. *The Journal of Economic Inequality* 2017
- Birdsong, N. (2015) The consequences of economic inequality. Seven Pillars Institute. <http://sevenpillarsinstitute.org/consequences-economic-inequality/>
- Equality Trust (2013) A Divided Britain? Inequality within and between regions.
- Equality Trust (2017) How is Economic Inequality Defined? <https://www.equalitytrust.org.uk/how-economic-inequality-defined>

Equality Trust (2017) The Scale of Economic Inequality in the UK.

<https://www.equalitytrust.org.uk/scale-economic-inequality-uk>

Iammarino, S. Rodriguez-Pose, A. and Storper, M. (2018). Regional inequality in Europe: evidence, theory and policy implications. *Journal of Economic Geography* pp. 1–26.

Jeffrey, C. (2002). Devolution: Challenging local Government? *Joseph Rowntree Foundation*.

Morelli, C. and Seaman, P. (2007) Devolution and Inequality: A Failure to Create a Community of Equals? *Transactions of the Institute of British Geographers*.

National Assembly of Wales (2015). *Inquiry into Poverty in Wales: Poverty and Inequality*

Pike, A. Rodríguez-Pose, A. and Tomaney, J. (2017). Shifting horizons in local and regional development. *Regional Studies* 51(1). pp 46-57

Wei, Y. (2015). Spatiality of regional inequality. *Applied Geography*. pp 61. 1-10.

# How Alarming is Regional Inequality in the UK to the Geographer?<sup>0</sup>

*Geraint Morgan, Second Year Medieval History*

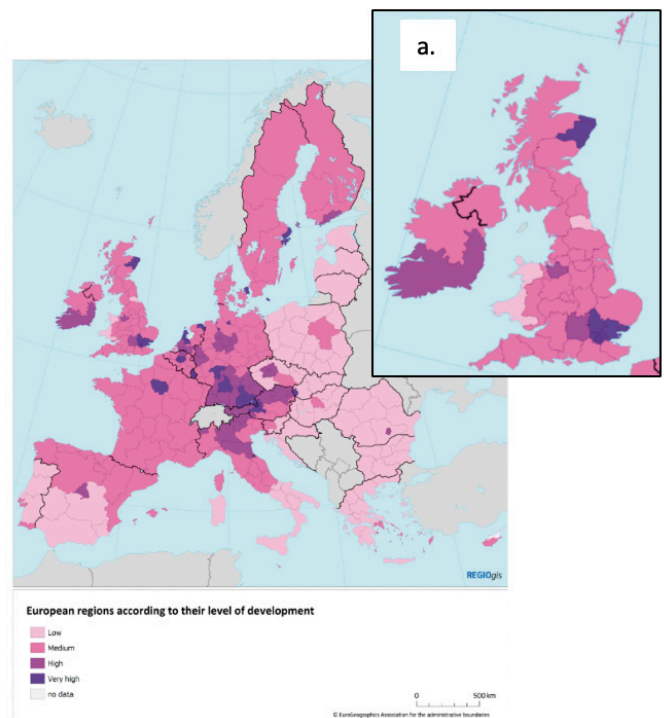
**Abstract – Regional inequalities within the United Kingdom have long been a subject of discussion and debate. However, in recent decades they have intensified, and become shaped on both a social and spatial axis. This article attempts to show how the growth in these inequalities is the result of neoliberal economic policies, and how this economic age ushered in by the Thatcher government has created a new political landscape. The author attempts to use a range of statistics, drawn both from literature and publicly available government sources to demonstrate the growth of these inequalities, and to provide a topic of conversation for both policy makers and geographers.**

In the years following the financial crisis of 2008/09, interest in the nature of inequalities created by modern neo-liberal capitalism has been on the increase (Wei, 2015). Inequalities exist at a range of scales, from the interpersonal to the international, with levels of inequality reaching historic highs in many countries and continuing to rise (Wei, 2015; World Inequality Lab, 2018). Though inequalities discussed in the press are at population or global scales (e.g. one report found that the richest 1% held half of the world's wealth (Neate, 2017)), some of the most persistent and overlooked inequalities exist between regions within developed countries such as the United Kingdom (Dorling and Hennig, 2016). Though the 'regional problem' has been a subject of interest from the 1920s (Hudson 2013), the increasing disparity which has developed between regions in various metrics has made this 'problem' particularly problematic, and perhaps even alarming in recent years.

This essay will consider the evidence for and factors driving regional inequalities at the national scale within the UK, before considering the extent of concern this should cause geographers and policy makers.

Evidence of regional inequality within the UK is significant and presents itself in a range of datasets. Perhaps the most obvious of these is the proportion of income taken by different regions within the UK. Based upon ONS (2017) (See Appendix 1 a.) provisional figures for 2017 earnings, London's weekly earnings were 138.3% (to 1 decimal place) of the na-

tional average<sup>1</sup>, compared with the average earnings of 90.5% of the national average outside of the South East of England. This is a divide which has grown over the last 35 years: in 1982 the average earnings in London were 'only' 121% of the national average (Duranton and Monastiriotis, 2002). These trends show a significant divergence in the economies of London (and its satellites) and the rest of the UK.



*Figure 1 - Regions by GDP per Capita level relative to EU average. Low <75% of EU average, Medium 75-119%, High 120-149%, Very High >150%. From (Iammarino et al., 2018). Insert a. showing enlarged British Isles. GDP per capita across Europe was €30,000 (Eurostat, 2018)*

This is repeated in other metrics. In 2014 the total value of housing in the three Northern Regions of England (Yorkshire & Humberside, the North East, and the North West) was worth considerably less than the housing stock in Greater London (Dorling and Hennig, 2016). Gross Domestic Product (GDP) per capita is the standard metric for economic development, both at the national and regional scale (Iammarino et al., 2018). The development disparity between differ-

<sup>0</sup> I would like to thank my peer reviewers for their cogent contribution to this article, as well as the editors of the Journal, without whom this article wouldn't have its present eloquence.

<sup>1</sup> Compare to average living costs of 119.9% of the national average (ONS, 2018 [A])(Appendix 1b).

ent regions within the UK can be shown by considering GDP per capita relative to the European average of €30,000 (Eurostat, 2018) (Figure 1). Figure 1 a. shows the extreme variation between some areas of the North and Wales with low levels of economic development, compared with London and parts of the South East which enjoy very high levels of economic development. In common with most European countries the main divide is between capital cities and periphery regions. Dorling and Henning (2016) also highlight inequalities in less traditional areas of focus. One of particular focus was the level of support for cultural activities in London and the rest of the country. Whilst London's position as capital city does mean that arts funding might be expected to be greater, the level of disparity has increased significantly over recent decades. Arts Council England funding outside of London per head of population in 2012/13 was 17.8% of total spend (compared with 19.6% in 1980/81), and when combined with the Department of Culture Media and Sport's direct support for cultural organisations, the rest of England received 6.6% of London for the arts per head in 2012/13 (Dorling and Henning, 2016). Regional inequalities in income, economic development and cultural activities are strongly evident in both the literature and from statistical sources. However, this level of inequality within Britain remains a relatively recent development: in the 1960s Britain was one of the most equitable countries in Europe, but now lags behind many other major and successful European economies (Dorling and Henning, 2016).

Whilst Britain has long had a 'regional problem' of a disparity in economic development between different regions, the turning point in the development of two decoupled economies within Britain arguably came after 1979, with the election of the Thatcher government (Hudson, 2013). Whilst previous 'one nation' government policy had sought to constrain regional inequalities within 'acceptable' limits, new neo-liberal approaches considered inequalities as an inevitable part of the healthy functioning of capitalism (Hudson, 2013). In addition to this, global economic restructuring from the 1960s led to manufacturing being offshored to lower wage economies, making the traditional manufacturing economy of the North of England more vulnerable than more innovative and specialised Southern industries when capital export controls were removed after 1979 (Hudson, 2013). Additionally, nationalised industries (e.g. National Coal Board and British Steel) which came under increasing pressure from government under the Thatcher ministry to 'rationalise' their production and close 'uneconomic'

units, often in single-industry communities such as the South Wales Valleys producing long term unemployment and economic stagnation (Hudson, 2013). Unemployment remains high in these regions; for example 5.7% in Merthyr Tydfil (ONS, 2018 [C]) compared to the national average of 4% (ONS, 2018 [B]). Even where new industries did replace the old, such as with the Nissan plant in Sunderland (unemployment currently at 5.6% (ONS, 2018 [C])), they had smaller work forces with more flexible working practices than the heavy industry they replaced (Hudson, 2013).

In contrast, London and the South East benefited both from government investment in infrastructure, and

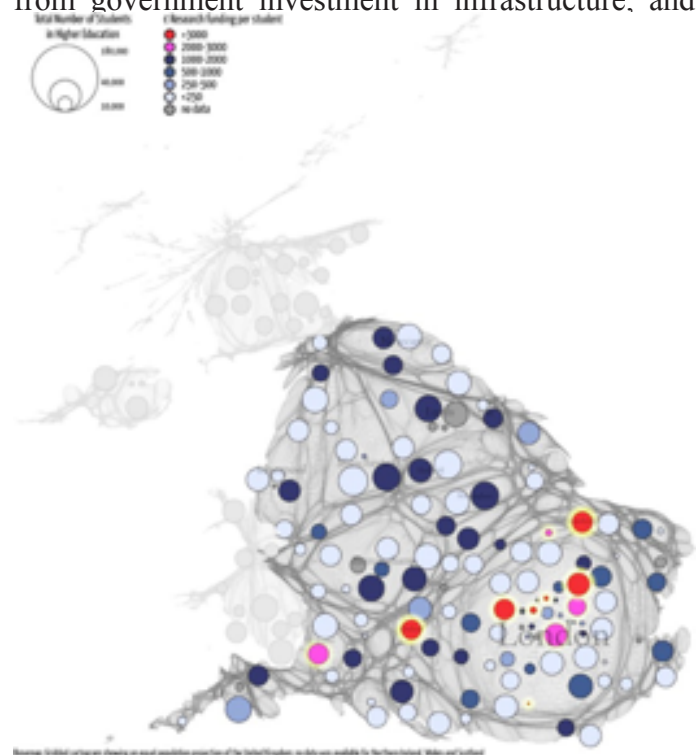


Figure 2 - Distribution of university research funding (determined by Quality of Research) per student. Colours represent funding level, and circle size represents student population. Equal population projection base map. (From Dorling and Henning, 2016).

from governmental focus on enhancing London's position as a global centre for financial services (Hudson, 2013). Additionally, government 'Research and Development', and its funding for university research, became increasingly concentrated in South Eastern England helping to develop high skilled employment (Hudson 2013)– a trend that still exists as shown by the distribution of government funding to universities in Figure 2 (Dorling and Henning, 2016). Though political change in 1997 did bring some change in the way of regional policy, much of the recovery in employment was driven by the public sector (half of new jobs under the Blair premiership were financed by the public sector (Fraud et al., 2016)) and private

sector employment in low paid, part-time roles (e.g. in call centres) (Hudson 2013), highly vulnerable to both economic crises and changing government policy, as seen following the 2008 financial crisis.

There remains a great deal of controversy over the amount of concern which needs to be associated with the inequality which currently exists. As highlighted by Iammarino et al. (2018), the issue is not particularity whether or not there is absolute equity within economies, 'but rather whether [an] economy is spreading prosperity or concentrating it' (p.3). Traditional neoclassical economics usually argue that regional inequalities are not a significant policy concern, as diminishing returns (increasing rents, wages, congestion etc.) to the concentration of economic activity into prosperous regions make peripheral regions more attractive, leading to the convergence of development, through diffusion of economic activity (Wei, 2015). However, since the 1980s this has not occurred as the development of service-based economies have compounded the advantages of agglomeration, producing further regional divergence (Iammarino et al. 2018). To some extent it has been argued that this regional divergence is a price worth paying for the increased productivity and innovation associated with urban centres (Iammarino et al. 2018). Studying regional earnings inequalities in the UK between 1982 and 1997, Duranton and Monastiriotis (2002) concluded that since the inequalities they identified were principally associated with variations in levels of education in the workforce, 'there is no large labour market unfairness across U.K. Regions' (p.248), without questioning why workers in London had higher qualifications than those elsewhere. It has been suggested that though the concentration of knowledge production may lead to increased regional inequalities, the increased opportunities which innovation brings counterbalance this (Iammarino et al. 2018). However, evidence for this is weak and may run in two directions – multinational corporations act as both dispersers and concentrators of knowledge and innovation, making it difficult to assess the extent of impact that they have (Iammarino et al. 2018). Whilst these arguments do suggest that inequalities at the national scale should not be a source of alarm, they are not convincing, given that the economic history of the last 30 years have undermined their validity.

However, there are causes for alarm. As processes of agglomeration continue, regions with low GDP per capita levels in Europe, tend to have falling populations with stagnant or rising levels of unemployment (Iammarino et al., 2018). This is because

higher-skilled workers migrate to economic centres, leaving behind residual populations with low skill levels or skills which are no longer relevant to the local economy. Many moderately developed regional economies are also economically vulnerable, as deindustrialisation and skill mismatches put strains on the local employment market (Iammarino et al. 2018). Many regions within the North of England fall within this category, and whilst they do possess development potential, their economies remain fragile and have higher unemployment rates than the national average.

Another cause for alarm is the rapid rise in inequality in the UK over the last 50 years, as discussed above, and the associated social and cultural impacts. Perhaps the foremost example is the British vote to leave the European Union in June 2016. The stark economic polarisation that has developed has arguably been reflected in the political polarisation associated with Brexit, which is attributable to a failure to adequately distribute the benefits of a globalised and financialised economy (Boyer, 2016). These patterns of polarisation and inequality should be considered highly alarming.

How we measure national scale inequalities also needs addressing. Collecting economic data (such as GDP per capita) is relatively straight-forward and allows easy comparison of results between regions. However, it fails to show the equitability of these results within regions, which is required in order to develop policies which are socially as well as spatially equitable. Perrons and Dunford (2013) have created two indices to supplement GDP/capita or GVA (Gross Value Added, a regional equivalent of GDP) measures: RDI (Regional Development Index, similar to the UN's Human Development Index, HDI) and Gs-RDI (Gender-sensitive RDI), shown in Table 1. These new metrics present an interesting new perspective on regional development. London, the region with the highest GVA score and usually conceptualised as the most developed region in the UK, falls to 7th place using Perrons and Dunford's RDI. This represents the high level of disparity which exists within London, which is both the most prosperous region in Europe and brings up 41% of its children in poverty (Perrons and Dunford, 2013). London falls to the bottom of the listing for Gs-RDI, reflecting male dominance of professional and managerial roles, with women remaining at the lower end of the pay scale, producing more gendered development.

In contrast, whilst Wales might be the 'least developed' region according to GVA, what development it



<b>Region</b>	<b>GVA Ranking</b>	<b>RDI Ranking</b>	<b>Gs-RDI Ranking</b>
<i>London</i>	1	7	12
<i>South East England</i>	2	1	6
<b>Scotland</b>	3	5	4
<i>Eastern England</i>	4	3	7
<i>South West England</i>	5	2	9
<i>East Midlands</i>	6	4	10
<i>North West England</i>	7	9	5
<i>West Midlands</i>	8	10	11
<i>Yorkshire</i>	9	8	3
<i>North East England</i>	10	11	2
<b>Northern Ireland</b>	11	12	8
<b>Wales</b>	12	6	1

Table 1 – GVA, RDI and Gs-RDI (Adapted from Perrons and Dunford (2013, p. 493).

does have is significantly less gendered than in London (Welsh Gs-RDI score is 1). The loss of heavy industry in the 1980s completely reshaped the South Wales economy<sup>2</sup>, with a greater proportion of the workforce being in public sector and services employment, rebalancing the labour force in favour of women (Perrons and Dunford, 2013). This data is alarming, suggesting that the traditional approach of principally using economic data can lead to both skewed perceptions of inequalities and potentially misguided policy approaches.

To conclude, inequalities on the national scale within the UK have grown significantly over the last twenty years. Whilst to some extent this may be within the normal functioning of capitalism, there are causes for concern. This growth in inequality has been rapid and has bucked historic trends. Equally alarming is the formation of regions with high levels of skilled out-migration and low levels of employment, with existing employment being low-skilled and part-time. This creates a need for policies which are spatially sensitive, taking account of local conditions, as well as being sensitive to other externalities such as gender. Policies also need to encourage the dispersal of economic activity, whilst balancing the advantages of agglomeration for some industries. The regional inequalities in existence within the UK present a challenge to policy making; the dangers of creating an enduring ‘regional problem’ should be considered alarming.

<sup>2</sup> Which drives the statistics due to population distribution.

**Appendix 1 – Data from Office for  
National Statistics (\*columns/rows are calculated)**

**Appendix 1 a. – Average Weekly Earnings by Region**

*Table 2 - Average Weekly Earnings as a Percentage of National Average. (Adapted from: Office for National Statistics, 2017)*

<b>Description</b>	<b>Mean (£)</b>	<b>Annual percentage change</b>	<b>Percentage of National mean *</b>
<b>United Kingdom</b>	538.7	2.6	100
<b>Great Britain</b>	540.8	2.6	100.3898274
<b>England and Wales</b>	543.1	2.6	100.8167811
<b>England</b>	546.8	2.7	101.5036198
<i>North East</i>	483.3	3.7	89.71598292
<i>North West</i>	492.5	1.4	91.42379803
<i>Yorkshire and The Humber</i>	474.2	1.8	88.02673102
<i>East Midlands</i>	478.8	2.4	88.88063857
<i>West Midlands</i>	502.3	3.5	93.24299239
<i>East</i>	506.5	2.5	94.02264711
<i>London</i>	744.9	4.5	138.2773343
<i>South East</i>	554.1	0.9	102.858734
<i>South West</i>	476.8	1.6	88.50937442
<b>Wales</b>	469.6	1.0	87.17282346
<b>Scotland</b>	516.9	2.5	95.95322072
<b>Northern Ireland</b>	472.8	2.6	87.76684611
<b>*UK outside of London and South East Average</b>	487	N/A	90.47150548

**Appendix 1 b. – Average household expenditure by region**

*Table 3 - Average Household Expenditure by Region. (Adapted from: Office For National Statistics, 2018[A])*

<b>Region</b>	<b>Household expenditure (£)</b>	<b>% of average *</b>
<b>UK Average</b>	536.8	100
<b>England</b>	N/A	N/A
<i>London</i>	643.7	119.9143
<i>South East</i>	632.2	117.772
<i>East</i>	558.1	103.968
<i>South West</i>	535.5	99.75782
<i>East Midlands</i>	530.8	98.88227
<i>North West</i>	492.4	91.72876
<i>Yorkshire and The Humber</i>	489.7	91.22578
<i>West Midlands</i>	472.2	87.96572
<i>North East</i>	437	81.40835
<b>Wales</b>	458.7	85.45082
<b>Scotland</b>	492.3	91.71013
<b>Northern Ireland</b>	497.1	92.60432

## References

- Boyer, Robert 2016. 'Brexit: the day of reckoning for the neo-functional paradigm of the European Union' in 'Discussion Forum; Brexit: understanding the socio-economic origins and consequences', *Socio-Economic Review*, Vol. 14 No. 4 pp. 814-819.
- Dorling, Danny, and Henning, Benjamin D. 2016. 'London and the English desert - the Geography of cultural capital in the UK', *Cultural Trends*, Vol. 25:1, pp. 35-46.
- Duranton, Gilles, and Monastiriotis, Vassilis 2002. 'Mind the Gaps: The Evolution of Regional Earnings in the U.K., 1982-1997', *Journal of Regional Science*, Vol. 42 No. 2 , pp. 219-256.
- Eurostat 2018. 'Main GDP aggregates per capita', product code: nama\_10\_pc, Eurostat, [https://ec.europa.eu/eurostat/search?p\\_auth=nkjg6zlu&p\\_p\\_id=estatsearchportlet\\_WAR\\_estatsearchportlet&p\\_p\\_lifecycle=1&p\\_p\\_state=maximized&p\\_p\\_mode=view&\\_estatsearchportlet\\_WAR\\_estatsearchportlet\\_action=search&\\_estatsearchportlet\\_WAR\\_estatsearchportlet\\_collection=dataset&text=GDP+per+capita](https://ec.europa.eu/eurostat/search?p_auth=nkjg6zlu&p_p_id=estatsearchportlet_WAR_estatsearchportlet&p_p_lifecycle=1&p_p_state=maximized&p_p_mode=view&_estatsearchportlet_WAR_estatsearchportlet_action=search&_estatsearchportlet_WAR_estatsearchportlet_collection=dataset&text=GDP+per+capita) (accessed 18/10/2018).
- Fraud, Julie, Johal, Sukhdev, and Williams, Karel 2016. 'Multiple economies: before and after Brexit' in 'Discussion Forum; Brexit: understanding the socio-economic origins and consequences', *Socio-Economic Review*, Vol. 14 No. 4 pp. 814-819.
- Hudson, Ray 2013. 'Thatcherism and its geographical legacies: the new map of socio-spatial inequality in the Divided Kingdom' *The Geographical Journal*, Vol. 179 No. 4, pp. 377-381.
- Iammarino, Simona, Rodriguez—Pose, Andrés, and Storper, Michael 2018. 'Regional inequality in Europe: evidence, theory and Policy implications', *Journal of Economic Geography*, 'lby021', pp. 1-26.
- Neate, Rupert 2017. 'Richest 1% own half the world's wealth, study finds', *The Guardian* (14/11/2017), <https://www.theguardian.com/inequality/2017/nov/14/worlds-richest-wealth-creditsuisse> (accessed 18/10/2018).
- Office for National Statistics 2017. 'Dataset: Place of Work by Local Authority - ASHE: Table 7', *ONS*, <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/placeofworkbylocalauthorityashtable7> (accessed 18/10/2018).
- Office for National Statistics 2018 [A]. 'Statistical bulletin: Family spending in the UK: financial year ending 2017', *ONS*, <https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/expenditure/bulletins/familyspendingintheuk/financialyearending2017> (accessed 18/10/2018).
- Office for National Statistics 2018 [B]. 'Dataset: A01: Summary of labour market statistics', *ONS*, <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/datasets/summaryoflabourmarketstatistics> (accessed 18/10/2018).
- Office for National Statistics 2018 [C]. 'Dataset: M01 Regional labour market: Modelled unemployment for local and unitary authorities', *ONS*, <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/unemployment/datasets/modelledunemploymentforlocalandunitaryauthoritiesm01> (accessed 18/10/2018).
- Perrons, Diane, and Dunford, Robin 2013. 'Regional development equality and gender: Moving towards more inclusive and socially sustainable measures' *Economic and Industrial Democracy* Vol. 34 No.3 (2013), pp. 483-499.
- Pike, Andy, Rodriguez—Pose, Andrés, and Tomaney, John 2017. 'Shifting horizons in local and regional development', *Regional Studies*, Vol. 51 No. 1, pp.46-57.
- Wei, Yehua D. 2015. 'Spatiality of regional inequality', *Applied Geography*, Vol. 61, pp. 1-10.
- World Inequality Lab 2018. *World Inequality Report 2018*, <https://wir2018.wid.world/files/download/wir2018-full-report-english.pdf> (accessed 18/10/2018).

# **A critical assessment of the extent to which geographers should be alarmed about the current spatial trends of economic inequality throughout Glasgow**

*Bethany McDade, Second Year Geography and Sustainable Development*

**Abstract – Economic inequalities are prevalent in today’s society, and visible on all scales. However, this form of inequality can dictate other factors in a person’s life such as their health, their employment opportunities and their life expectancy. To investigate economic disparities and the impacts it has upon a region and its people, this small-scale study will focus on the post-industrialised city of Glasgow. The city has a history of industry, in particular shipbuilding, making it an interesting case study as economic inequalities have been pronounced and widespread throughout the area for decades. I will analyse the impact of Glasgow’s past industries through comparing wealthy and deprived areas of the city, discuss what is being done to narrow the economic gap and examine the reasons why geographers should be concerned about the spatial trends of economic inequality.**

## **Introduction**

Economic inequalities are defined as the unequal distribution of money to people within society, involving all scales from global to local. These disparities are clearest on a smaller local scale, of which the city of Glasgow is a key example. Glasgow has the highest population for a city in Scotland, making it one of the most diverse and recognisable regions. This size and diversity, however, leaves it open and vulnerable to inequalities. Throughout the city there is a significant gap between the rich and the poor, which can be traced back to Glasgow’s industrial past. Due to disparities present between wealth and deprivation, a set of other problems such as poor health, high mortality rates, poverty and unemployment are becoming increasingly prevalent. These issues become part of a negative feedback loop which leads to a lack of economic development within an area, and ultimately creates unequal opportunities. This should concern geographers greatly as, whilst attempts have been made to regenerate deprived parts of Glasgow, not enough has been done to help those in deprivation prosper. As geographers we need to get to the root of the issues to help deprived areas become more economically stable. Throughout this essay I will be exploring the current economic inequalities in Glasgow, what these means for the people living within the city, and what is being done to solve Glasgow’s economic inequalities.

## **Glasgow’s Industry & The Gorbals**

Glasgow owes a great deal of its economic success to the industry of shipbuilding. In its prime, Scotland was the ‘shipbuilder to the world,’ with the River Clyde being the centre point (Reid, 2013). Prior to the First World War, the Fairfield Shipyard in Govan employed over 70,000 workers, resulting in substantial economic success within the area, with many people having a sufficient income (Brocklehurst, 2013). This could be considered a time of greater equality as many people were working within the same industrial jobs whilst living in similar conditions. However, this all dramatically changed when the industries that had made Glasgow prosperous began to decline rapidly. A variety of factors can be held accountable for this deterioration, including a decline in the inner-city population, increased factory costs, and a greater degree of competition from foreign businesses (Keeble, 1978). This all contributed to a decrease in industrial work, which resulted in mass unemployment and ultimately sparked many inequalities which widened the gap in Glasgow between the wealthy and the economically deprived.

The effects of the decline in industry can still be observed today throughout Glasgow. An example of this is the Gorbals, located on the south of the River Clyde in the city. Problems began to arise in the area from the 1920s onwards, when the growing industry of shipbuilding resulted in many of the workers being forced to live nearby in the Gorbals. Whilst this caused mass overcrowding, poverty and shockingly inadequate public amenities, in a sense it made the people more equal as they were stuck in the same situation (Pendlebury, 2015). It was not until the 1990s that momentous change occurred within the Gorbals. The Crown Street Regeneration Project was a scheme that used advanced town planning techniques to redesign the Gorbals by incorporating more green spaces, modern buildings and pedestrianised areas (Pendlebury, 2015). The attempts to regenerate the area were relatively successful as it began the process of closing the gap between those in wealthy areas and those in deprived ones. Creating more high-condition areas reduced housing prices as there was a greater supply to meet the demand, thus narrowing the economic gap (Pendlebury, 2015).

Furthermore, the socio-economic segregation and

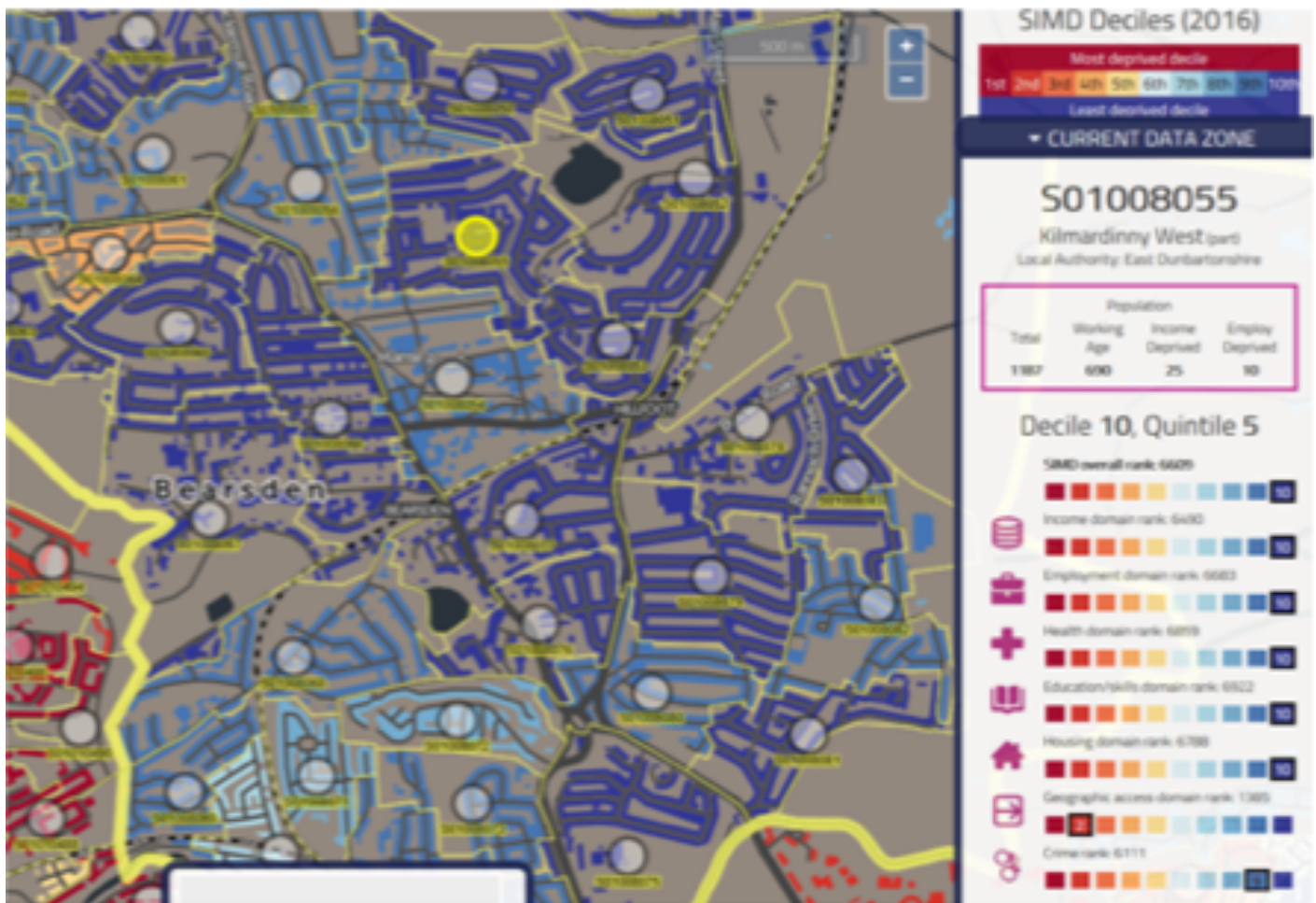


Figure 1: Wealth in Bearsden. From the Scottish Index of Multiple Deprivation, Scottish Government, scale 1:500. (2016). [online].

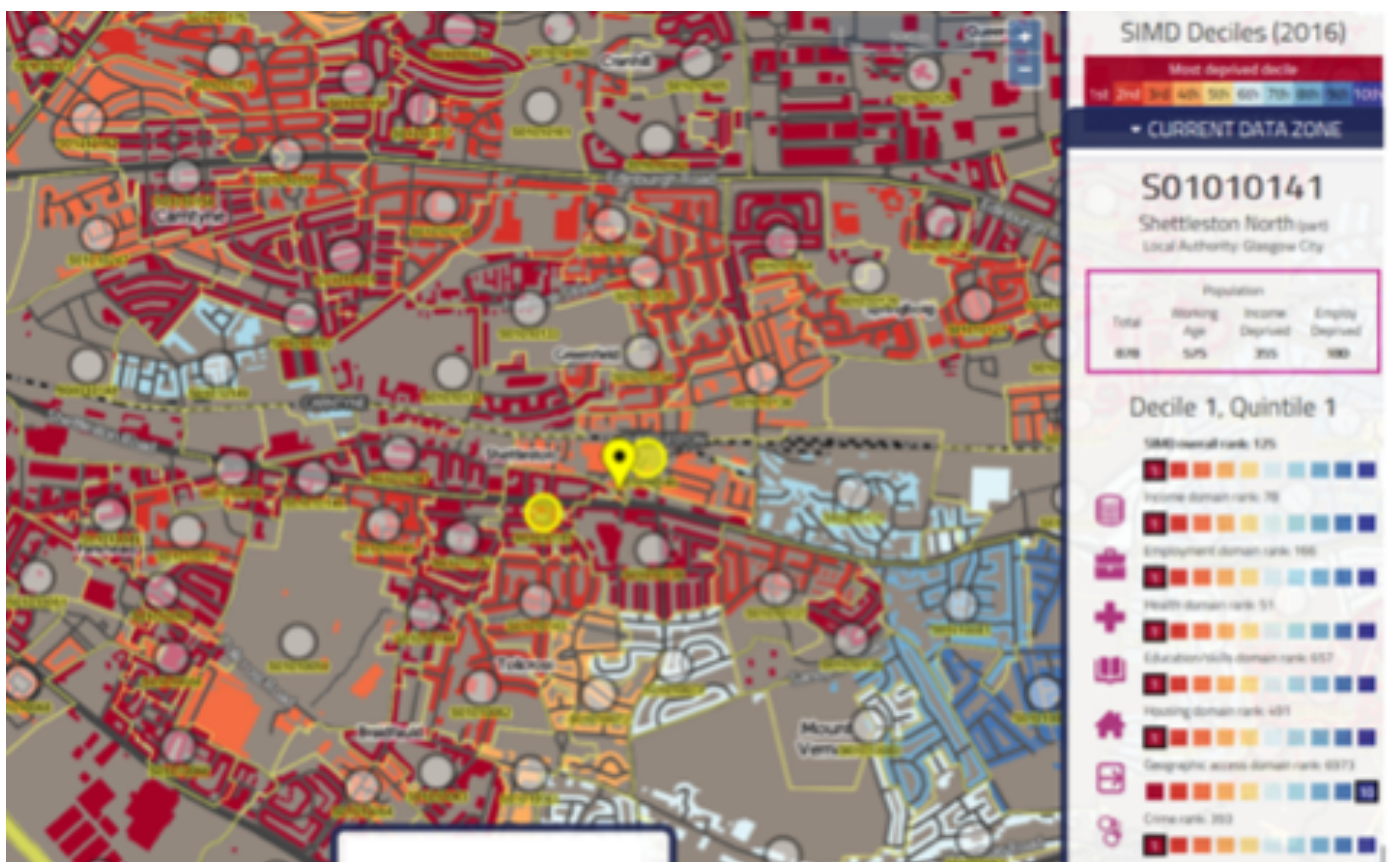


Figure 2: Deprivation in Shettleston. From the Scottish Index of Multiple Deprivation, Scottish Government, scale 1:500. (2016). [online].

<b>Socio-economic indicators</b>	<b>Shettleston constituency</b>	<b>Scotland</b>
% Total population income deprived, 2008	35	15
% Working age population employment deprived, 2008	25	12
% Population aged 60+ claiming guaranteed pension credit, 2009	46	18
Hospital admission for drug misuse, per 100,000, 2001–2004	816.5	127.5
Hospital admission for alcohol misuse, per 100,000, 2001–2004	2305.3	722.7
Average tariff position of S4 students, 2008	136	180
% Households in social renting, 2001	54	29
House sales, mean price (£), 2009	105,302	159,075
% People within 0–500 m of derelict site	82	30

Figure 3: Comparison between Shettleston and Scotland. From Paton, Mooney & McKee. “Class, Citizenship and Regeneration: Glasgow and the Commonwealth Games 2014.” (2012). [online].

social exclusion experienced by many residents of the Gorbals has led to initiatives being established to drive a further sense of community and to improve the economic prosperity of the area (Pendlebury, 2015). This can be seen in the GoWell scheme which aims to provide activities that help local residents understand the connection between their livelihood and health as an outcome of investments within their area and how beneficial it can be (GoWell, n.d.). The organisation primarily supports young people to gain practical skills from a young age to ensure they have an employable skillset, reducing the gap between those who grow up in deprived areas and those who grow up in affluent ones (GoWell, 2015).

### Shettleston VS Bearsden

Financial inequalities are found all throughout Glasgow, but the sheer variances can be clearly seen when the deprived area of Shettleston is compared to the affluent area of Bearsden. Bearsden is located in East Dunbartonshire, on the outskirts of Glasgow and its residents are, for the most part, wealthy. The district scores highly on the Scottish Index of Multiple Deprivation, as shown in Figure 1, with 6 categories falling within the least deprived decile. This highlights that factors such as health, employment and education are to the highest standard within this area, which gives the residents an advantage, with more opportunities to live a long and prosperous life (Paton, Mooney & McKee, 2012).

However, comparatively, Shettleston is an area of

high deprivation, unemployment and economic instability. As Figure 2 shows, Shettleston scores very poorly on all categories with 7 out of 8 of the categories being in the first decile, which represents the most deprived areas. This is very concerning, as it demonstrates that many problems are occurring, from unemployment to poor health, which will in turn affect all aspects of an individual’s life. This is further supported by Figure 3, as it illustrates the socio-economic issues Shettleston is facing. The table shows that 35% of those living in Shettleston are income deprived, which is more than double the Scottish average of 15%. This is a significant difference and highlights the extent to which economic inequalities are present within Glasgow. Furthermore, the figure indicates that there are a vast number of socio-economic factors at play which influence health and poverty within Shettleston. It is vital for geographers to be concerned by what is occurring, not just in this area but throughout Glasgow, as there is a sharp spatial disparity between those who are economically stable and have access to resources, and those who do not, resulting in poverty with few means of escaping.

### Glasgow’s Health Inequalities

Economic inequalities also interweave with other societal problems, such as health. This is particularly true of Glasgow where a high level of poor health and mortality rates are recognised as being one of the largest problems facing the city today (Livingston & Lee, 2014). Scotland, as a whole, has the highest mortality rates in Western Europe, with Glasgow hav-

ing the highest rates within Scotland. This is closely interconnected to the high levels of deprivation and poverty within the city (Livingston & Lee). This coined the term “The Glasgow Effect” which takes into account the number of deaths and higher numbers of health problems occurring in Glasgow in comparison to deprived areas in other cities such as Manchester and Liverpool (Reid, 2011). The question remains, however, as to why there is such a wide disparity within Glasgow. A significant spatial disparity of life expectancy within the city is present, furthering the inequality gap. “[A] boy in the deprived area of Calton had an average life expectancy of 54 years compared with a boy from affluent Lenzie, 12 km away in East Dunbartonshire, who could expect to live to 82” (Reid, 2011, pp.706). This highlights the spatial inconsistency throughout Glasgow, emphasising the fact that there appears to be a strong link between health and economic inequalities. Within more deprived areas of society, there are higher occurrences of smoking, alcoholism and obesity, all contributory factors of poor health. This may therefore provide an explanation as to why Glasgow is experiencing such adverse health problems (Reid, 2011).

An alternative explanation for why some of Glasgow’s population are experiencing detrimental health issues is the theory of the ‘Collective Resource Model.’ This theory postulates that those living in deprived areas do not have the same access to resources, such as medical centres, as those living in wealthier areas, which in turn results in poorer health and further decline in the area (Livingston & Lee, 2014). This implies deep-rooted inequality in relation to the dispersal of and access to resources purely on the basis of where people live. However, the impact of this theory can be weakened if increasingly more deprived areas have wealthier ones surrounding them (Livingston & Lee, 2014). Research found that deprived areas which were bordered by prosperous ones had fewer people living with Type 2 diabetes than those that were surrounded by poorer districts (Livingston & Lee). This makes an interesting argument that those living near affluent areas often have more positive influences and better resources close by, which can result in better overall health.

### **Glasgow’s Commonwealth Games 2014**

In the summer of 2014, the Commonwealth Games took place in Glasgow. It was hoped that this famous sporting event would be the catalyst for further economic growth within the city and ultimately help to close the economic inequality gap which is prevalent within the area. In Glasgow’s East End “...successive

decades of deindustrialisation, disinvestment and economic destruction left the area with high levels of unemployment, poverty and other social ills” (Paton, Mooney & McKee, 2012, pp.1477). This has led to many attempts to resolve the economic issues faced in the areas to create additional wealth, but it still remains one of Glasgow’s most deprived communities. One of the objectives of the Games was to encourage investment which would make the areas more economically prosperous and get communities together and involved in the games. The venues which were built for the games were clustered primarily within areas in the East End of Glasgow, contributing to the physical regeneration and providing facilities. It was hoped that this would make it a desired location for both residents and tourists to the city. In particular, the Athletes’ Village has been very beneficial to the area, as after the games the newly built houses were sold at affordable prices compared to the cost of buying in other parts of the city (Glasgow 2014, 2013). It is hoped that this will instigate more productive regeneration of the area and further inspire economic growth. However, whilst the best intentions were in place for the new housing development as part of the area’s regeneration, it may actually cause more problems for those it is trying to help. The majority of the people who live within Glasgow’s East End in poverty, meaning that the new affordable housing may still be unaffordable for many (Paton et. al., 2012). This in turn could result in the displacement of people from the East End to other areas outside the city if the prices to live in the area rise further (Paton et. al., 2012).

### **Conclusion**

In conclusion, there are many economic inequalities throughout Glasgow, with a clear gap between those who are well-off and those who are deprived and living in poverty. The divide has resulted in many disparities which include variations in health, mortality rate, employment and educational attainment, which are all dependant on where someone lives within the city. It is very challenging to decipher if in fact the economic inequalities which Glasgow is facing are narrowing or not; they are to some extent due to the new projects and initiatives which are being set up to help reduce this form of inequality, but only very slowly. Overall, geographers should be concerned about the trends in geographic inequalities due to the spatial and temporal disparities which are present. It is clear that not enough is being done from a bottom-up approach through working with communities, instead of being reliant on the trickle-down method that is not going far enough to help those most vulnerable.

## References

Brocklehurst, S. (2013). "Govan: A shipbuilding history." *BBC News*. [online]. Available: <https://www.bbc.co.uk/news/uk-scotland-glasgow-west-24820573> (Last Accessed: 7/10/2018).

Doucet, B., Kempen, R. V. and Weesep, J. V. (2011). 'We're a rich city with poor people': municipal strategies of new-build gentrification in Rotterdam and Glasgow. *Environment and Planning A: Economy and Space*, Vol 43, Issue 6, pp. 1438 – 1454. Available: <http://journals.sagepub.com/doi/pdf/10.1068/a43470> (Last Accessed: 6/10/2018).

Glasgow 2014. (2013). "Glasgow 2014's Athletes' Village is streets ahead for One Year to Go celebrations." [online]. Available: <http://www.glasgow2014.com/media-centre/press-releases/glasgow-2014s-athletes-village-streets-ahead-one-year-go-celebrations> (Last Accessed: 17/10/2018).

GoWell. (2015). Gorbals Riverside Winter Newsletter, pp.1-2. Available: [http://www.gowellonline.com/assets/0000/3697/Gorbals\\_Riverside\\_Winter\\_2015.pdf](http://www.gowellonline.com/assets/0000/3697/Gorbals_Riverside_Winter_2015.pdf) (Last Accessed: 17/10/2018).

GoWell. (n. d.). Gorbals Riverside. [online]. Available: [http://www.gowellonline.com/community/66\\_gorbals\\_riverside](http://www.gowellonline.com/community/66_gorbals_riverside) (Last Accessed: 17/10/2018).

Keeble, D. (1978). "Industrial Decline in the Inner City and Conurbation." *Transactions of the Institute of British Geographers*, 3(1), 101-114. doi:10.2307/621814 (Last Accessed: 7/10/2018).

Livingston, M. & Lee, D. (2014). "The Glasgow effect? – The result of the geographical patterning of deprived areas?" *Health & Place*, 29, pp.1-9. Doi: <https://doi.org/10.1016/j.healthplace.2014.05.002> . (Last Accessed: 15/10/2018).

Paton, K., Mooney, G. & McKee, K. (2012). "Class, Citizenship and Regeneration: Glasgow and the Commonwealth Games 2014." *Antipode*, 44: 1470-1489. doi:10.1111/j.1467-8330.2011.00966.x (Last Accessed: 10/10/2018).

Pendlebury, D. (2015). "The Gorbals Regeneration – Delivering Economic Value through Planning." *Royal Town Planning Institute*, pp. 1-18. Available: [https://www.rtpi.org.uk/media/1387124/rtpi\\_working\\_paper\\_gorbals\\_regeneration\\_june\\_2015.pdf](https://www.rtpi.org.uk/media/1387124/rtpi_working_paper_gorbals_regeneration_june_2015.pdf). (Last accessed: 9/10/2018).

Reid, J. (2013). "Background: when Clyde shipbuilding was the envy of the world." *The Herald*. [online]. Available: [https://www.heraldscotland.com/news/13130543.Background\\_when\\_Clyde\\_shipbuilding\\_was\\_the\\_envy\\_of\\_the\\_world/](https://www.heraldscotland.com/news/13130543.Background_when_Clyde_shipbuilding_was_the_envy_of_the_world/). (Last Accessed: 17/10/2018).

Reid, M. (2011). "Behind the 'Glasgow effect.'" *Bulletin of the World Health Organization*, pp. 706–707. Doi: 10.2471/BLT.11.021011 (Last accessed: 16/10/2018).

Walsh, D., Bendel, N., Jones, R & Hanlon P. (2010). "It's not 'just deprivation': Why do equally deprived UK cities experience different health outcomes?" *Science Direct*, Volume 124, Issue 9, Pages 487-495. Doi: <https://doi.org/10.1016/j.puhe.2010.02.006> (Last Accessed: 8/10/2018).

## Figures:

Figure 1: The Scottish Index of Multiple Deprivation: Interactive Mapping. (2016). "SO1008066: South Castlehill and Thorn, East Dunbartonshire." *Scottish Government*, scale 1:500. Available: <http://simd.scot/2016/#/simd2016/BTTTTT/14/-4.3379/55.9179/>. (Last Accessed: 17/10/2018)

Figure 2: The Scottish Index of Multiple Deprivation: Interactive Mapping. (2016). "SO1010141: Shettleston North, Glasgow City." *Scottish Government*, scale 1:500. Available: <http://simd.scot/2016/#/simd2016/BTTTTTT/13/-4.1708/55.8600/>. (Last Accessed: 17/10/2018)

Figure 3: Paton, K., Mooney, G. & McKee, K. (2012). "Class, Citizenship and Regeneration: Glasgow and the Commonwealth Games 2014." *Antipode*, 44: pp.1480. doi:10.1111/j.1467-8330.2011.00966.x (Last Accessed: 10/10/2018).





# An investigation into the link between population growth and sustainable development.

*Kerri Samson, Second Year Geography*

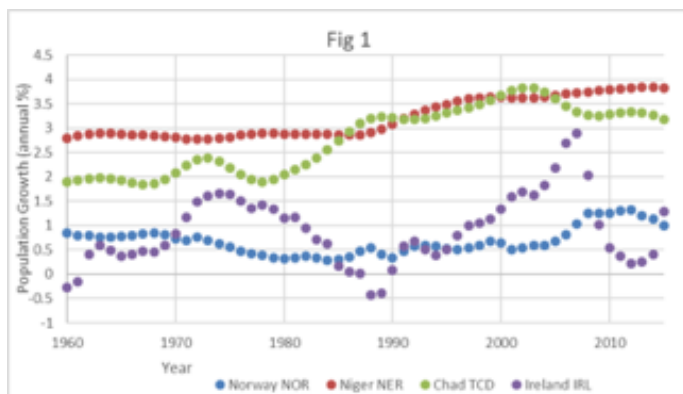
**Abstract** – This paper discusses the relationship between population growth and sustainable development by utilizing datasets available online, courtesy of The World Bank. Using a variety of indicators, it is possible to examine issues of comparative economic development during the period 1960 to 2015. This paper focuses particularly on GDP, CO2 emissions, and renewable energy consumption in association with population growth to determine the level of Sustainable Development in each country. By comparing two developing countries, with two that are developed, it is also possible to evaluate how, and why, the experience of economic growth and development vary between them.

## Introduction

It is the proposed addition of a new geological era, the Anthropocene, that motivated me to explore the relationship between population growth and Sustainable Development (SD). Using data collected by the World Bank (2017) between 1960 and 2015, I hope to find a correlation between the two. By comparing two developed countries, Ireland and Norway, with two developing countries, Niger and Chad, I will attempt to determine whether or not development is a contributing factor.

## Population Growth

First, it is imperative to look at the population growth for these four countries. In Figure 1, it is possible to see that both the developing countries have a high, and fairly consistent, rising population growth rate. This means that the overall population of the country is increasing at a rapid rate, which could have detrimental environmental consequences - as outlined in Moffatt et al. (2001). The developed countries however, Ireland and Norway, have a lower and sometimes even a negative population growth rate. This suggests a lower overall rise in population and a lessened environmental impact, which is why other indicators should be taken into account when considering sustainable development.

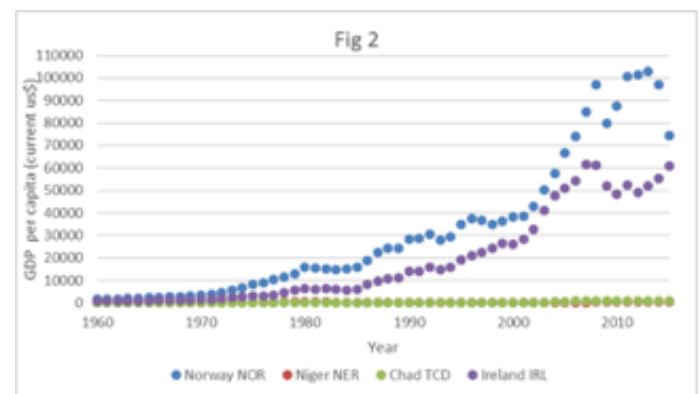


## Sustainable Development

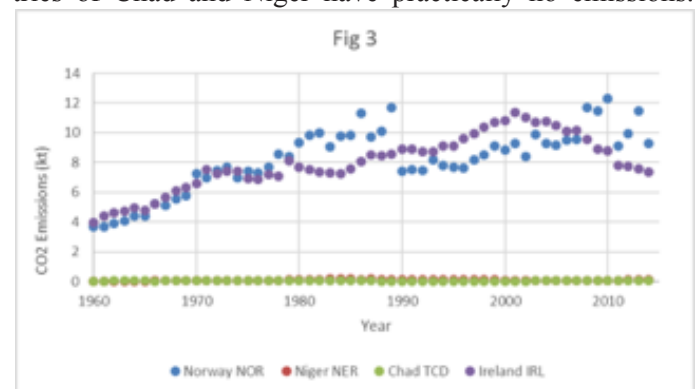
To create a greater understanding of the level of SD, I will be using three indicators:

1. GDP per capita: to recognise the level of poverty within the country.
2. CO2 emissions: in order to understand the countries' contribution to air pollution.
3. Renewable energy consumption: which indicates the countries utilizing sustainable energy products.

Using GDP per capita helps to outline whether there is a high or low level of poverty within a country. As shown in Fig. 2, it is clear to see the constant low figures held in Chad and Niger; indicating a high level of poverty<sup>1</sup>. Ireland and Norway seem to be experiencing a stronger economy, and therefore the population has an increased share in the overall wealth of the country. This implies that Ireland and Norway have less poverty and are therefore more sustainable: according to the indicators surrounding the United Nation (UN) first Sustainable Development Goal (SDG), No Poverty (2019).



Secondly, in Fig. 3 we can see that the developed countries, Ireland and Norway, have a considerably higher amount of CO2 emissions. The developing countries of Chad and Niger have practically no emissions.



<sup>1</sup> Fig 2- The data for Niger is obstructed by the similar data by Chad.

According to Elliott (2006), the key cause of CO2 emissions is the burning of fossil fuels. This is something more likely to be seen in a developed country due to the industrialisation process having already occurred, and it explains why there is a lack of CO2 emissions in Chad and Niger: there is less demand for such expansive energy needs due to lack of industrial infrastructure. This data then gives the impression that Ireland and Norway, compared to Chad and Niger, are not as sustainable. While Chad and Niger have been consistently hitting low carbon emissions, the overall trend for Ireland and Norway sees an increasing amount of CO2 being released into the atmosphere between 1960 and 2015.



Lastly, if we consider the renewable energy consumption from each of these countries we can again see, in Fig. 4, a distinct difference between developing and developed countries.<sup>2</sup> Chad and Niger remain high on the chart, with a greater overall percentage of renewable energy consumption when compared to its developed country counterparts. It is worth mentioning that the data shows that Norway is significantly more sustainable than Ireland, with an average of 58.6% renewable energy consumption compared to Ireland's average of only 3.4%.

### Evidence of Connection

When starting this research, I wrongly assumed that higher rates of population growth would result in lower levels of Sustainable Development. I have in fact found the opposite to be true. The average population growth rate for Niger (3.2%) and Chad (2.8%) indicates a rapidly increasing population, but the three indicators of SD show the countries both have high levels of renewable energy use (on average: Niger 83.7% and Chad 94.5%), and a low level of CO2 emissions (on average: Niger 0.07kt and Chad 0.03kt). Both indicate a positive approach to SD. However, the remaining indicator (showing GDP per capita) demonstrates a great level of poverty in these countries (Niger \$242.62 and Chad \$328.60); this is a negative approach to the goals of SD (namely SDG1 (UN, 2019)). However, using GDP per capita may not be the best way to measure poverty, as this assumes that everyone has an equal share of the wealth (Dietz and O'Neill, 2012). Overall, however, we can see that the developed

<sup>2</sup> The data collected by The World Bank for Renewable energy consumption (% of total final energy consumption) only begins in 1990 (2000 for Niger) opposed to 1960 for the other indicators.

countries with larger populations and population growth are not necessarily having an adverse effect on SD.

If we look at the developed countries, we can reach same conclusion here. The lower population growths of Norway and Ireland (Average: 0.68%, 0.89%) are in relation to the lower renewable energy use (Average: Norway 58.6% and Ireland 3.4%), and a higher amount of CO2 emissions (Average: Norway 8.2kt and Ireland 8.0kt) – both negative approaches to SD - but a lower level of poverty due to increased GDP per capita (Average: Norway \$32,108 and Ireland \$19,225) - a positive. Overall, low population growth does not necessarily have an auspicious effect on SD.

### Conclusion

Using data provided by The World Bank to find a link between population growth and SD has proved difficult. SD is such an expansive subject with many different outlooks. One of which is the United Nations' (2019) 17 Sustainable Development Goals (SDG's); three of which were the basis for my indicators: No Poverty, Affordable and Clean Energy, and Responsible Consumption and Production. I have had to narrow my own definitions down to just three indicators, which over-simplifies the whole process. While my research shows there is a correlation between population growth and Sustainable Development, due to the small and limited sample of this analysis, this relationship is not certain. I would encourage more research into this topic using many more indicators in order to attain a true reflection.

### References

- Dietz, R and O'Neill, D. (2012). *Enough is Enough: Building a Sustainable Economy in a World of Finite Resources*. Routledge, London. pp 114-120
- Elliott, J. (2006). *An Introduction to Sustainable Development*. 3rd Ed. Routledge, New York. p72-73
- Moffatt, I., Hanley, N. and Wilson, M. (2001). *Measuring and Modelling Sustainable Development*. Parthenon Publishing, New York. pp 170-172
- United Nations. (2019) "Sustainable Development Goals" <https://www.un.org/sustainabledevelopment/> (accessed 22/10/19)
- World Development Indicators, The World Bank. (2017) "Indicators" <https://data.worldbank.org/indicator> (accessed 15/11/2017)

# CSR Reporting in Fashion Industry

*Elsa Kivinen, Third Year Geography and Sustainable Development*

**Abstract – The aim of this essay is to discuss corporate sustainability reporting and corporate social responsibility (CSR) in the global fashion industry. Throughout the paper, the corporate sustainability reporting of Fenix Outdoor, a company focused on outdoor products, is used as a case study; with their 2016 CSR report being referenced to draw attention to the issues experienced by the whole fashion industry sector. The findings suggest that CSR reporting has moved beyond annual reports to stakeholder-engaging ways of reporting about companies' sustainability practices, and that one of the biggest challenges to CSR remains the collection of reliable data across the whole supply chain.**

## Background

The clothing and fashion industry has become one of the most globally dispersed industries, with companies outsourcing materials and services to different countries and regions around the world; mainly to developing countries where wages are low, and recruiting cheap workforce is possible. Due to the concern over workers' well-beings and stakeholders' increased awareness of environmental and social issues, companies are increasingly being held accountable on sustainability issues present in the fashion industry, which are reinforced by the consumerist lifestyle encouraging disposable fashion: 'desire for fast fashion has created demand for 80 billion new garments per year' (Abreu, 2015, pp. 2).

Corporate Social Responsibility (CSR) refers to the responsibility of companies towards their stakeholders and the environment. Langenwater (2009) listed some of the principles of sustainability practices in companies, including 'respect for people (at all levels of the organization), the community and its supply chain; respect for the planet; recognising that the resources are finite; and generating profits that arise from adhering to these principles.' Some sustainability issues in the fashion industry are the working conditions and labour rights violations across the supply chain, toxic chemicals and pesticides used in the pretreatment dyeing of the fabrics, the pesticides used in cotton production, and poor waste management. Supply chains in the fashion industry are complex due to their high level of vertical disintegration and geographic dispersal, and for that reason it remains a challenge to ensure reliable CSR practices through-

out the entire supply chain (Perry and Towers, 2013).

## Issues in CSR reporting

The most common and widely used framework for providing guidance on CSR performance disclosure is the Global Reporting Initiative, first released in 2000 to make reporting more uniform, consistent and comparable across companies. However, even companies that use the same framework for CSR reporting can focus on very different aspects, and have a very different structure in their reporting, which complicates their comparability.

The reliability of data disclosure is vital because it positively correlates with the credibility and perceived responsibility of the company. Ensuring reliable data collection for CSR disclosure is therefore crucial, but remains one of the biggest challenges for many companies, including Fenix Outdoor. This is especially true in waste management because in some locations where the company operates pay for waste based on weight, while others do so by volume, and the smallest ones only pay for the bins or collectors they use (CSR Fenix Outdoor 2016, pp.20).

Another complication in the data collection in the case of Fenix Outdoor is that their overall consumption of energy increased in 2016. This was mainly stated to be attributed to several new stores and the consolidation of a new factory (Progressz Kft), but also because 'locations were able to gather additional data, omitted in the previous reports' (CSR 2016 pp.13). This is an example of the problem of finding out that in the past there have been impacts that have not been accounted for. Although reporting about the problem afterwards is better than hiding it, the fact that there has been something undisclosed, even if done unintentionally, weakens the company's credibility.

Additionally, it can be difficult to find public financial information of the subsidiaries of the main company. This is because most of the information that is disclosed from the perspective of the main company is at the expense of that of the subsidiaries, often better known by the consumers. It is notable that companies are moving beyond reports and use various other communication channels, such as corporate websites to engage with and inform their stakeholders on their CSR practices. For example,

Fjällräven's corporate website has a section devoted to "responsibility", but their detailed CSR disclosure is embedded within the CSR report by their parent company Fenix Outdoor, and is sometimes indistinguishable from the parent company's details. Putting more effort into the CSR reporting of the main company, than that of its subsidiaries, is because larger companies have more pressure to disclose information on CSR than smaller companies/subsidiaries/brands (Abreu, 2015); but, it still impedes the comparability and full transparency of the parent company.

### **Environmental and Social Standards and Codes of Conduct**

The role of environmental and social standards is fundamental in shaping corporate social responsibility. Being a member of NGOs, such as Fair Labor Association (FLA), that ensure adherence to international and national labour laws is a way for companies to gain credibility to their sustainability practices. To use the example of Fenix Outdoor, the company started publishing annual CSR reports in 2011 and became a participant of the UN Global Compact Principles in 2012. Their principal focus in 2016 was the deepening of the activities within Sustainable Apparel Coalition (SAC) and improvement of their activities with the Fair Labor Association (CSR Fenix Outdoor 2016, pp.4).

Fenix Outdoor has developed their own managerial guidance document called "The Fenix Way", which is based on the FLA Workplace Code of Conduct and several other international standards, such as The UN Global Compact. It is also notable that when the legal requirements set forth by national laws are less strict than the code, suppliers adhering to The Fenix Way should always apply the highest standards to prevent exploiting countries where people would be willing to work overtime at the expense of their wellbeing just so they can earn more money to provide for their families. However, Gupta (2012) notes that not all companies are ready to agree following international recommendations. Despite being widely recognised, one cannot stay uncritical of NGOs such as FLA - their practices and legitimacy must be examined. Fenix Outdoor is a member of FLA and their own Code of Conduct follows the requirements set by FLA. According to the 2016 CSR report of Fenix Outdoors, 97.2% of their brands' suppliers had signed the Code of Conduct of the company by the end of 2015, and in 2016 approximately 91.2% had signed the Code. Fenix Outdoor explains this drop as a result of two factors: firstly, they have discontinued certain product ranges where

they had a strong support for their Code; and secondly, they have consolidated their supplier-base and adjusted that to their specific needs, which resulted in increasing the number of new suppliers to their system (CSR Fenix Outdoor, 2016, pp.5). Müller (2009) criticizes FLA by saying that even if the FLA code refers to all operational facilities of the company and its suppliers, contractual partners and licensees, it is quite easily legally bypassed. This is because of the exception it allows: very small facilities with business connections of six months or less during the last 24 months, and those that deliver less than 10% of their yearly production to a FLA member are not concerned by the FLA code. The issue is that in the fashion industry, short-time contracts are very common. Müller adds that supply chains are frequently subject to modifications and changes, meaning that the standards by FLA are often too inflexible and limited. One positive aspect of the FLA is that participating companies agree to both internal and independent external monitoring that takes place in the form of unannounced visits (Wick, 2005). In 2016, FLA conducted several on-site audits, checking the implementation of the Code, and the application of FLA processes and standards for Fenix Outdoor (CSR Fenix Outdoor 2016, pp.27). However, this thoroughness of the verification of the code implementation is not always the case everywhere, as pointed out by Esbenshade (2004) when he voices the concern that some codes are not enforced beyond requiring the supplier to sign that the factory is following the code.

### **Stakeholder involvement strategies**

The company's relationship with their stakeholders has become of crucial importance and engaging with and listening to stakeholders is desirable—both in terms of strategy and business ethics. CSR is a moving target, which requires good adaptation skills and stakeholder involvement strategies from the company. Morsing and Schultz (2006) argue that managers should move from "informing" and "responding" to "involving" stakeholders in CSR communication itself. Eleven years later, many companies have been able to develop completely new ways that allow them to engage with their stakeholders: the surveying of customers has developed a lot and social media has taken a big role in public relations involving stakeholders.

"So far we have conducted a customer survey for our retail business in 2015, a stakeholder roundtable involving representatives from academia, media, non-governmental and not-for-profit organizations

(NGOs), governments, international organizations, consumer groups, trade associations and suppliers in 2014 and several social media interactions with various groups' (CSR Fenix Outdoor 2016, pp.7).

It is also remarkable that the perceived importance of different stakeholder groups changed noticeably in one year:

'A quick survey among the top management revealed a slight shift in the stakeholder ranking: while now 83% of the managers think that the end consumer is the most important stakeholder, 17% think that it is the business partner; in 2015 staff and retailer were seen as most important stakeholder groups. The current ranking looks as follows: End Consumer > Retailers and business partners > Staff/Suppliers > Authorities > Media > NGOs > Owners' (CSR Fenix Outdoor 2016, pp.9).

It is notable that in one year customers' importance to the company increased by 50% in a poll where several managers were asked to rank the stakeholders they feel are the most influential to the business, as customers scored only 33% in 2015 but 83% in 2016. (CSR Fenix Outdoor 2015, pp.9)

Very often companies address sustainability in a symbolic and rhetorical way, or using pictures and other subtle marketing strategies in their reports, making the stakeholders associate the product or service with aspects that might reinforce the desire to invest in the service or the product. These desirable aspects can be anything from the image of sustainable lifestyle to gender equality. Social action itself is becoming a marketable "item", and commodity activism is increasingly present in the contemporary world where commercial forces mobilize consumers' values. (Mukherjee and Banet-Weiser, 2012)

Fenix Outdoor states one of their goals is to increase people's respect for nature. This would make the stakeholders associate their products with an environmentally friendly attitude, which is a very efficient marketing strategy that would "justify" the company's desire for growth in the market. Past research suggests that what individuals do earlier in their lives often influences what they believe later in their lives, and that direct contact with nature has been shown to increase interconnectedness and love for nature (Kaplan and Kaplan, 1989).

## Conclusion

CSR practices of the global fashion industry still face great challenges, such as the reliability and comparability of data collection, and its truthful disclosure. This is a crucial issue to tackle since data collection is relevant in all aspects of CSR from environmental issues, such as CO2 emissions, and issues in human rights to wage levels and the security of employees; which are all problems present in this labour-intensive and heavily polluting industry. It can also be noted that companies have started considering customers as their most important stakeholders and have developed new ways of engaging with them by using social media platforms. To maintain its image as an environmentally friendly company, Fenix Outdoors should ensure reliable and relevant data collection across the supply chains, raise awareness amongst key industry players, and disclose more detailed sustainability information on the subsidiaries' corporate websites.

## References

- Abreu, M.C.S. (2015), "Perspectives, Drivers, and a Roadmap for Corporate Social Responsibility in the Textile and Clothing Industry", in: Muthu, S.S. (Ed.), *Roadmap to Sustainable Textiles and Clothing: Regulatory Aspects and Sustainability Standards of Textiles and the Clothing Supply Chain*, Springer, Singapore, pp. 1 – 21.
- Delmas, M. and Toffel, M.W. "Stakeholders and environmental management practices: an institutional framework". *Business Strategy and the Environment* 13, 209–222 (2004) Published online in Wiley InterScience ([www.interscience.wiley.com](http://www.interscience.wiley.com)). <http://onlinelibrary.wiley.com/doi/10.1002/bse.409/epdf>
- Esbenshade, J. (2004) "Codes of Conduct: Challenges and Opportunities for Workers' Rights." *Social Justice* 31 (3): 40-59.
- Fenix Outdoor CSR report (2016) <http://www.fenixoutdoor.se/nyheter/csr-report-2016/>
- Fenix Outdoor CSR report (2015) <http://www.fenixoutdoor.se/nyheter/csr-report-2015/>
- Fernie, J. and Sparks, L. (eds.) (2014) "Logistics and Retail Management: Emerging issues and new challenges in the retail supply chain". 4th edition. Kogan Page: London.
- International Organization for Standardization. (1992). *ISO 9000: International Standards for Quality Management*. Genève, Switzerland: Author.
- Kaplan, R. and Kaplan, S. (1989) *The Experience of Nature: A Psychological Perspective* Cambridge University Press, New York
- Langenwater, G. (2009). "Planet First." *Industrial Management* 51(4): 10–13.
- Maloni, M. J. and Brown, M. E. (2006). Corporate social re-

sponsibility in the supply chain: An application in the food industry. *Journal of Business Ethics*, 68(1): 35–52.

Martin, J. 1992. *Cultures in Organizations. Three Perspectives*. New York: Oxford University Press.

Morsing, M. and Schultz, M. (2006), Corporate social responsibility communication: stakeholder information, response and involvement strategies. *Business Ethics: A European Review*, 15: 323–338. doi:10.1111/j.1467-8608.2006.00460.x

Mukherjee, R. and Banet-Weiser, S. (2012) “Commodity activism: Cultural resistance in Neoliberal times”. New York University Press.

Müller M., Gomes dos Santos V. and Seuring S. The Contribution of Environmental and Social Standards towards Ensuring Legitimacy in Supply Chain Governance. *Journal of Business Ethics*, Vol. 89, No. 4 (Nov., 2009), pp. 509-523 <http://www.jstor.org.ezproxy.st-andrews.ac.uk/stable/pdf/27735208.pdf?refreqid=excelsior%3Aafb61040aba9fe20dd5f69a3680040fc>

Perry, P. and Towers, N., (2013) “Conceptual framework development: CSR implementation in fashion supply chains”, *International Journal of Physical Distribution & Logistics Management*, Vol. 43 Issue: 5/6, pp.478-501, [https://www.researchgate.net/profile/Patsy\\_Perry/publication/256495343\\_Conceptual\\_framework\\_development\\_CSR\\_implementation\\_in\\_fashion\\_supply\\_chains/links/00b7d5267b237c4aa6000000/Conceptual-framework-development-CSR-implementation-in-fashion-supply-chains.pdf](https://www.researchgate.net/profile/Patsy_Perry/publication/256495343_Conceptual_framework_development_CSR_implementation_in_fashion_supply_chains/links/00b7d5267b237c4aa6000000/Conceptual-framework-development-CSR-implementation-in-fashion-supply-chains.pdf)

Yonjiang Li, Xiukun Zhao, Dan Shi and Xiang Li. “Governance of sustainable supply chains in fast fashion industry”. *European Management Journal*. Volume32, Issue 5. October 2014. <https://doi.org/10.1016/j.emj.2014.03.001>

Wick, I. (2005) “Worker’s tool or PR ploy—A guide to Codes of International Labour Practice”. Friedrich-Ebert-Stiftung and SÛDWIND, Siegburg. <http://library.fes.de/pdf-files/iez/04288.pdf>

# Critical Reflection Essay on Food Waste

*Alexandra Imberh, First Year Sustainable Development*

**Abstract – Food security is one of the most pressing tasks that is being addressed in relation to sustainable development. Parallel to two billion of people worldwide going malnourished or hungry, we are throwing away one third of the global food production every year: an unacceptable paradox. As studies show, most of the food in Europe occurs at the household level of the food production chain. With this context in mind, in this essay I critically engage with theory about social practices related to food waste at the household level, before reflecting on my own food waste practices which I recorded in a diary. I will mainly draw upon insights from David Evans’ studies (2011; 2012) and elaborate on the socio-material context of my student life, as well as the way awareness about the severity of food waste might shape my food waste practices.**

## Introduction

The question of food security is central to sustainability issues and one of the most pressing tasks. Solutions must be found in the near future, as manifested in Sustainable Development Goals (SDGs) 12 and 17. While almost 1 billion people go malnourished and another 1 billion goes hungry (UN, 2018), billions of kilograms of food that is produced gets wasted every year. This is a macabre paradox. More precisely, an estimated one third of global food production is wasted each year (FAO, 2011). In Europe specifically, consumers at the household level are responsible for 53 percent of food waste (Stenmarck et al., 2016) as people there can simply ‘afford to waste food’ (FAO, 2011, p. 14). In lower income countries, more food loss (two thirds) occurs in the post-harvesting and processing levels of the food chain (Chalak et al., 2016). In Western countries, food wastage is happening at a higher level in the food chain, and thus accumulates value due to upstream resources that go into its production, which has serious implications for climate change.

This essay will focus on food waste as it occurs in households, which is defined as food that otherwise could have been eaten or parts of food that tend not to be eaten (such as vegetable peels). In the UK, 60 percent of food thrown away in 2012 was avoidable (WRAP, 2012). A high level of awareness about the severity of food waste and its implications for the environment could lead to elimination of food waste to some degree. This essay will explore this possibility

by using David Evans’ study on food waste occurring in UK households, which finds that awareness alone does not lead to decreased food waste (Evans, 2011; Evans, 2012). A focus on the individual as a wasteful consumer takes away much of the complexity of social structures surrounding household food practices and the material aspect of solutions, such as adapting packaging (ibid.). The essay will further reflect on personal data collected in the form of a diary in relation to the sociologically-informed implications of food waste and the Evans (2011) study.

## Theoretical framework: The sociological approach to Food Waste

The theoretical framework underpinning this essay stems from a sociologically-informed perspective on food waste, a more ‘practice-based approach’ (Reid, Hunter and Sutton, 2011, p. 221) in comparison to the individualistic oriented behavioralist take. This approach takes into account the bigger picture of social and material conditions of food provision, and their influence on why and how food waste occurs in households. ‘Practice theory’, as coined primarily by Shove on a series of papers on social practice and transitions (see, for example, Shove, 2010; Hand et al., 2007), rejects the paradigm in behavioralist studies working with a framework centered around individuals’ attitude, behavior and choice. Evans (2011) makes use of the practice-based perspective by framing the subjects of his study as social actors, acting as part of their environment. He thereby suggests ‘that the passage of “food” into “waste” occurs as a consequence of households enacting ordinary domestic practices and negotiating the contingencies of everyday life’ (Evans, 2012, p. 53).

I found this approach constructive when reflecting upon my data on personal food waste, collected over the span of a week. The amount of waste I produced was noted in a diary. Diaries have proven to be useful in this context of food waste research (Evans, 2012; Reid, Hunter and Sutton, 2011), not only as means of collecting data for researchers, but for the subjects as well, as ‘the processes of reflection and questioning, rather than the information used or provided as part of that process, lie at the heart of change’ (Reid, Hunter and Sutton, 2011, p. 722). Reid et al. further suggest that ‘there is clearly a link between diaries designed to encourage reflection, and the impact of this reflection



on behavior' (ibid., p. 723). The authors focus in their study on a more behavioralist approach and elaborate further on notions such as loop-learning, which suggest that behavior will change when reflection on negative impacts occurs, followed by a correction of those actions (ibid., 721). I found that the problem for me was not one of awareness about the impacts of food loss, but rather the socio-material context of my food practices.

### **Reflecting upon Personal Data Results**

I believe the sociological aspects to be of greater impact on my food waste behavior. The fact alone that I moved from living at home and sharing food practices with my family to living as a self-catered student has implications for my relationship with food waste. As Evans observed with some of his subjects in the 2012 study as well, the socio-temporal context of having to match university schedules (in my case) with the intention to prepare "proper" food makes it hard to avoid food going bad (Evans, 2012, p. 51-52). During the period of my data collection I found myself throwing out leftovers, which I had replaced with easy-to-cook fresh meals, even though I considered myself to act sustainably by leaving leftover food to make for another meal the next day. A majority of my waste ended up being vegetable and fruit peelings, and there is the possibility to dispose of these more sustainably in the future; so far, we only have one commercial waste bin provided in halls, which goes into landfill. Back at home, I live in the countryside, and all unavoidable food waste goes into compost to be used as fertilizer in the garden. The difference in household practices ultimately shapes my behavior surrounding waste. One of the university's short-term solutions concerning food waste will be composting food waste instead of sending it to landfill, so my task will be to make use of that opportunity (University of St Andrews, 2018).

Packaging problems and preparing too much food are other issues that Evans pointed out in his study, drawing back on the material contexts of food provision (Evans, 2012). I sometimes find it hard to shop for a single person and overestimate the amount of food I need to cook. Some conclusions I drew from my personal data concerning this context are that I could talk to my flat mates to avoid throwing out decayed leftovers in the future, by sharing leftovers with them. Preparing food together, on the other hand, proves to be more difficult as timetable clashes often prevent us from dining together. Hebroks and Boks (2017) suggest in their article that proper storage of food items is key to avoid waste. The fridge and freezer appear to be the most useful kitchen

items in a student lifestyle like mine, as products like bread and leftover meals could be frozen, and thereby kept fresh for longer. A concern could be the increased emissions of having to freeze food and then reheat it in the microwave again, but it shows that these emissions are in fact 'far smaller than those caused by food going to waste' (Hebrok and Boks, 2017, p. 386).

### **Food in Halls**

At my workplace in the canteen in halls of residence of the University of St Andrews, I am confronted with the amount of food waste building up there. Students turn "food" into "waste" simply by leaving leftovers on their plates, which we as staff have to throw out. Reducing plate sizes can lead up to 20 percent less wasted food as 'people generally overestimate how much food they will eat and underestimate how much food fits a large plate' (Hebrok and Boks, 2017, p. 389). This could be a suggestion for how the university handles food waste in halls in the future.

In addition, a policy requires the staff not to store any cooked food longer than 4 hours for food safety reasons, which results in large quantities being thrown out every night after the serving is over. As Evans (2011) and Hebrok and Boks (2017) point out, usually more importance is given to risk avoidance and ensuring food safety than to the avoidance of waste. The kitchen does try to reduce its waste by allowing students to go for "seconds" after the serving closes, and additionally providing the staff working there with a meal out of leftover food after the shift. Furthermore, me and my colleagues try to reduce food waste by "boxing" as much food as we want before it gets thrown out. For me the dilemma of wanting to "save" as much of the good food as possible but not being able to store it correctly and eating it in time occurs. The binning process just gets postponed, '[deferring] the (perhaps inevitable) disposal of certain foodstuffs' (Evans, 2012, p. 52).

### **Conclusion**

Being a self-catered student in halls of residence, and working in the university canteen allows insight and personal experience of both worlds, and the effects these conditions have on practices with food waste. By utilizing sociologically-informed perspectives to reflect on my own dealings with food waste, I was able to tease out solutions. A starting point could be the 'material infrastructures of provision' (Evans, 2011, 438), instead of focusing on individual's motivation to waste or not waste food. As Evans points out, waste is a natural occurrence in all food practices and is part of a household's food routine as much as

preparing and eating the food is (Evans, 2012). Solutions must be found on infrastructural and social levels, and the conditions of food provision must change. Evans shows in his studies, and I myself encountered this notion: it is not the lack of awareness that leads to avoidable food waste. The ongoing food crisis definitely has to be tackled by the increased productivity and efficiency of primary production, but as the FAO report pointed out, ‘tensions between production and access to food can also be reduced by tapping into the potential to reduce food losses’ (2011, 15).

## References

- Chalak, A. et al. (2016) ‘The global economic and regulatory determinants of household food waste generation: A cross-country analysis’, *Waste Management* 48, 418-422
- Evans, D. (2011) ‘Blaming the consumer – once again: the social and material contexts of everyday food waste practices in some English households’, *Critical Public Health* 21 (4), 429–440
- Evans, D. (2012) ‘Beyond the Throwaway Society: Ordinary Domestic Practice and a Sociological Approach to Household Food Waste’, *Sociology* 46 (1), 41-56
- FAO (2011) ‘Global food losses and food waste: Extent, Causes and Prevention’, *Food and Agricultural Organization of the United Nations*. Available at: <http://www.fao.org/3/mb060e/mb060e00.pdf> (Accessed: 05 March 2019)
- Hand, M., Shove, E. and Southerton, D. (2007) ‘Home extensions in the United Kingdom: space, time, and practice’, *Environment and Planning D: Society and Space* 25, 668-681. doi:10.1068/d413t
- Reid, L., Hunter C. and Sutton W. P. (2011) ‘Rising to the challenge of environmental behaviour change: Developing a reflexive diary approach’, *Geoforum* 42 (6), 720-730 doi:10.1016/j.geoforum.2011.04.011
- Shove, E. (2010) ‘Beyond the ABC: climate change policy and theories of social change’, *Environment and Planning* 42, 1273-1285. doi:10.1068/a42282
- Stenmarck, Å. et al. (2016) ‘Estimates of European food waste levels’, FUSIONS EU Project.
- UN (2018). *Goal 12: Ensure sustainable consumption and production patterns*. Available at: <http://www.un.org/sustainabledevelopment/sustainable-consumption-production/> (Accessed: 04 March 2019)
- University of St Andrews (2018). Available at: <https://www.st-andrews.ac.uk/media/estates/environment/documents/Sustainable%20Food%20Policy%202018.pdf> (Accessed: 05 March 2019)
- WRAP (2012) ‘Household food and drink waste in the UK 2012’, *Waste and Resources Action Programme*. Available at: <http://www.wrap.org.uk/content/household-food-and-drink-waste-uk-2012> (Accessed: 04 March 2019)



# Food Waste Essay

*Bethany Carol, First Year Sustainable Development*

**Abstract – This essay critically evaluates drivers of food waste, starting with how consumption and practice theories affect our relationship with it, from the household to national scale across temporally related shifts. It looks at large events, such as the impact of wartime rationing, and other influencers such as family dynamics. It also assesses how modern perceptions of health and socio-economic imbalances can affect choice. It includes my own research using my food waste diary and those of my parents, grandparents, and friends. I chose to conduct further research because I live in catered halls and wanted a broader sample pool from which to make observations; much of my essay focuses on things external to the university environment.**

This essay critically evaluates drivers of food waste, starting with how consumption and practice theories affect our relationship with it, from the household to national scale across temporally related shifts; such as, the impact of war-time rationing, and other influencers such as family dynamics, modern perceptions of health, and socio-economic imbalances affecting choice. It aims to compare literature on the topic with my own opinions and primary sources; my own food waste diary alongside that of my parents, grandparents, and another retired couple. I chose to conduct further research because I live in catered halls and wanted a broader sample pool from which to make observations, so much of my essay focuses on things external to the university environment.

According to Warde (2005), human consumption is a practice driven by mutual comprehension behaviour and engagement. This system is inherently dynamic: driven by cultural convention, socio-economic circumstances, and spatial and temporal organisation (Warde, 2005). This process is also understood as “Specular interaction”- the processes by which humans shape each other’s behaviours (Cochet, 2015). We can use this understanding of human interaction to look at why we waste food, and how this has changed over time.

One would automatically assume that applying this theory divides “Western” nations, such as the UK, and developing countries due to different behaviours founded on different histories, and it does: the FAO explained in 2011 that food waste is a huge problem in both areas, but whilst the UK consumer is found to throw away 70% of post-farm waste

(WRAP, 2019), in developing countries it is predominantly ‘food loss’ arising after harvest due to poor technology and planning (FAO, 2011). In fact, in the developed world and amongst more affluent people, food is seen as an opportunity for “exploration and self-expression” rather than necessity (Devault, 1991 as cited by Fischer, 1992). This is demonstrated by my ‘vegan egg’ substitute going into the bin after being deemed ‘slimy and rubbery’ (Figure 1). As someone who has a certain amount of monetary freedom, I have no need to eat something that I won’t enjoy if I can just as easily eat and afford something that I will.

An example of technological advantage and temporal succession lies with the invention of the refrigerator. The advancement of refrigeration led to the production and consumption of more foods that go off quickly when not cared for (Garnett, 2011), consequently increasing waste. Another temporal and social shift is the influence of rationing on food consumption. During World War II in particular, rationing practices discouraged food waste as consumers were limited in their resources, so learnt to make use of every part of the food they had (Thyberg & Tonjes, 2016). For Example, the ‘Dig for Victory’ campaign encouraged people to grow their own food and buy less. As a by-product, this highlighted the need to reduce consumption. In my own research, Kathy Bowen stated ‘we were brought up by parents who had lived through the war and wasted nothing!’ (Figure 5). My grandparents also recorded very little waste and stated ‘we are usually quite good at eating leftovers’ (Figure 2), thus once again being suggestive of people who grew up learning to save. Post World War II, Western (specifically within the U.S, but I feel justified to extrapolate) culture moved towards one of abundance and waste, caused by cheaper food that people could get more of (Thyberg & Tonjes, 2016). This is supported by my parents’ food waste diary (born in the late 1960s): it is much fuller and more reasons for food waste regard disliking it, therefore demonstrating how the privilege of being able to eat what you want and when you want ultimately leads to more waste.

There are discrepancies relating to the time available for cooking, storing, and preparing food. David Evans (2014) outlines the journey of food from planning, through shopping, preparation, consumption, storage, and ultimately to the bin, and explains how the planning process is usually much more subtle

than drawing out a meal plan and sticking to it to the letter. It allows for contingencies and last-minute changes. It is also very reliant on routine, as shown by Evan's case study of Sarah, a wife and mother of two, who buys fresh vegetables to replace those she has only half used as they're past their best.

I also agree with his statement that supermarkets have led to higher levels of food waste, as items are often only available in large quantities (Evans, 2014) and the availability of offers; hence, creating an overwhelming feeling that causing you to overbuy. In my study, most "off" food that was thrown away was bought from a supermarket. This raises the issue of consumer provenance and how we value food depending on where we purchase it. Watson and Meah (2013) discuss how food is valued less when bought in places with high staff turnover, such as supermarkets, rather than a more social purchasing experience; this lack of value perhaps leading to higher levels of waste.

Another interesting observation in both mine and Evans' study are the family dynamics involved in the buying and eating of food. Evans (2014) and Fischer (1992) discuss Devault's 1991 work on 'Feeding the Family'. Devault talks specifically about how women pay attention to eating preferences of each family member, and how they balance demands and limitations of income, work and other factors. This encourages the purchase of "fail safes" and "back-ups", leading to surplus food, and therefore waste (Evans, 2014). In my parent's survey, my mum threw out food twice because of my sister's preferences. Similarly, in one of Evans' study, a subject throws out half a cauliflower because their family only like it 'when it's "smothered" in cheese', and she doesn't want to cook something so unhealthy twice in a single week (p.35).

This leads into the strong imperative found by many to "eat properly"; my point, again, is based on work by Devault (1991) and is discussed by Evans (2014). "Proper eating" involves fresh ingredients, cooking from scratch, and experimentation (Evans, 2014). As above, experimentation is a privilege (Fischer, 1992), but the other two are financially viable for most. Sarah, of Evans' study, routinely buys the same vegetables to feed her family, but very often intentions to eat well don't quite align with reality. We often face time constraints and other commitments (Watson & Meah, 2013), so fresh food often goes off before eaten (Evans, 2014). Anxieties surrounding hygiene also come into play here, as Sarah often replaced vegetables, even though they were still edible as she (like most

others) would rather "play it safe" (Evans, 2014).

There are other anxieties surrounding food consumption and waste, which I believe to be products of "Western" culture. The increasing ease of accessibility to food could have a major effect on what and how much people eat (White, 2007). It's questionable as to whether excessive consumption is wasteful as it is technically eaten, but if the only outcome is weight gain, it is unnecessary and therefore wasteful. At the other end of the scale, I interviewed Sandra (not her real name), a friend who has suffered from anorexia in the past. She used to hide food from her parents and dispose of it at school, which whilst counting as "food waste", wasn't thrown away due to excess purchase.

Most anxiety surrounding food waste does not concern environmental impacts, but the personal financial impact of this, and any guilt, is usually directed towards people with less means to consume (Evans, 2014). Whilst these are valid concerns, they don't connect with the socio-environmental consequences of waste (Watson & Meah, 2013). To change behaviour surrounding food waste, we need to target specific behaviours that require changing. According to Shove (2010), behaviour change can often depend on institutional and social conditions, making attitudes and behaviours the product of specular interaction (Cochet, 2015); thus, drawing responsibility from the individual consumer and pushing it towards a more influential actor (Maniates, 2001). Nudge theory has been very effectively employed in food waste scenarios to change behaviour without invading personal lives. Living in catered halls, I personally do not throw much away. However, a lot of food does go into the bin from the kitchen as it isn't eaten by students; another example of overprovisioning to be better safe than sorry. Studies have shown that switching to a tray-less system reduces food waste in university halls (Getty & Thiagarajah, 2013), and with our plate sizes being deliberately small, students are prevented from taking more than they need. I believe that this could have a knock-on effect on the food waste recorded by kitchen staff, leading them to reduce the amount of food produced in the first place. To further decrease food waste in halls, it would be very beneficial to have students say what they want to eat a week in advance so that rough estimates of portions needed could be made and only slightly exceeded to ensure there is enough. This could also be supplemented by less perishable foodstuffs that can be stored for longer periods of time.

## Conclusion

To conclude, food waste practices have changed over time as a result of major structural changes, such as the Second World War, and much slower, long term changes that take place as a result of social and infra-structural conditioning. How we value food evolves depending on its ease of availability and our own changing perceptions, depending on the information seen and processed by different individuals; such as, two children being brought up as neighbours, one taught to throw things away when they hit the best before date and the other to eat things until they have mould growing on them. Food waste is intrinsically linked to how we value food, with periods of austerity leading to less food waste, and high provision normally leading to more waste. To decrease levels of waste, we must therefore look at how food is perceived by people and what we can do to influence the value of food.

**Additional food and drink waste**  
Now that you've recorded your daily food waste over a 7-day period, please look through your fridge and cupboards, and see if you are storing any food that can no longer be eaten. Recrod the details below.

	Additional food or drink thrown out	Brand / place of purchase	Weight / Quantity	Why wasn't it eaten in time?	Any other details?
11/02/2019	Most of an apple	from catered halls		Didn't like it	It got very squished in my bag
	Half a cup of coffee	from catered halls	100ml	Sold in too big a quantity	Too much caffeine = bad
	pear stalk	from catered halls	tiny		I ate the rest inc core
12/02/2019	one cherry tomato	from catered halls		Not stored effectively	it was slightly mouldy and split
	apple core	from catered halls		Not stored effectively	mouldy in the middle or I'd have eaten it.
13/02/2019	1.5 weetabix with soya milk	from catered halls	200g	Didn't plan ahead	took too much for my hunger
	bit of pastry from spring roll	from catered halls		20 Sold in too big a quantity	twas rock solid
	tea bag	from catered halls			
14/02/2019	tea bag				
	Vegan egg from holland and barret- basical	holland and barret	100g	Didn't like it	slimy and rubbery
15/02/2019					
16/02/2019	1/2 poppadom	restaurant in glen feshie	50g	Sold in too big a quantity	I was feeling greedy and took more food than I could manage. Oops.
	1/4 mini naan		50g	Sold in too big a quantity	
	200g curry		200g	Sold in too big a quantity	
17/02/2019					

Figure 1, My own food waste diary

A	B	C	D	E	F	G
Day	Type of food or drink waste	Brand / place of purchase	Quantity	Why wasn't it eaten?	Where did you	Any other details?
1	Bacon Rind					
2	lemons	asda	2	Went out of date		dried up after 2 weeks on holiday
2	none					
3	potato, carrot, onion peelings			Inedible		'Little or no waste here- we are usually quite good at using leftovers . More concerned about the proliferation of plastic wrapping in the bin! Nan.
4	none					
5	none					
6	none					
7	none					My Nanny and Grandad, born 1943 and 1939 respectively.

Figure 2, My grandparents diary

Your food waste diary						
Thank you for taking part in this study. Please record your daily food and drink waste in the spreadsheet below. Remember to record any additional items from your kitchen that are no longer edible at the bottom of the spreadsheet.						
Day	Type of food or drink waste thrown out	Brand / place of purchase	Quantity	Why wasn't it eaten?	Where did you eat?	Any other details?
1	Borscht	homemade	200g	Cooked too much	At home (self-catering)	cooked too much for daughter
	Sweet potato curry	homemade	50g	Cooked too much	At home (self-catering)	leftovers had been reheated too often
2	Carrot peel	veg box	1 carrot worth	Didn't like it	At home (self-catering)	Daughter doesn't like it
	banana skin	coop		1 Inedible	At home (self-catering)	don't know how to make string with it
3	banana skin	coop	200g	1 Inedible	At home (self-catering)	don't know how to make string with it
	coffee grounds	extract coffee mail order		Inedible	At home (self-catering)	no compost bin available
	mozzarella	aldi		Went out of date	At home (self-catering)	been in fridge for 3 weeks
4	1/5 kebab	kebab shop	100g	Sold in too big a quantity	Out at restaurant or café etc.	
	onion skin, sweet potato peel, garlic peel	veg box	30g	Inedible		
	cooking oil	sainsbury's	200g		At home (self-catering)	used 6 times and ready for bin
	carrot peel	veg box	10g	Inedible	At home (self-catering)	
	chips	sainsbury's	100g	Inedible		defrosted and didn't cook them
5	sourdough starter	wholefood shop	100g	Inedible	At home (self-catering)	
	orange peel	veg box		2 Inedible	At home (self-catering)	
6	mango pit and skin	sainsbury's	100g	1 Inedible	At home (self-catering)	
	yukky stir fry	veg box/ home made		Didn't like it		
	tea bags			2 Inedible		
7	onion peelings and cauliflower leaves	veg box	150g	Inedible		
	tea leaves	whole foods shop	20g	Inedible		

Figure 3, My parent's diary

Your food waste diary						
Thank you for taking part in this study. Please record your daily food and drink waste in the spreadsheet below. Remember to record any additional items from your kitchen that are no longer edible at the bottom of the spreadsheet.						
Day	Type of food or drink waste thrown out	Brand / place of purchase	Quantity	Why wasn't it eaten?	Where did you eat?	Any other details?
4	1 Used tea bags	Aldi brand	10 to 12		At home (self-catering)	They were composted
5	Coffee grounds	Aldi brand	4 scoops		At home (self-catering)	Should have been composted or used in the garden. I do usually but not this week!!
6	Vegetable and fruit peelings and cores	Various			At home (self-catering)	They were composted
7	Egg shells	Aldi	4		At home (self-catering)	They were composted
8	Chicken carcass and skin	Asda	1			Had made a stock with them before throwing in the bin.
9	2 Used tea bags	As above			At home (self-catering)	As above
10	Coffee grounds					
11	Fruit skins and cores					
15	3 Used tea bags	As above			At home (self-catering)	As above
16	Coffee grounds					
17	Fruit skins and cores					
18	Vegetable peelings					
19	Small amount of fat from chops	Asda				
21	4 Used tea bags	As above			At home (self-catering)	as above
22	Coffee grounds					
23	Fruit and vegetable peelings and cores					
24	Egg shells		4			
25	Soft crackers		6			
27	5 Used tea bags	As above			At home (self-catering)	As above
28	Coffee grounds					
29	Fruit cores and peels					
30	Mouldy olives					
31						
33	6 Used tea bags	As above			At home (self-catering)	As above
34	Coffee grounds					
35	Fruit skins and cores					
36	Vegetable peelings					
39	7 Used tea bags	As above			At home (self-catering)	AS above
40	Coffee grounds					
41	Fruit skins and cores					
42	Vegetable peelings					
43	Fat from beef					
45						

Figure 4, Kathy Bowen's Diary

It is rather boring actually but I believe it reflects our age and situation. Most of your questions I felt were more in tune with student life not a retired, reasonably well off couple!! I do not really need to budget and can buy in bulk and freeze. Will admit that perhaps I do spend too much on food each week - its cheaper when we are not buying wine!! But there is always something in the cupboards. I do plan a menu for the week ahead (don't always stick to it though) so I do not have stuff in I do not need and any left overs are either frozen or eaten the next day.

We were brought up by parents who had lived through the war and wasted nothing!!

Though I will do my main shop at Aldi and Asda once a week I also have the time and opportunity to go to local shops during the week to top up - on mainly fruit and vegetables.

Figure 5, Kathy Bowen Comments

## References

- Cochet, Y., 2015. Green Eschatology. In: *The Anthropocene and the global environmental crisis*. s.l.:Routledge in association with GSE research, pp. 112-119.
- Evans, D., 2014. *Food Waste: Home consumption, Material culture and everyday life...* s.l.:Bloomsbury Academic.
- FAO, 2011. *Global Food Losses and Food Waste*, Düsseldorf: interpack.
- Fischer, B., 1992. Reviewed Work: Feeding the Family: The Social Organisation of Caring as Gendered Work by Marjorie L. Devault. *Symbolic Interaction*, 15(4), pp. 529-532.
- Garnett, T., 2011. Where are the best opportunities for reducing greenhouse gas emissions in the food system (including the food chain)?. *Food Policy*, 36(1), pp. s23-s32.
- Getty, V. M. & Thiagarajah, K., 2013. Impact on plate waste of switching from a tray to a trayless system in a university dining hall and employee response to the switch. *Journal of the Academy of Nutrition and Dietetics*, 113(1), pp. 141-145.
- Maniates, M. F., 2001. Individualisation: Plant a Tree, Buy a Bike, Save the world?. *Global Environmental Politics*, 1(3), pp. 31-52.
- Shove, E., 2010. Beyond the ABC: climate change policy and theories of social change. *Environment and Planning*, 42(A), pp. 1273-1285.
- Thyberg, K. L. & Tonjes, D. J., 2016. Drivers of food waste and their implications for sustainable policy development. *Resources, Conservation and recycling, Volume 106*, pp. 110-123.
- Warde, A., 2005. Consumption and Theories of Practice. *Journal of Consumer Culture*, 5(2), pp. 131-153.
- Watson, M. & Meah, A., 2013. Cooking up Consumer Anxieties about "Provenance" and "Ethics". *Food, Culture & Society*, 16(3), pp. 495-512.
- White, M., 2007. Food Access and Obesity. *Obesity reviews*, 8(s1), pp. 99-107.
- WRAP, 2019. *Food Surplus and Waste in the UK - Key Facts*. [Online] Available at: <http://www.wrap.org.uk/sites/files/wrap/Food-Surplus-and-Waste-UK-Key-Facts-23-11-18.pdf> [Accessed 13 2019].

# What is divestment's role in a just transition and does it represent a legitimate means of reaching a global low carbon future?

*Meggie Beattie, First Year Biology*

**Abstract – By critically evaluating the divestment movement we can better understand if it is a useful cause to engage in, and if it will push a movement towards what is needed for a sustainable future; a just transition. In evaluating the movement itself, its actions, as well as the direct and indirect possible effects, this article works towards generating a better understanding of if this is an effective tool for sustainability.**

## **Introduction**

A just transition to a low carbon energy system is essential, and needs to be done in a way that can cope with increasing demands for access to clean and affordable energy (Healy & Barry, 2017). This leads to the necessity of reducing fossil fuels. Starting in 2011 on university campuses, the fossil fuel divestment (from now on referred to as FFD) campaign puts itself forward as a way to encourage this transition and now has multinational reach with 58,000 commitments to divest from over 76 countries (Ibid). It involves the encouragement of institutions to divest from fossil fuels, an action that has more widespread influences than direct impact. As the largest part of the Fossil Fuel Divestment movement, within this essay, FFD will be used synonymously with reference to the divestment movement. This essay will explore if divestment is useful for the push towards a just transition by looking at its aims, influences and supposed effects.

## **Just transition and low carbon future**

A global energy transition is essential, as halting or at least decreasing the rate of climate change is something that needs imminent action (IRENA, 2018). For this transition to be just, it must address the problems involved with energy justice, such as the politics of availability, accessibility and sustainability (Healy & Barry, 2017). With this, it should be understood that the transition is also a political problem involving power, as well as resource distribution, and should be addressed as such (Burke & Stephens, 2018). If energy justice is not built into the transition, then any new energy system will just continue the habits of the past global political economy (Healy & Barry, 2017). To achieve this, many approaches will be needed, with FFD representing just one part of this global movement.

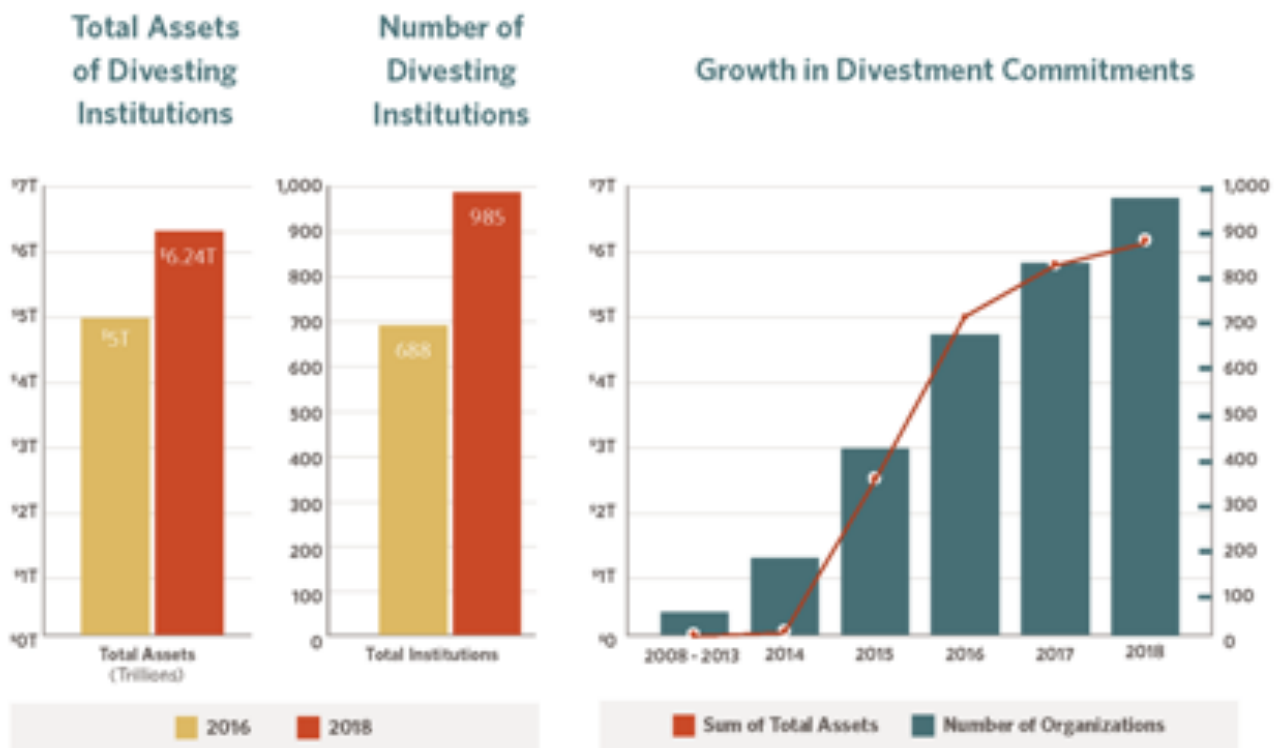
## **Divestment movement**

Divestment is the reduction of investments that are unethical or morally ambiguous, such as fossil fuels (Fossil-Free, 2017). The FFD campaign has called for institutions and individuals to sell shares or other forms of shareholding from firms investing in fossil fuels (Healy & Barry, 2017). Through this and other methods, the movement looks to publicly name, stigmatize, and take away the social license of the fossil fuel industry. The way in which the FFD movement is perceived as unique is in how its climate action has a focus on the energy justice needed in a transition - making divestment at its heart a social justice movement, as well as a climate one (Miller & Richer, 2014). Its focus on ethical and economic limits, as well as the ecological, is key in making sure that the transition towards a low-carbon world is a just one (Healy & Barry, 2017).

The true impact of FFD as a campaign for the transition can be looked at from both direct and indirect effects. In Ayling and Gunningham (2015) it is explained how the FFD movement is under no illusions to the fact that while it argues for divestment by investors, others are likely to purchase the divested stocks, and therefore the divestments would have little discernible mark on their value. This is a key issue that highlights how the divestments at this stage are not the point of the campaign, and how the true impact of these actions is the indirect effects and influences into the public sphere (Ayling & Gunningham, 2015; Healy & Barry, 2017).

The campaign's hard-line approach of vilifying fossil fuel companies puts the campaign itself in direct conflict with the financial world and fossil fuel industries (Ayling & Gunningham, 2015). As this strategy works to stigmatise the fossil fuel industry, it has obviously garnered disdain, but even that can help in generating publicity in ways that are helpful for the transition movement. For example, through radical shift. The radical shift is where activism is promoted by providing alternative viewpoints that can shift debate through the introduction of more extreme options – this can create impact even if they remain radical ideas as it can help affect institutional policy by indirectly giving legitimacy to the positions of others (Schifeling, 2017). So, in this case, it means more moderate sus-





Data accurate as of September 5, 2018.

Figure 1. Statistical description of growth of divestment movement and associated assets (Caden, 2018)

tainability ideas about climate action and transitions to a low carbon future can be moved into the centre ground. This increase in normalisation can help put forward cases for more substantial divestment, such as those explored by Grantham (2018) at the London School of Economics, which found that investors were unlikely to lose money by divesting from fossil fuels. These types of studies can help lend legitimacy to transitions toward a low-carbon world, and help in convincing the public sphere of its feasibility.

The effectiveness of this stigmatisation in changing public opinion has been much disputed in both academic and industrial discourse. What cannot be denied though is the growth of the movement. This is evident in Figure 1, which shows how in under 5 years the movement grew from almost nothing to having brought about \$6 trillion in divestments. A study by Kiyar (2015), on the changing of the energy mix in the four main energy suppliers in Germany, found that that the divestment campaign had little to no impact on decision making for the new structure. The effectiveness of the shaming has also been disputed by studies, such as MSCI (2013) and IEEFA (2018) where little to no effect by divestment campaigns were found. Contradictorily, a study by Cornell (2015) indicates high costs for divesting from fossil fuels. A case that may show the effectiveness of stigmatization is coal discourse in Australia between 2013 and 2016, where

the FFD campaign targeted the legitimacy of the coal industry resulting in much discourse in the public sphere, and a retaliation that resulted in the coal industry increasing advertising campaigns (Ayling, 2017; Ayling & Gunningham, 2015). These attempted destructions of the social licence can be useful in getting the transition started, but is not necessarily the only answer to the transition movement in the long term.

Divestment continues to divide academia, where some believe it to be important for the projection of the climate agenda, and others fearing that the movement could draw attention away from more effective ways to encourage the low-carbon energy transition (Tollefson, 2015).

### Conclusion

While the FFD campaign is a useful tool for bringing attention to issues and acknowledging the social justice side to climate issues more, the divestments are not very impactful in themselves. Divestment does not appear to be affecting more than the politics of sustainability, and while the framework of the movement states it has social justice at its core, it currently functions as more of an attention grabber. Divestment still plays this role well. Ayling and Gunningham (2015) highlight this as stigmatising fossil fuel industries, highlighting the need for energy justice and helping to push for a rapid change in attitudes.

## References

- Ansar, Atif, Ben Caldecott, James Tilbury (2013) “Stranded Assets and the Fossil Fuel Divestment Campaign: What Does Divestment Mean for the Valuation of Fossil Fuel Assets?” *Stranded assets program*, SSEE & University of Oxford
- Apfel, Daniel C. (2015) “Exploring Divestment as a Strategy for Change: An Evaluation of the History, Success, and Challenges of Fossil Fuel Divestment,” *Social Research: An international Quarterly* 82(4): 913-937
- Ayling, Julie M., and Neil Gunningham. (2015) “Non-State Governance and Climate Policy: The Fossil Fuel Divestment Movement.” SSRN Scholarly Paper. Rochester, NY: Social Science Research Network, <https://papers.ssrn.com/abstract=2601176>. (Accessed March 25, 2019).
- Ayling, Julie. (2017): “A Contest for Legitimacy: The Divestment Movement and the Fossil Fuel Industry.” *Law & Policy* 39(4) 349–71. <https://doi.org/10.1111/lapo.12087>. (Accessed March 25, 2019).
- Bradshaw, Elizabeth A. (2015) “Blockadia Rising: Rowdy Greens, Direct Action and the Keystone XL Pipeline.” *Critical Criminology* 23(4): 433–48. <https://doi.org/10.1007/s10612-015-9289-0>. (Accessed March 25, 2019).
- Burke, Matthew J., and Jennie C. Stephens. (2018) “Political Power and Renewable Energy Futures: A Critical Review.” *Energy Research & Social Science*, Energy and the Future, 35: 78–93. <https://doi.org/10.1016/j.erss.2017.10.018>. (Accessed March 29, 2019).
- Caden, Yossi, Mark Camplanale, Ellen Dorsey, Sian Ferguson, Daniela Finamore, Fletcher Harper, et al, (2018) “The Global Fossil Fuel Divestment and Clean Energy Investment Movement” Arabella Advisers, <https://www.arabellaadvisors.com/wp-content/uploads/2018/09/Global-Divestment-Report-2018-1.pdf> (Accessed March 29 2019).
- Grantham, Jeremy (2018) “The Mythical Peril of Divesting from Fossil Fuels.” *Sustainable finance leadership*, Grantham Research Institute on Climate Change and the Environment (blog). <http://www.lse.ac.uk/GranthamInstitute/news/the-mythical-peril-of-divesting-from-fossil-fuels/>. (Accessed March 25, 2019).
- Hazan, Louise, Yossi Caden, Richard Brooks, Alex Rafalowicz, and Brett Fleishman. “\$€ 1000 Divestment Commitments and Counting,” FOSSIL FREE
- Healy, Noel, and Jessica Debski. (2017), “Fossil Fuel Divestment: Implications for the Future of Sustainability Discourse and Action within Higher Education.” *Local Environment* 22(6): 699–724. <https://doi.org/10.1080/13549839.2016.1256382>. (Accessed March 25, 2019).
- Healy, Noel, and John Barry. (2017) “Politicizing Energy Justice and Energy System Transitions: Fossil Fuel Divestment and a ‘Just Transition.’” *Energy Policy* 108:451–59. <https://doi.org/10.1016/j.enpol.2017.06.014>. (Accessed March 25, 2019).
- IRENA “Energy Transition.” <https://www.irena.org/energytran-> sition. (Accessed March 24, 2019).
- Kiyar, Dagmar, and Bettina B. F. Wittneben. (2015) “Carbon as Investment Risk—The Influence of Fossil Fuel Divestment on Decision Making at Germany’s Main Power Providers.” *Energies* 8(9): 9620–39. <https://doi.org/10.3390/en8099620> (Accessed March 24, 2019).
- Rowe, James, Jessica Dempsey, and Peter Gibbs. (2016) “The Power of Fossil Fuel Divestment (and Its Secret),” UC Santa Cruz. <https://escholarship.org/uc/item/5482r07p> (Accessed March 24, 2019).
- Sanzillo, Tom, Kathy Hipple, and Clark Williams-Derry. (2018) “The Financial Case for Fossil Fuel Divestment,” IEEFA, Sightline Institute
- Tollefson, Jeff, and Mark Ralston. (2015) “Reality Check for Fossil-Fuel Divestment,” *Nature*. 521(7550) 16



# An Exploration of Future Implications of Background Climate Change

*Alusha Romaniszyn, Third Year Geography*

**Abstract** – This piece summarises the key geographical literature pertinent to considering the future implications of background climate change. The piece was designed for use in policy decision making, and thus it should be understood by a general audience, as well as being interesting for more geographically inclined individuals. Therefore, an explanation of background climate change – focussing on orbital forcing and the effect of atmospheric CO<sub>2</sub> – is given, before the implications of these processes for future climate change are explained. Of equal importance is the scientific knowledge presented in the paper, highlighting how the submission informs readers on all levels of background climate change knowledge.

the beginning of the genus Homo (Jackson, 2016). This period is characterised by glacials (lasting ~100,000 years) followed by much warmer interglacials (lasting 10,000-15,000 years) (National Geographic, n.d.). This POSTNote will discuss:

- How orbital forcing in combination with atmospheric CO<sub>2</sub> concentrations caused these changes and produced the Earth's present climate.
- How these forces are expected to interact with human factors in dictating the future of Earth's climate.
- The impact of the expected climate changes involving sea level rise (particularly in the UK) and the impacts on plants and animals.

## Causes of Climate Change in the Quaternary

The last glacial maximum of the Quaternary reached its global peak 21,000 years ago (Mann and Selin, 2017), at which point the ice sheet covering most of the Northern Hemisphere's land mass retreated. 11,700 years ago Earth had warmed into the current interglacial, known as the Holocene, which is characterised by the stable temperatures that have allowed human societies to develop (Ruddiman, 2013). It is not known how the Holocene will end, however, it is likely that Earth will fall into another glacial as has been the case throughout the Quaternary. The following sections will elaborate on the planetary forces which effect the Earth's climate.

### Orbital Forcing:

Temperature is dependent on incoming solar radiation (insolation). Once this has entered the atmosphere it interacts with atmospheric phenomena, like greenhouse gases and cloud cover, before reaching Earth's surface. The distribution of insolation is what causes different climates over different times and regions – including the seasons – by increasing the temperature between areas (Imbrie and Imbrie, 1979). The insolation at 65°N is an indicator used to study the interaction between temperature and the loss/formation of ice sheets. When insolation is low at 65°N, the temperature is cooler and, consequently there is an accumulation of ice. Conversely, when insolation is high, ablation (a net loss) of the ice sheet occurs. Over 100,000s years of accumulation can form thicker and larger ice sheets, leading the Earth into a new glacial. To end this accumulation of ice, temperatures increase above -10°C, subsequently meaning the rate of ablation increases rapidly enough to surpass accumulation; the ice sheets retreat, and the Earth enters an interglacial period (Ruddiman, 2001).

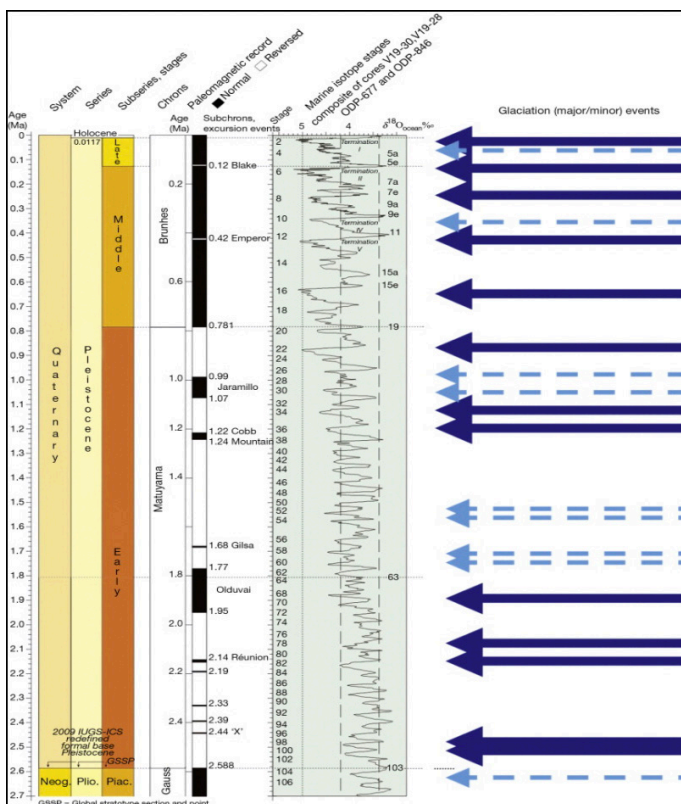


Figure 1 Source: (Subcommission on Quaternary Stratigraphy, 2019).

Over the last 2.6 million years background climate change has caused a repeating cycle of glacials and interglacials (Ehlers and Gibbard, 2013). This POST-Note will provide an overview of the systems driving these changes and the impact they will have on the future climate, including the predicted start date of the next glacial.

## Background

The Quaternary is the current geological period, starting 2.6 million years ago and coinciding with

Roughly the same amount of insolation reaches the Earth each year, but it is distributed differently depending on which phase of orbital variation is currently underway (Imbrie and Imbrie, 1979). These variations in insolation occur over thousands of years – resulting in significant change in the characteristics of the ice sheets present. There are three main orbital variations with different timescales:

- **Eccentricity:** the orbit changes from oblong to more circular, with a periodicity of 100,000 years. This has the least direct effect, but it changes the amplitude of precession effects (Ruddiman, 2001).

- **Tilt:** by affecting the distribution of insolation the Earth's tilt causes the seasons:

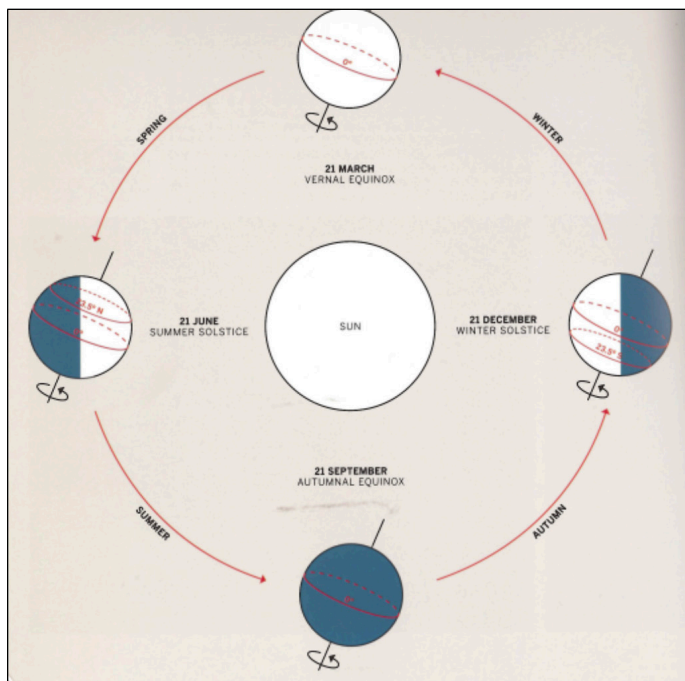


Figure 2: Diagram to illustrate the effect of tilt. Source: (Cox and Cohen, 2014)

As can be seen in Figure 2, the Northern Hemisphere is tilted towards the sun between March and September. It therefore receives most of the insolation, and thus experiences spring and summer at this point of the year. This same process causes the Southern Hemisphere to experience spring and summer from September to March. Tilt varies between  $22.2^\circ$  and  $24.5^\circ$ , with a periodicity of 41,000 years. At  $22.2^\circ$ , the seasons and climate in the Northern and Southern Hemispheres are more similar than the present day's middling tilt of  $23.5^\circ$ . The opposite is true when the tilt reaches  $24.5^\circ$ .

- **Precession of the equinoxes:** the equinoxes occur at different points on the orbit each year – due to changes to the direction of tilt and the points of the orbital ellipse – eventually occurring at the same point again after 23,000 years. Its main effect is to

change the length of the seasons, as shown in Figure 3.

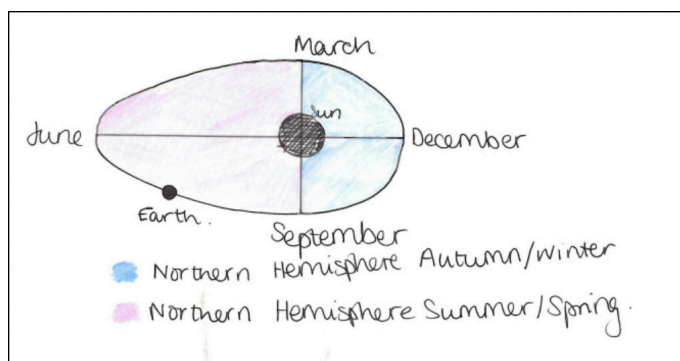


Figure 3: Precession of equinoxes illustrated as an exaggerated ellipse. Source: Author's own sketch.

Due to the elliptical nature of Earth's orbit, the Northern Hemisphere currently has a slightly longer summer than the Southern Hemisphere by 7 days (Imbrie and Imbrie; 1979). When the shape of the ellipse changes, this ratio also changes.

### CO<sub>2</sub> and Orbit:

Atmospheric CO<sub>2</sub> is a greenhouse gas; therefore, a build-up of the gas forms part of the blanket, which is reflected heat energy back to the Earth's surface (Ruddiman, 2001). A large portion of the insolation which reaches the atmosphere passes through to Earth's surface. Part of this energy is absorbed and the rest reflected back into the atmosphere. Without greenhouse gases the energy would be lost. However, they act to insulate Earth and reflect the energy back to the surface, repeating the cycle. Together, CO<sub>2</sub> and orbital forcing account for the changes in climate seen throughout the Quaternary: orbital variations dictate how much insolation reaches Earth, and the CO<sub>2</sub> concentration dictates how much of that energy stays within the Earth system. For example, the greenhouse effect is lessened when CO<sub>2</sub> concentrations are low, and so a glacial period would be expected; though this may not occur if there is high insolation due to orbital variations, exemplifying the importance of joint consideration.

### Implications of These Processes for Future Climate Change

Climatic changes in the Quaternary have dramatically reshaped not only the landscapes of the continents, but also the ecosystems, as illustrated by Case Study 1. It is expected that future climate changes will have a similarly dramatic effect both on sea levels and the distribution of organisms. For example, Barnosky et al. (2014) predicted that some areas currently populated by humans may become uninhabitable due to temperature increases.

### CO<sub>2</sub> and Orbit:

Ganopolski et al. (2016) studied CO<sub>2</sub> and orbital

### Case Study 1:

During the Last Glacial Maximum (LGM), the Laurentide ice sheet covered most of North America, not only preventing the movement of plants and animals, but also holding a large volume of Earth's water. This opened a land bridge between modern day Canada and Russia. When the global ice sheets melted, sea level increased by a net total of 120m (Clark and Mix, 2002). When this period ended the ice sheets covering the Northern Hemisphere retreated, allowing for vast movements of organisms including humans.

forcing to predict future climate by comparing the present conditions to those of past interglacials. This indicated that if the input conditions were similar, the results would be too. However, it was difficult to find a good analogue because atmospheric CO<sub>2</sub> is currently higher than it has been for much of the Quaternary. CO<sub>2</sub> emissions are also increasing more rapidly now than at any earlier point in the Quaternary (Haigh, 2017). This is due to human-caused emissions. It would be wholly inaccurate to ignore human impacts, but they are difficult to predict. Regardless of the difficulties, Ganopolsky et al. predicted the Holocene to be an exceptionally long interglacial, lasting for another 50,000-100,000 years. This illustrates the importance of considering both factors since Earth is currently experiencing very low insolation, and without studying CO<sub>2</sub>, the global climate would be expected to be considerably cooler.

### Impact of Extended Interglacial:

Earth is experiencing low insolation because it is nearing the lowest orbital eccentricity (i.e. the orbit is more circular), so the effects of precession are dampened (Berger, 2002). However, the coming of a new glacial is not the only potential threat to human society. Barnosky et al. (2014) predicted that "human quality of life will suffer substantial degradation by the year 2050 if we continue on our current path." Much of this degradation would be resultant from substantial sea level rise (Berger, 2002). Berger (2002) predicted that if humans were to raise CO<sub>2</sub> to 750ppmV, all ice on Earth will have melted within 1000 years. This would cause up to 65m of sea level change (National Geographic, n.d.), which would have a catastrophic effect on coastal and low-lying areas; such as, the Ganges Delta, extremely populated coastal cities in China, and the UK, as illustrated in Case Study 2.

### Case Study 2:

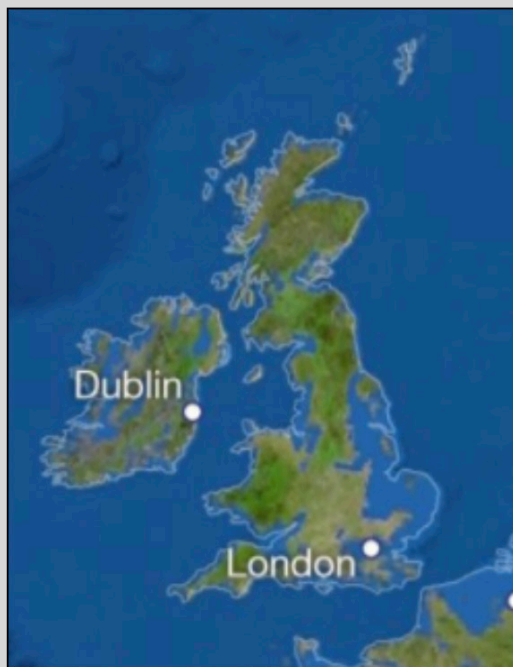


Figure 4: the effect of total ice melt on the UK (National Geographic, n.d.)

Figure 4 shows the coast of the UK in 3017 if the rise in sea level predicted by Berger (2002) occurred. It would include substantial loss of both populated areas, valuable habitats, and farmland. Only the areas with the greatest altitude would be left, however these are very difficult to farm and live on. The loss of populated areas such as London would cause not only substantial loss of property, but also displace millions of people (Prynn, 2017).

This demonstrates how orbital variations and CO<sub>2</sub> levels can combine to have a monumental impact, especially if the rates of human CO<sub>2</sub> emissions are not curbed in the "Anthropocene".

## References

- Barnosky, A. and Hadly, E. (2016). *End game*. London: William Collins.
- Barnosky, A., Brown, J., Daily, G., Dirzo, R., Ehrlich, A., Ehrlich, P., Eronen, J., Fortelius, M., Hadly, E., Leopold, E., Mooney, H., Myers, J., Naylor, R., Palumbi, S., Stenseth, N. and Wake, M. (2014). Introducing the Scientific Consensus on Maintaining Humanity's Life Support Systems in the 21st Century: Information for Policy Makers. *The Anthropocene Review*, 1(1), pp.78-109.
- Berger, A. (2002). CLIMATE: An Exceptionally Long Interglacial Ahead?. *Science*, 297(5585), pp.1287-1288.
- Clark, P. and Mix, A. (2002). Ice sheets and sea level of the Last Glacial Maximum. *Quaternary Science Reviews*, 21(1-3), pp.1-7.
- Cox, B. and Cohen, A. (2014). *Human universe*. London: William Collins.
- Ehlers, J. and Gibbard, P. (2013). GLACIATIONS | Overview. *Encyclopedia of Quaternary Science*, pp.143-150.
- Ganopolski, A., Winkelmann, R. and Schellnhuber, H. (2016). Critical insolation-CO<sub>2</sub> relation for diagnosing past and future glacial inception. *Nature*, 534(7607), pp.1-2.
- Haigh, J. (2017). *A brief history of the Earth's CO<sub>2</sub>*. [online] BBC News. Available at: <http://www.bbc.co.uk/news/science-environment-41671770> [Accessed 29 Oct. 2017].
- Imbrie, J. and Imbrie, K. (1979). *ICE AGES: Solving the Mystery*. London: Macmillan.
- Jackson, S. (2016). *Climate Change*. [online] Encyclopedia Britannica. Available at: <https://www.britannica.com/science/climate-change/Climate-change-since-the-advent-of-humans#ref994351> [Accessed 27 Oct. 2017].
- Mann, M. and Selin, H. (2017). *Global Warming*. [online] Encyclopedia Britannica. Available at: <https://www.britannica.com/science/global-warming#ref979217> [Accessed 27 Oct. 2017].
- NASA. (2014). *What Is Climate Change?*. [online] Available at: <https://www.nasa.gov/audience/forstudents/k-4/stories/nasa-knows/what-is-climate-change-k4.html> [Accessed 27 Oct. 2017].
- National Geographic. (n.d.). Quaternary Period. [online] Available at: <https://www.nationalgeographic.com/science/prehistoric-world/quaternary/> [Accessed 27 Oct. 2017].
- Nationalgeographic.com. (n.d.). *What the World Would Look Like if All the Ice Melted*. [online] Available at: <https://www.nationalgeographic.com/magazine/2013/09/rising-seas-ice-melt-new-shoreline-maps/> [Accessed 27 Oct. 2017].
- Prynn, J. (2017). *London population surges to all-time high of 8.8m*. [online] Evening Standard. Available at: <https://www.standard.co.uk/news/london/london-population-surges-to-all-time-high-of-88m-a3570641.html> [Accessed 29 Oct. 2017].
- Ruddiman, W. (2001). *Earth's climate: Past and Future*. New York, NY: Freeman.
- Ruddiman, W. (2013). The Anthropocene. *Annual Review of Earth and Planetary Sciences*, 41(1), pp.45-68.
- Subcommission on Quaternary Stratigraphy. (2019). Charts | *Subcommission on Quaternary Stratigraphy*. [online] Available at: <http://quaternary.stratigraphy.org/charts/> [Accessed 14 Aug. 2019].

# POSTnote on Sea Level Change around the British Isles

*Kathryn Hastie, First Year Geography*

**Abstract** – This POSTnote looks at sea level changes around the British Isles, with a focused study on the isostatic and eustatic processes that influence sea level change. By looking at the history of sea level change since the Last Glacial Maximum (LGM), approximately 15,000 years ago, we can determine how sea levels have changed over the centuries. Furthermore, the POSTnote discusses the causes and implications of sea level change, which are important factors to consider in order to put effective management strategies in place to combat the issue of increasing global sea levels.

## Introduction

Global sea level change is a profound concern and primary long-lasting effect of anthropogenic climate change. Sea level was greatly impacted by the deglaciation of the Last Glacial Maximum (LGM), and the British Isles were almost certainly ice-free after 15ka. As the British–Irish ice sheet (BIIS) retreated and all remaining ice sheets vanished, global sea levels increased by 2.5m (Clark et al., 2012). However, sea level changes are not consistent across different areas of the world due to different isostatic changes. Relative sea level (RSL) describes sea level rise with respect to the land and varying land and sea movements; eustatic sea level changes are based on the level of water in the ocean as a whole, without taking into consideration land movements (Rovere et al., 2016). Relative sea level rise shows the variation of sea level on a regional and more local level, illustrating how sea level change is more or less severe in different areas of the British Isles. This allows for “area specific” management strategies to be implemented in order to reduce the impacts of sea level rise that affect coastal areas today. This POSTnote summarises the sea level changes which occurred across the British Isles after the LGM, while taking into consideration the isostasy and eustasy components. Furthermore, it will explore possible outcomes of future sea level rise, and will outline implications and management strategies to adjust to changing sea levels across the British Isles.

## Causes of Global Sea Level Rise

Sea level rise is influenced by a number of factors. The two main processes are thermal expansion (as temperatures rise) and the melting of glaciers, ice caps and ice sheets. As greenhouse gas emissions (GHG) increase, in part due to anthropogenic activ-

ity, the Earth’s atmosphere heats up. This results in ocean warming, causing water density to decrease and oceans to volumetrically expand (explaining the sea level rise). Sea levels are projected to rise by 40% from 1993-2015 due to thermal expansion alone (Edwards, 2017). Furthermore, the melting of ice caps and large bodies of ice causes fresh water (originally locked out of the hydrological system) to be returned to the sea, causing sea levels to rise.

## Sea Level Rise across the British Isles

After the LGM around 15,000 years ago, and the retreat of ice sheets that covered large areas of the British Isles, there has been a profound effect on sea levels. The British Irish Ice Sheet covered most of the British Isles, while it left South East England predominantly ice-free (Figure 1). As the mass of ice in the northern hemisphere grew, eustatic sea levels fell due to water being stored as ice. At the end of the glacial period, the ice retreated, causing glacio-isostatic rebound in northern parts of Scotland; as eustatic sea level rises (due to there being more water) and the depressed land also starts to rise, causing both the land and sea to rise together, in turn causing global sea levels to also rise. The ice had the greatest presence in Scotland and as a result, this was where the ice was at its thickest, leading to significant crustal depression there as the land was pushed downwards. As Scotland was being pushed down, this caused England to form a forebulge region, where the land began to rise and the sea levels dropped (Shennan et al, 2018). Areas such as the western Highlands were where ice was most concentrated - ice cover was much thinner towards the outskirts of Scotland. This led to differing degrees of isostatic rebound across Scotland, forming the varying coastal shores present today (Scottish Archaeological Research Framework). Following the last glacial maximum, temperatures rose by 4°C until they eventually stabilised 11,000 years ago. This rise in temperature caused any remaining ice sheets in the British Isles to disappear completely, forming the sea levels we have today. However, despite the stabilisation of temperatures 11,000 years ago, it took a further 8,000 years for ice sheets to do the same, resulting in a sea level rise of 45m before reaching modern day levels around 3,000 years ago (Wentworth and Mackie, 2017). Over the last century, sea level has risen at a rate of around 1-2mm per year, in part due to anthropogenic climate change (Warrick and Oerlemans, 1990).



## Future Sea Level Rise

As human activities increase, GHG emissions increase, resulting in temperature and sea level rise. These climatic changes could result in a global sea level rise between 10-30cm over the next four dec-

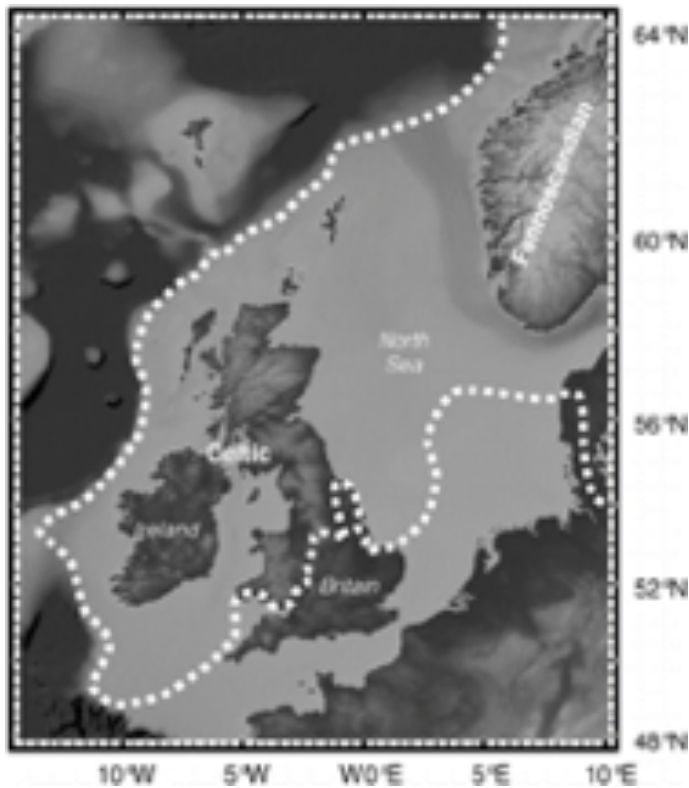


Figure 1 – British Irish ice sheet. (Source: unknown.)

ades (Warrick and Oerlemans, 1990). However, it is hard to accurately predict future sea levels due to the uncertainties surrounding temperature predictions over future decades. For example, the Intergovernmental Panel on Climate Change has created Representative Concentration Pathways which outline different projections of sea level rise under different conditions. From the years 2081-2100, RCP2.6, the scenario that assumes GHG will reduce and temperature rise will be under 2.0 °C, projects a sea level rise of between 0.26-0.55m. However, RCP8.5, the worst-case scenario that expects high temperatures and GHG emissions, projects sea level rise between 0.45-0.82m (Church and Clark, 2011).

## Implications

Sea level rise has major implications for populations and landscapes across the British Isles, with one central concern being coastal flooding. Coastal flooding is estimated to cost around £540 million per year with it being 1 of the top 4 priority risks in the UK. With 1/3 of the UK population living within 5km of the coast and 2/3 living within 15km of the coast, it is vital that effective policy and management strategies

are implemented in order to combat the effects of sea level rise (Edwards, 2017). Coastal erosion is another major concern; in the UK, damages are estimated to cost up to £126m per year by 2080, with 28% of the English and Welsh coast experiencing coastal erosion of 0.1m/year. In England, 44% of the coast is protected against erosion, whereas only 6% of Scotland's coastline is protected, suggesting Scotland is at a much higher risk of coastal erosion than England (Climate Change Post, 2018). It is estimated that flooding may cost businesses between £26m and £72m by 2050s as damage to buildings, infrastructure, and supply disruption come at a considerable cost (Climate Change Risk Assessment, 2012). When looking at the environment, sea level rise also causes wetlands to shrink and increases flood risk in coastal areas. Wetlands are vital to nature conservation, and wetland shrinkage due to sea level rise can cause wildlife, biodiversity and habitats to be negatively impacted. If sea levels continue to rise at an alarming rate in the future, between 36-70% of wetlands worldwide could be lost, seriously impacting many sectors and industries, such as food production (Nicholls et al, 1999).

## Government Policy and Management Strategies

As global average temperatures increase, and sea levels rise in the future, the impacts to populations and built environments could be devastating, showing that it is vital that the UK implements effective strategies to combat these problems. Due to the differing pressures of sea level rise, and variations in land-use across different areas of the UK, coastal management strategies must be adjusted accordingly. Scotland's risk of flooding is far less than other areas of the UK, such as England, due to it having upward land movement, as well as lower population densities. On the contrary, much of England and Wales are at high risk of flooding, and communities such as Fairbourne in Wales may have to relocate due to flooding of the town (Wentworth and Mackie, 2017). Management realignment strategies have been implemented in many areas across the UK, and work by removing defence structures in order to allow an area to flood in a controlled way. This, therefore, allows ecosystems to flourish despite rising sea levels. Such a strategy was implemented in Essex in 2002 to try to revitalise saltmarsh habitats in the area, and was proven to be extremely beneficial as it effectively protected the local communities from flooding, as well as provided infrastructure (Baker-Jones et al., 2017). Furthermore, the Department for Environment, Food and Rural Affairs (DEFRA) has implemented policy in order to combat the problems of

coastal erosion and flooding. One way in which DEFRA has done this is through offering a £6,000 grant to those most affected by coastal erosion in order to cover some of the costs they may face (The Parliamentary Office of Science and Technology, 2010).

## References

Baker-Jones, M. et al. (2017) *Managed coastal realignment projects in the UK: 'working with nature'*. Gold Coast: National Climate Change Adaptation Research Facility

Church, J. A. and Clark, P. U. (2011) *Sea Level Change*. Cambridge and New York: Cambridge University Press

Clark, C.D., Hughes, A.L.C., Greenwood, S.L., Jordan, C., and Sejrup, H.P. (2012). Pattern and timing of retreat of the last British-Irish Ice Sheet. *Quaternary Science Reviews*, 44, pp.112–146.

Climate Change Post (2018) *Coastal erosion United Kingdom*. Available at: <https://www.climatechange.org.uk/england/coastal-erosion/> (Accessed: 26 October 2018)

Climate Change Risk Assessment (2012) *Floods and Coastal Erosion*. United Kingdom: Climate Change Risk Assessment

Edwards, T., (2017). *Sea Level Rise*. SpringerReference.

Nicholls, R. J., Hoozemans, F. M. J. and Marchand, M. (1999) *Increasing flood risk and wetland losses due to global sea-level rise: regional and global analyses*. 9 (1) pp. S69-S87

Rovere, A., Stocchi, P. & Vacchi, M., (2016). Eustatic and Relative Sea Level Changes. *Current Climate Change Reports*, 2(4), pp.221–231.

Scottish Archaeological Research Framework *Relative sea level changes during the last 15,000 years*. Available at: <https://www.scottishheritagehub.com/content/34-relative-sea-level-changes-during-last-15000-years> (Accessed: 24 October 2018)

Shennan, I., Bradley, S.L. & Edwards, R., (2018). Relative sea-level changes and crustal movements in Britain and Ireland since the Last Glacial Maximum. *elsevier*. pp.143-159.

The Parliamentary Office of Science and Technology (2010) *Sea Level Rise*. London: The Parliamentary Office of Science and Technology

Warrick, R. and Oerlemans, J. (1990) Climate Change. *The IPCC Scientific Assessment*. pp. 257–282

Wentworth, J. and Mackie, E. (2017) *Rising Sea Levels*. London: The Parliamentary Office of Science and Technology



# An Exploration of Ruddiman's Early Anthropogenic Hypothesis

*Lara Williams, Fourth Year Geography*

**Abstract – Professor William F. Ruddiman proposed a theory in 2003 that anthropogenic impacts on the climate started 8000 years ago due to mass deforestation. Prior to this proposal, the Industrial Revolution of the 1800s was widely regarded as the starting point for anthropogenic impacts on the environment and climate; Ruddiman's suggestion upended this assumption. Ruddiman received a fair amount of criticism following his proposals; in response, he expanded his research and raised several counter-points to defend his position. This piece will discuss his Early Anthropogenic Hypothesis in more depth and identify some contestations, ultimately providing an analysis of the arguments for and against his hypothesis and concluding that Ruddiman's hypothesis is not as radical as his critics might believe.**

## Introduction

In 2003, Professor William Ruddiman proposed a theory that anthropogenic impacts on the planet began 8000 years ago with early deforestation. Prior to this proposition, the Industrial Revolution of the 1800s was widely accepted as the starting point for anthropogenic impacts due to the substantial increase in the release of greenhouse gases. Citing mass deforestation and the expansion of agricultural settlements in the early Holocene, Ruddiman draws upon climate modelling techniques, ice core data, and archaeological evidence of early human development, which together show a reversal of projected downward trends of CO<sub>2</sub> (carbon dioxide) and CH<sub>4</sub> (methane) as early as 8000 years ago. Ruddiman's argument is separated into three parts: 1) the anomaly between predicted and recorded late Holocene CO<sub>2</sub>/CH<sub>4</sub> trends resulted in a warming period; 2) this anthropogenic warming caused an ongoing glacial interception; and 3) short-term CO<sub>2</sub> drops over the last 2000 years that cannot be explained by natural forcing are a result of major pandemics (Ruddiman 2003). Ruddiman specifies that the upward CO<sub>2</sub> trend began 8000 years ago with mass deforestation, while CH<sub>4</sub> levels started rising about 5000 years ago due to the expansion of inefficient rice paddy agriculture. Following the original publication of his paper in 2003, Ruddiman received several criticisms of his hypothesis. He expanded his research and came up with several counter-arguments to the raised issues, modifying certain aspects but overall defending his original early anthropogenic proposition. This

paper will discuss Ruddiman's hypothesis in more depth and point out some potential contestations, ultimately providing an analysis of the arguments for and against the Early Anthropogenic Hypothesis.

## Framework for the Hypothesis

As stated above, Ruddiman's overarching argument consists of three parts – significant anthropogenic impact began ~8000 years ago, a late Holocene glacial onset was intercepted, and the recent dip in CO<sub>2</sub> levels was due to mass mortality across the globe due to widespread pandemics. To fully grasp Ruddiman's argument, the context for his hypothesis must be outlined. The distinction between the Anthropocene and the Holocene is key to Ruddiman's hypothesis and must be appreciated. The Holocene, also known colloquially as “the age of man,” marks the current interglacial cycle (Bagley, LiveScience 2013). Although the Holocene has “witnessed all of human's recorded history and the rise and fall of all its civilizations”, the question of a new epoch entitled the Anthropocene has been raised (Crutzen 2007). The concept of the Anthropocene suggests an epoch within the Holocene characterised entirely by human activity. The start of the Anthropocene is currently proposed at the Industrial Revolution. However, Ruddiman's argument that human activity impacted climate change thousands of years earlier suggests a much earlier beginning for the Anthropocene. Ruddiman's hypothesis seems too radical to many scientists, as a consensus for the beginning of the Anthropocene has not yet been reached; by proposing a much earlier start, Ruddiman is disproving what many people consider to be fact. The ensuing debates will be discussed below.

## Ruddiman's Hypothesis - In Brief

The argument in a nutshell is that early anthropogenic activity released significant amounts of CO<sub>2</sub> and CH<sub>4</sub> into the atmosphere, preventing the (projected) Holocene glaciation. He draws upon evidence from the Vostok and Dome C ice cores in Antarctica, as well as simulations and models such as GENESIS and DEMETER that altered various controls to project different environmental scenarios (Foley 1994). Kutzbach's orbital monsoon theory presents evidence for CH<sub>4</sub> cycles in particular, and suggests that the early Holocene release of CH<sub>4</sub> into the atmosphere was connected with natural summer insolation changes and wetland expansion based on the Earth's orbital

cycles (Kutzbach 1981). Ruddiman draws upon Kutzbach's research, as well as evidence from pollen and lake-level data sources, that confirm a drying period in the early to mid-Holocene. This points towards a downward trend in CH<sub>4</sub> levels during the late Holocene based on previous early-interglacial CH<sub>4</sub> minima and the resulting CH<sub>4</sub> fluctuations (Ruddiman 2003: 263). This is where the anomaly lies; the mid-Holocene did not follow the projected downward trend in CH<sub>4</sub>. As for CO<sub>2</sub>, a similar downward trend was projected based on CO<sub>2</sub> patterns during former orbital cycles (Ruddiman 2003: 265). Similarly, CO<sub>2</sub> levels rose steadily instead of dropping as predicted.

The final aspect of Ruddiman's argument provides a counterargument for critics who maintain that early human population sizes were not sufficiently substantial to make a significant impact that many years ago, especially in comparison to the anthropogenic output of those greenhouse gases today. Ruddiman notices a downward trend in CO<sub>2</sub> concentration over the last 2000 years that coincide with widespread epidemics such as the black plague and Spanish influenza. The downward trend in CO<sub>2</sub> that followed cannot be explained by natural forcing, and therefore provides a basis for Ruddiman's argument that even a relatively minute population change can have an impact on climate trends.

### **Arguments against Ruddiman's Hypothesis**

One challenge to the Early Anthropogenic Hypothesis is that the wrong timescale was used as an analog to CO<sub>2</sub> trends throughout the Holocene. Ruddiman argues that the CO<sub>2</sub> pattern during the late Holocene does not follow those of the previous three interglacials (isotopic stages 5, 7, and 9). He further argues that late Holocene CO<sub>2</sub> trends have risen exponentially instead of following a steady decrease as seen during previous isotopic stages. Noting that the anomaly began around 8000 years ago, Ruddiman concludes that the relative rise in CO<sub>2</sub> must have been driven by anthropogenic deforestation and carbon release into the atmosphere. Based on simulations using the GENESIS and DEMETER climate models, this conclusion seems valid. However, as pointed out by Claussen et al, these models "do not consider natural atmosphere-biosphere feedback cycles", and therefore provide a limited perspective on CO<sub>2</sub> fluctuations during the previous interglacial cycles (Claussen et al, 1997). It has been argued that orbital eccentricity and natural forcing needs to be considered to validate Ruddiman's hypothesis.

Ruddiman suggests that late Holocene CO<sub>2</sub> patterns should follow - or at least closely resemble - the fluctuations during interglacial isotopic stages 5, 7, and 9 (Ruddiman, 2005: 427). As mentioned above, Claussen points out that the orbital eccentricity and Milankovitch cycles throughout these three periods were larger than the Holocene orbit, rendering Ruddiman's timescale flawed. Claussen suggests Marine Isotopic Stage 11 (MIS11) as a more accurate comparison to the Holocene due to much closer similarities in orbital eccentricity (Ruddiman 2007: 9). As Kutzbach's research proposes, orbital eccentricity drives planetary warming and cooling processes (Kutzbach 1981). Furthermore, studies performed on the EPICA Dome Concordia (Dome C) ice core in Antarctica suggest that the interglacial warming period of MIS11 lasted for 28,000 years, while the current Holocene interglacial has only lasted 12,000 years (EPICA community members, 2004: cited in Ruddiman 2007: 9). If MIS11 is to be used as a framework for present CO<sub>2</sub> trends, the Holocene warming period can be expected to endure for at least another 16,000 years. This renders Ruddiman's argument that a glaciation is well overdue invalid.

As the first critique of the Early Anthropogenic Hypothesis was centered around the CO<sub>2</sub> anomaly, the second example will address CH<sub>4</sub> Holocene trends. While Ruddiman suggests that the expansion of rice paddy farming some 5000 years ago is the cause of the rise in atmospheric CH<sub>4</sub>, it has been proposed that the rising trend was actually a result of natural forcing cycles. Methane is naturally released into the atmosphere as a product of organic matter decomposition. Schmidt et al. propose that the "rising Holocene methane trend resulted from an increase in natural methane emissions from expanding circum-Arctic wetlands and low-latitude deltas," (Schmidt et al: 2004, cited in Ruddiman, 2007). Furthermore, a study conducted by Ramankutty and Foley concluded that the area of land actually used for rice paddy farming was likely "only 10-30% of the area used today, even by the 1700s" (Ramankutty and Foley, 1999). Ruddiman's argument for the expansion of rice paddy farming as the driving force behind the CH<sub>4</sub> anomaly relies on the low productivity and high inefficiency of these farms.

### **Rebuttal and Evaluation**

As for the proposal in favor of MIS11 over stages 5, 7, and 9, Ruddiman argues that the "method used by EPICA to align stage 11 with the Holocene was flawed" (Ruddiman 2007: 9). Relative interglacial lengths were calculated by counting forward in

'elapsed time,' but this resulted in a misalignment of insolation minima and maxima. This conclusion rivals both the Ice Age and summer monsoon theories, provided by Milankovitch and Kutzbach respectively, by implying that orbital cycling has no influence whatsoever over the Earth's climate, which is known to be false. Although the stages Ruddiman used to propose his original hypothesis were probably not the most reliable framework, MIS11 is not a perfect parallel to the Holocene either. This leaves room for criticism; the theory is difficult to verify since the dataset is predominantly simulated.

Regarding the upward CH<sub>4</sub> trend, Ruddiman dismisses the argument for natural forcing and the expansion Arctic wetlands, addressing the distinction between CH<sub>4</sub> concentrations in Greenland and Antarctic ice cores (Chappellaz et al 1997: cited in Ruddiman, 2007). He points out the potential issue with studies from Antarctica being used as a record for global climate change; greenhouse gas concentration, as well as heating and cooling, would not be exactly the same at both poles let alone all over the globe. He maintains that the CH<sub>4</sub> anomaly must have been caused by inefficient irrigation and agricultural practices.

One of Ruddiman's most powerful rebuttals is his insistence that time is crucial. He emphasises that deforestation and inefficient early agricultural practices could have spanned over thousands of years, accumulating Greenhouse Gasses in the atmosphere and therefore contributing to the general warming trend at a consistent rate. Critics argue that early anthropogenic population sizes were far too small to make the sort of impact Ruddiman proposes, especially in comparison to the Industrial Revolution. However, he maintains that the volume of CO<sub>2</sub> and CH<sub>4</sub> released into the atmosphere over thousands of years at a consistent rate rivals the volume released during the brief Industrial Revolution period. Looking back to the final aspect of his hypothesis, widespread pandemics, such as the black death, seem to have had an impact on CO<sub>2</sub> levels. Based on this conclusion, human activity can have an impact on climate change regardless of how small the population is.

### Conclusion

Ruddiman's Early Anthropogenic Hypothesis is not as radical as some critics might originally believe. Although not verifiable except by models and simulations, Ruddiman presents a thought-provoking and well-informed argument. Drawing upon various sources including climate models and ice cores, Rud-

diman argues that there was an anomaly of CO<sub>2</sub> and CH<sub>4</sub> during the Holocene, that anthropogenic activity disrupted the current glacial cycle, and that climate change could have been impacted even by a small population, especially prior to the Industrial Revolution. Several reasons some researchers believe Ruddiman's hypothesis should be refuted were then identified, including the proposition of MIS11 as a more accurate timescale, as well as natural forcing being the driving factor behind the CH<sub>4</sub> anomaly. Finally, Ruddiman's rebuttals (if any) to these criticisms were outlined. In summation, the Early Anthropogenic Hypothesis is a thought-provoking theory, which is difficult to prove explicitly. There will always be critics to this theory, but early anthropogenic activity may well have resulted in changes to the climatic trajectory of the Holocene.

### References

- Bagley, Mary. "Holocene Epoch: The Age of Man." *LiveScience*. N.p., 27 Mar. 2013. Web.
- Chappellaz, J., and I. Fung (1993), The atmospheric CH<sub>4</sub> increase since the last glacial maximum, *Tellus, Ser. B*, 45, 228 – 241.
- Claussen, M.: 1997, 'Modelling biogeophysical feedback in the African and Indian Monsoon region,' *Climate Dyn.* 13, 247–257.
- Eyer, M., et al. (2004), Comparison of two 13CO<sub>2</sub> records measured on air from the EPICA Dome C and Kohnen Station ice RG4001 Ruddiman: EARLY ANTHROPOGENIC HYPOTHESIS 34 of 37 RG4001 cores, paper presented at First General Assembly, Eur. Geosci. Union, Nice, France.
- Foley, J. A.: 1994, 'The Sensitivity of the Terrestrial Biosphere to Climatic Change: A Simulation of the Middle Holocene', *Global Biogeochem. Cycles* 8, 505.
- Kutzbach, J. E.: 1981, 'Monsoon Climate of the Early Holocene: Climate Experiment with Earth's Orbital Parameters for 9000 Years Ago', *Science* 214, 59
- Petit, J. R., Jouzel, J., Raynaud, D., Barkov, N. I., Barnola, J.-M., Basile, I., Bender, M., Chappellaz, J., Davis, M., Delaygue, G., Delmotte, M., Kotlyakov, V. M., Lipenkov, V., Lorius, C., Pepin, L., Ritz, C., Saltzman, E., and Stievenard, M.: 1999, 'Climate and Atmospheric History of the Last 420,000 Years from the Vostok Ice Core, Antarctica', *Nature* 399, 429
- Ramankutty, N., and J. A. Foley (1999), Estimating historical changes in global land cover: Croplands from 1700 to 1992, *Global Biogeochem. Cycles*, 13, 997 – 1027.
- Ruddiman, W.F. *Climatic Change* (2003)
- Ruddiman, William F. "The Early Anthropogenic Hypothesis: Challenges and Responses" *Reviews of Geophysics*. N.p., 31 Oct. 2007. Web.

Schmidt, G. A., D. T. Shindell, and S. Harder (2004), A note on the relationship between ice core methane concentrations and insolation, *Geophys. Res. Lett.*, 31, L23206.

Steffen, W., Crutzen, P., & McNeill, J. (2007). The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature? *Ambio*, 36(8), 614-621.

# Understanding The Biogeography Of ‘Natural’ Systems Only Remains Important In The Anthropocene In Conjunction With Understanding ‘Modified’ Systems.

*Joanna O’Flynn, Third Year Geography and International Relations*

**Abstract – An understanding of natural organisational mechanisms, such as the dispersion of species remains fundamental to the study of biogeography. However, 75% of the earth’s systems are estimated to be strongly influenced by human-driven factors. Under the understanding that ‘natural’ systems are those which have not been influenced by human activity, there are few such systems left. Vitally, it is important to consider how precepts regarded as natural drivers of dispersal are to be understood in conjunction with human-induced drivers, such as human transport systems and anthropogenic climate variation. This paper considers the debates surrounding the question of whether many of the earth’s systems can be considered natural, and how understanding them are important in contemporary biogeographical studies. We conclude that the Earth’s system must be understood as an ever-evolving system, recognising both long-term and short-term trends.**

The environmental state which we are now in has been dubbed the “Anthropocene” by some due to the profound and highly accelerated effects that humans are having on all spheres of the earth (Thomas, 2015). This essay will use the Anthropocene, not as a defined geological era, but as a term for a modern environment in which 75% of the earth’s ecosystems are estimated to be strongly influenced by human-driven factors (Mendenhall et al., 2013). It is within this context that we discuss whether understanding the biogeography of ‘natural’ systems is still important. Biogeography is the study of the distribution of life across space at various scales, how dispersal has changed through time and the processes that drive these patterns (Holden, 2012; Whittaker et al., 2005). What ‘natural’ systems mean and how ‘natural’ can be defined is a very complex debate. Whilst recognizing that the separation of the natural and human is both problematic and unhelpful, for the purpose of simplicity within this essay, ‘natural’ will be discussed solely in terms of the exclusion from human influences. Following this simple definition, we are living in a period of rapid change in which almost no landscape or ecosystem can be considered purely ‘natural’ (Thomas, 2015). This paper will demonstrate how, although there are few purely natural landscapes

left, it is important to understand both the human and natural systems driving distribution patterns.

## **Literature focused on the ‘natural’ systems**

Much of the literature and theory of biogeography has, in the past, focused predominantly on what are considered the ‘natural’ systems, patterns and processes of species distribution (Soulé et al., 1992; MacArthur and Wilson, 1967; Ricketts et al., 2001). When determining and modelling the controls of vegetation patterns, research frequently overlooks the human dominated landscape in order to consider the ‘natural’ and ‘untouched’ realms and systems of biogeography (Ricketts et al., 2001). This tendency can especially be seen in theories relating to fragmented landscapes, such as the theory of island biogeography and metapopulation dynamics. For example, a study which looks at the effects of habitat fragmentation on plants, birds and rodents in California exclusively, considers natural habitats split up within ‘an urban sea’ as the scope of their analysis (Soulé et al., 1992). Although the authors recognise the presence of urban landscapes, they actively choose to omit these from their scope of analysis.

## **Importance of ‘natural’ systems in conservation and wilderness movements**

Understanding the composition, as well as the functioning of natural systems, also underpins many conservation efforts in the face of environmental change (Knapp, 2013). For example, the understanding of species range sizes underpins the Red List of Threatened Species by the International Union for the Conservation of Nature, and the discovery of endemism hotspots has influenced where conservation efforts are focused and which are given priority (Knapp, 2013). The wilderness debate also links closely to the debate concerning the role and relevance of naturalness in the Anthropocene. What drives many conservation efforts is the value placed on pristine ‘wilderness’. By this geographical thinking, natural systems are conceptualized as baselines; Simmons (1979) writes that “it is necessary to consider nature without man, as a datum-line”. A datum-line or baseline is a spatial or temporal reference state or a neutral state before change (in this case before the rapid changes of the Anthropocene). As we understand ‘natural’ as lacking



human impacts, the ‘natural’ system is often taken to be like the baseline, and almost “every scientific study of environmental change assumes [one]” (Marris, 2013).

One example of this approach is demonstrated at the Oostvaardersplassen nature reserve in the Netherlands, which uses ‘Pleistocene rewilding’ conservation strategies (Marris, 2013). This nature reserve, pioneered by Frans Vera, attempts to recreate the natural system operating as far back as 13,000 years ago. The concept behind this nature reserve is based on looking at the functions of the natural system and recreating the processes within the system, using proxy species (Marris, 2013). Vera bases his discussion and the idea behind Oostvaardersplassen on what he believes the natural environment of lowland central and Western Europe to have looked like, given the absence of humans (Vera, 2000).

This example shows how an understanding of natural systems is an important basis for conservation and rewilding movements. This is not to say that they are wholly comprehensive in their holistic understanding of biogeography. The issue with Oostvaardersplassen National Park is that research still relies on a historic baseline of approximately 13,000 years ago. Although we may choose to conserve aspects of a natural ecosystem, doing so does not mean the system remains ‘natural’. We should not try to permanently fix the environment to a baseline which we perceive as ‘natural’, because patterns and processes of the environment and the species within are dynamic (Gleason, 1939).

### **‘Natural’ systems no longer exist**

Today, about 75% of the earth’s ecosystems are strongly influenced by humans (Mendenhall et al., 2013), through both biotic and abiotic activities. An example of the former being introductions or over-exploitations of species and the latter being changes to atmospheric CO<sub>2</sub> concentrations and global warming, as well as changes to biochemical processes (Vitousek et al., 1997; Villéger et al., 2011). The flipside to the view that ‘natural’ systems and an understanding thereof is of the highest importance, is that almost all geographical space today is dominated by humans; understanding pristine ‘natural’ systems is no longer of central importance.

In her book “Rambunctious Gardens”, Marris (2013, p. 2) puts forward this idea that we must make room to understand nature as a “half-wild rambunctious garden, tended by us”. She argues that, in this way, nature is everywhere but not in a pristine, untouched,

wild way. Although Marris’ (2013) argument that no nature exists anymore is somewhat extreme, her understanding of nature is insightful. She gives the example of Yellowstone park and the ‘natural’ landscape on which it is based. An historical perspective in conjunction with a baseline of what the ‘natural’ system once looked like is only useful if you assume nature to be a stable system (Marris, 2013, p. 27). The Anthropocene must be considered as an ever-changing system.

### **Understanding ‘natural’ systems in combination with ‘cultural’ systems**

Whittaker et al. (2005) argue that we must break away from the paradigm that the environment is either pre-anthropogenic (undisturbed ‘natural’ systems), or post-anthropogenic (irrevocably altered systems). Just as there is no clear-cut point as to when the Anthropocene started, there is no clear-cut line as to how natural or unnatural ecosystems are. The environment is understood more usefully in terms of a disturbance gradient, in which landscapes and ecosystems can range from natural to sub-natural to semi-natural and, finally, to cultural landscapes (Holden, 2012). Cultural biogeography is predominately concerned with mankind’s effect on the patterns of species distribution (Simmons, 1979). Just as there is a combination of natural and cultural spheres and systems across the Earth, an understanding therefore must be one which combines both systems. The biogeography of ‘natural’ systems can be used to understand the rapid environmental change during the Anthropocene, but is only useful when considered in combination with human-modified systems (Thomas, 2015).

Organisational systems, such as natural barriers to dispersal, have become less critical mechanisms for understanding the biogeographic distribution of species because of the increasing role humans play in introducing non-native species to new biogeographical realms. The expanding presence of introduced species has the ability to increase taxonomic similarities and lead to taxonomic homogenisation (Villéger et al., 2011). A study looking at the level of taxonomic homogenisation of freshwater fish fauna found evidence of a slight increase in taxonomic similarities globally (0.5%), and an up to 10% increase in Palearctic and Nearctic regions. What Villéger et al. (2011) stress is the importance of understanding the effects of taxonomic homogenisation on ecological and evolutionary processes. The ecological and evolutionary processes are natural processes that are being affected by an ‘unnatural’ homogenous ecosystem. This highlights once again how natural systems are rele-

vant to biogeographical patterns and processes of the Anthropocene that are not considered ‘natural’, such as those of homogenisation, which are taking place.

What influences whether species survive or face extinction in the Anthropocene is a combination of biological functions and capabilities to adapt, and the effects of human impacts and decisions (McKinney and Lockwood, 1999). The theory of island biogeography is often used to understand terrestrial habitat islands, and from it, predictable patterns of species loss are anticipated (Whittaker et al., 2005). What would traditionally be considered the driving forces of island biogeography, area and isolation of the island, are reducing in importance as humans are breaking down natural barriers to dispersal.

A good example of the way in which anthropogenic processes are becoming more important than natural geographic processes (in terms of dispersal patterns) is in the study by Helmus et al., (2014). They skillfully look at how much the theory of island biogeography needs to be adapted to consider anthropogenic drivers of species distribution, specifically the shifting importance of the concepts of geographic area and isolation. They look at the distribution of native and non-native Caribbean *Anolis* lizards across the Caribbean islands. Helmus et al. (2014) use their adapted model of island biogeography, which includes economic isolation as a driving factor, to demonstrate the pattern of anole lizard distribution and predict that Cuba would gain 1.65 anole lizard species if US trade with Cuba normalises.

Leading on from this example, ecosystems’ and species’ responses to anthropogenic climatic variations increasingly need to be taken into active consideration. This must be achieved by jointly considering and understanding modified and natural systems. Understanding these changes to biogeographical patterns are important as new pests and diseases may arise in response to anthropogenic changes in temperature or precipitation patterns (Holden, 2012). Using theories based purely on the understanding of natural systems could easily overlook such newly arising issues. “Just as for models of other Earth systems, biogeographic models must now include anthropogenic forcing to understand, predict and mitigate the consequences of the new island biogeography of the Anthropocene” (Helmus et al., 2013, p. 456). This does not only apply to island biogeography, but other models as well, including the biome model which should also aim to encapsulate more than just the climate elements and natural systems. An emerging theory-based literature

which does this effectively is countryside biogeography, which looks at understanding and forecasting biogeographical changes. It is inclusive of “native habitats, novel ecosystems, domestic and feral plants and animals, human populations, and the services provided by nature to human beings, including quality of life” (Ricketts et al., 2001, p. 379). The study of Ricketts et al. (2001) focuses on this countryside biogeography and analyses the patterns of moth species abundance, richness and composition in native and modified habitats, specifically native forests, coffee, shade coffee, pasture and mixed farms. It is this sort of combined study which shows the extent to which understanding the biogeography of natural systems remains important in the Anthropocene.

In conclusion, as ‘natural’ has been defined in terms of an absence of human influence, while landscapes completely free of human impact rarely exist, there is a realisation that understanding the biogeography of natural systems is reducing in importance as humans have been altering the mechanisms of species dispersal. Although pristine, ‘natural’ environments are a rarity, there is a disturbance gradient of landscapes and the division between what are ‘cultural’ or ‘natural’ systems is not clear-cut. Certain components, structures or functions of the ecosystems may still be natural, and certain elements of ‘natural’ systems are more important to understand than others. New dynamics such as human transport systems and anthropogenic climate variation are becoming increasingly important in relation to what are usually considered ‘natural’ habitats and processes. Hopefully these reflections have demonstrated that in a world of continuous change, understanding the patterns and processes of ‘natural’ systems only remains important when studied in relation to the systems modified as a result of anthropogenic activities.

## References

- CAPINHA, C., PEREIRA, H. M., ESSL, F., MOSER, D. & SEEBENS, H. 2015. The dispersal of alien species redefines biogeography in the Anthropocene. *Science*, 348, 1248-1251.
- COLE, D. N. & YUNG, L. 2010. *Beyond naturalness : rethinking park and wilderness stewardship in an era of rapid change*, Washington, DC : Island Press, c2010.
- DUDLEY, N. 2011. *Authenticity in Nature : Making Choices About the Naturalness of Ecosystems*, Abingdon, Oxon, Routledge.
- GLEASON, H. A. 1939. The Individualistic Concept of the Plant Association. *The American Midland Naturalist*, 92.

- HELMUS, M. R., MAHLER, D. L. & LOSOS, J. B. 2014. Island biogeography of the Anthropocene. *Nature*, 513, 543-546. [Electronic book], Wallingford, Oxon ; New York, N.Y. : CABI Pub., c2000.
- HOLDEN, J. 2012. An introduction to physical geography and the environment. 3rd ed. [Electronic book], Harlow : Pearson, 2012.
- KNAPP, S. 2013. What, Where, and When?
- LANDRES, P. B., MORGAN, P. & SWANSON, F. J. 1999. Overview of the Use of Natural Variability Concepts in Managing Ecological Systems. *Ecological Applications*, 1179.
- MACARTHUR, R. H. & WILSON, E. O. 1967. The theory of island biogeography, Princeton, N.J. : Princeton University Press, 1967.
- MARRIS, E. 2013. Rambunctious garden : saving nature in a post-wild world, New York : Bloomsbury, 2013.
- MCKINNEY, M. L. & LOCKWOOD, J. L. 1999. Biotic homogenization: a few winners replacing many losers in the next mass extinction.
- MENDENHALL, C. D., KAPPEL, C. V. & EHRlich, P. R. 2013. Countryside Biogeography. *Encyclopedia of Biodiversity*, 347-360.
- MENDENHALL, C. D., KARP, D. S., DAILY, G. C., HADLY, E. A. & MEYER, C. F. J. 2014. Predicting biodiversity change and averting collapse in agricultural landscapes. *Nature*, 509, 213-217.
- MITCHELL, F. J. G. 2005. How Open Were European Primeval Forests? Hypothesis Testing Using Palaeoecological Data. *Journal of Ecology*, 168.
- MOORE, P. D. 1981. Biogeography: Natural and Cultural. I. G. Simmons. Blackwell Scientific Publications.
- PRENTICE, C. I., WOLFGANG, C., SANDY, P. H., RIK, L., ROBERT, A. M. & ALLEN, M. S. 1992. Special Paper: A Global Biome Model Based on Plant Physiology and Dominance, Soil Properties and Climate. *Journal of Biogeography*, 117.
- REDFORD, K. H. 2012. Deciding What to Conserve. Wiley-Blackwell.
- RICKETTS, T. H., DAILY, G. C., EHRlich, P. R. & FAY, J. P. 2001. Countryside Biogeography of Moths in a Fragmented Landscape: Biodiversity in Native and Agricultural Habitats. *Conservation Biology*, 378.
- SIMMONS, I. G. 1979. Biogeography : natural & cultural, London : Edward Arnold, 1979.
- SOULÉ, M. E., ALBERTS, A. C. & BOLGER, D. T. 1992. The Effects of Habitat Fragmentation on Chaparral Plants and Vertebrates. *Oikos*, 39.
- THOMAS, C. D. 2015. Opinion: Rapid acceleration of plant speciation during the Anthropocene. *Trends in Ecology & Evolution*, 30, 448-455.
- VERA, F. W. M. 2000. Grazing ecology and forest history. VILLÉGER, S., BLANCHET, S., BEAUCHARD, O., OBERDORFF, T. & BROSSE, S. 2011. Homogenization patterns of the world's freshwater fish faunas. *Proceedings of the National Academy of Sciences of the United States of America*, 18003.
- VITOUSEK, P. M., MOONEY, H. A., LUBCHENCO, J. & MELILLO, J. M. 1997. Human Domination of Earth's Ecosystems. *Science*, 494.
- WHITTAKER, R. J., ARAÚJO, M. B., JEPSON, P., LADLE, R. J., WATSON, J. E. M. & WILLIS, K. J. 2005. Conservation Biogeography: Assessment and Prospect. *Diversity and Distributions*, 3.

# The Practical and Moral Dynamics of Invasive Species Management in Scotland: the Case of the American Mink

*Fiona Banham, Fourth Year Geography and Modern History*

**Abstract** – In 1938, the American mink was brought to southern Scotland in the service of the fashion industry. After escaping the confines of fur farms, it spread prolifically, reaching as far as north as the Scottish Highlands and Islands. This paper will use a case study of the American mink to explore discourses on native and non-native species within a Scottish context. It will argue that the use of emotive labelling of non-native species as “invasive” or “alien” constructs is a dangerous rhetoric which prioritises ecologically irrelevant national borders over measurable, species-based ecosystem impacts, and is of limited validity for designing effective management strategies.

The introduction and subsequent management of non-native, “invasive” species in Scotland are two of the most contentious issues in the field of environmental management. This is a topic which bitterly divides academics and stakeholders, locking those who favour the complete eradication of non-natives for fear of their replacing biodiversity with “biosimilarity”, and those who are more tolerant, in a fierce feud (Hettinger, 2001).

The case of the American mink (*Neovison vison*) in Scotland has proven to be no exception. Mink were accidentally introduced to the UK in the early-1900s. Having escaped from British fur farms, the mink spread prolifically to (almost) every corner of the country. Figure 1 shows the extent of the distribution of the species throughout Scotland between 1965 and 2012. Ambiguities over responsibility for the release delayed responses to a point beyond which it was impossible to contain the “invasion” (Sheail, 2004).

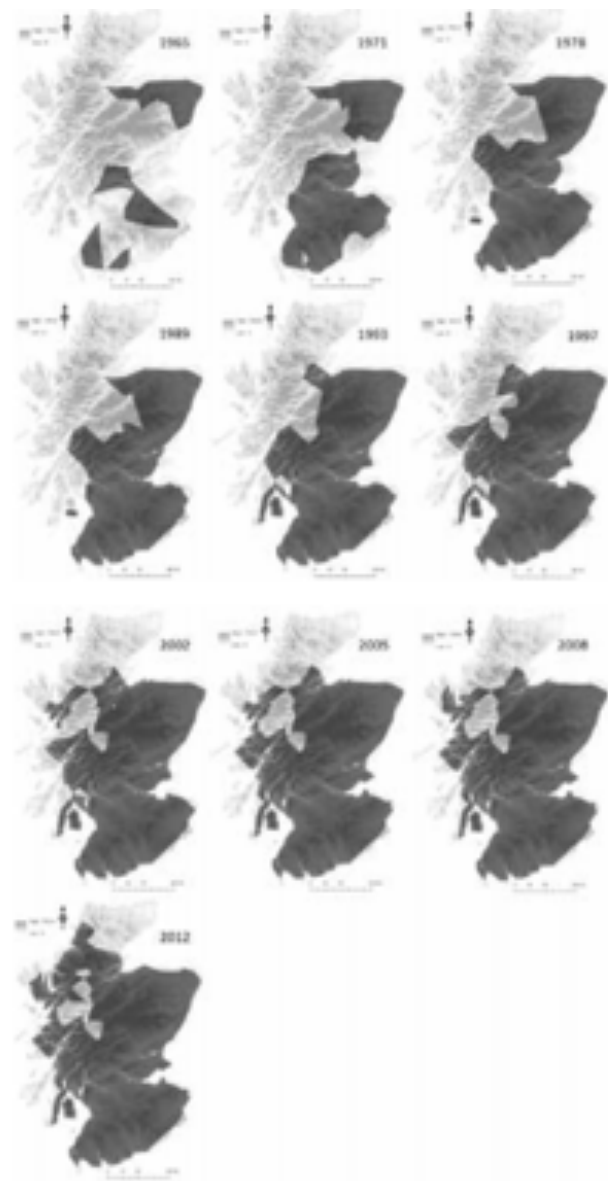
By firstly exploring the controversies associated with the American mink and subsequently considering the nature and efficacy of the practices in place in order to control it, it is also possible to expose some of the underlying debates surrounding the issue of the invasion of “alien” species. This can be achieved by problematising the disturbingly common conflation of the adjectives non-native and invasive used to describe species which do not belong in Scotland. Acknowledging the subjectivity inherent in all definitions of “alien” species is a vital consideration for

determining the most appropriate management strategies for this biologically unique northerly country.

## Controversies associated with the American Mink in Scotland:

The most significant controversy surrounding the presence of the American mink concerns its interactions with the native species which occupy the same habitat, such as the water vole and ground-nesting seabirds.

### *i. Ecological Impacts*



*Figure 1 A map depicting the spread of the American mink, from a few isolated, predominantly southerly and easterly regions right through to the Highlands and Isles. The dark grey areas are those populated by mink (Fraser, 2016)*

The plight of the water vole in the UK has hit many a headline over the past decade. Despite being one of the most common species in Neolithic times, the population is believed to have been decimated by up to 96% on a national scale, declining most sharply in North-East Scotland (Aars et al, 2001; Bryce et al, 2011). These alarming trends have coincided strikingly with the introduction of the mink. Indeed, a study conducted in England revealed that the water vole could constitute up to 32% of the mink's diet (Macdonald and Harrington, 2003). Not only were water voles not biologically and ecologically equipped to deal with the threat, but mink are also notoriously opportunistic predators, prone to 'over killing' (GISD, 2015). Therefore, a single mink is capable of repeatedly causing a great deal of damage to water vole populations along the riverbanks of the UK.

Ground-nesting seabird colonies in the Western Isles of Scotland have also suffered at the paws of the mink. Island biotas are particularly vulnerable to the introduction of non-native species (Peterken, 2001); the presence of a fur farm on the Isle of Lewis in the 1960s enabled the mink to spread rapidly across the archipelago (Moore et al., 2003). A lack of natural predators made the seabirds extremely vulnerable to mink predation, enabling the mink to take eggs, chicks and, occasionally, adult birds (Craik, 1997). This contributed significantly to the 42% decline of all breeding seabirds on the Western Isles during the 1980s and '90s (Craik, 2008).



*Figure 2 Fish constitute a notable proportion of the mink's diet, posing a threat to the Scottish fishery industry (University of Aberdeen, 2013).*

#### *ii. Social and Economic Impacts*

The spread of the American mink has also had significant knock-on effects for human societies. As Figure 2 implies, there is some evidence that the mink could be impacting upon the fishing industry. Salmon constitute a notable proportion of the mink's diet, particu-

larly during the winter months, therefore potentially lowering catch yields (GISD, 2015). Despite the lack of rigorous scientific investigation, the fact that the fishing industry has served as a dominant source of funding for many mink trapping and control projects emphasises the extent of their concern (Raynor et al., 2016). Moreover, the fact that it was the Game & Wildlife Conservation Trust who invented the mink tunnels used for trapping and detecting the presence of mink is a strong indication of fears that the species may also have been impacting game bird populations (Reynolds et al, 2004; Reynolds et al, 2010).

Mink have also proven economically detrimental to the tourism industry. The economies of the Hebrides and the Western Isles are heavily dependent upon tourism, with the migratory and native bird species nesting during the spring and summer months on the islands being a dominant attraction bringing people to visit the islands (Craik, 2008). That one of the most concerted and successful attempts to eradicate the mink has occurred on the Hebrides is as strong an indication as any as to the extreme socio-economic value of these birds.

#### **Management Strategies:**

Controlling non-native species is an emotionally and financially draining business, costing an estimate £1.7 billion per year (Fraser et al., 2014). Various management strategies have been employed in an attempt to eradicate the mink from Scotland and the UK. The lack of centralised coordination of the mink control projects has been a striking feature (Sheail, 2004). Moreover, there has been an astounding correlation between the profile of such projects and the specifically economic impacts which the mink have posed; as Henderson (2006) notes, non-monetary losses are extremely difficult to quantify. That each of these projects has thus far been community-based, fuelled by volunteers with a strong sense of local passion, implies that the priorities of Scotland's official governing bodies lie elsewhere.

One particularly prominent management project has been the Hebridean Mink Project. It began in 2001, involving over 10,000 cage traps being installed for the purposes of humane mink culling. Costing an estimated £1.65 million, its funders included the RSPB, who were committed to the project's aim of restoring the seabird colonies nesting there (Raynor et al., 2016). By 2003, over 220 mink had been caught (Anderson et al., 2016). The project was deemed a success, as whilst the mink were not altogether eradicated from the islands, some of

the Western Isles, including the Uists, are now confidently free of mink. In their absence, seabird colonies are beginning to return (Anderson et al., 2016).

### Management Implications:

The management implications of controlling the mink are intertwined with issues of morality. Whilst it is vital to maintain the health of the populations of the native and internationally important species in Scotland, it is important to consider whether native species are being protected from the mink for their own sake or for the purposes of the more easily quantifiable societal contributions which they make. For instance, it must be called into question whether the inherent value of ground-nesting bird species is being recognised in these justifications for control, beyond their mere economic purpose of attracting tourists and their capital to the islands. With regards to the game and fisheries industries, there is perhaps a degree of irony in calling for the persecution of the American mink for exploiting these prey resources when *Homo sapiens* are just as much the “invasive” species, with arguably no more right to exploit these resources. The highly controversial nature of deliberately taking the life of any animal means that it is vital to legitimately justify these measures.

### Concluding Remarks:

It can therefore be concluded that the mink does seemingly pose a threat to native species in the UK, such as the water vole and ground-nesting seabirds. However, it is vital to recognise that it is the nature of the mink and its behaviours—rather than the fact that it is not a species native to the UK—at the heart of the issue. Warren (2007) is indeed highly justified to note that the basis for the culling of non-native species ‘should not be their time mode and place of origin, but... their potential for causing damage’ (p.445). Though we are pre-programmed to categorise according to the national boundaries which mankind has defined, such boundaries are conceptual and are not necessarily physically manifested. Thus, whilst the mink can justifiably be controlled for the health of Scotland’s diverse ecosystems, it cannot be vilified for the simple reason of its performing its own natural behaviours. It is inappropriate to hold up species which have damaging impacts upon our ecosystem as a means of denouncing all non-native species as “aliens” who do not belong; such rhetoric is not only unhelpful but dangerous to society as a whole, both within and out with the context of the plant and animal kingdoms.

## References

- Aars, J., Lambin, X., Denny, R. and Griffin, A C. 2001. Water vole in the Scottish uplands: distribution patterns of disturbed and pristine populations ahead and behind the American mink invasion front. *Animal Conservation* (4), pp. 187-194.
- Anderson, K. and Raynor, R. 2016. Water vole. *Version 1.0*. In *The Species Action Framework Handbook*, M. J. Gaywood, P. J. Boon, D. B. A. Thompson and I. M. Strachan IM (eds). Scottish Natural Heritage, Battleby, Perth.
- Bryce, R., Oliver, M. K., Davies, L., Gray, H., Urquhart, J. and Lambin, X.. 2011. Turning back the tide of American mink invasion at an unprecedented scale through community participation and adaptive management *Biological Conservation* (144:1), pp. 575-589.
- Craik, J. C. A. 1995. Effects of North American mink on the breeding success of terns and smaller gulls in West Scotland. *Seabird* (17), pp. 3-11.
- Craik, C. 1997. Long-term effects of North American Mink *Mustela vison* on seabirds in western Scotland. *Bird Study* (44:3), pp. 303-309.
- Craik, J. C. A. 2008. Sex ratio in catches of American mink- how to catch females. *Journal for Nature Conservation* (16), pp. 56-60.
- Fraser, E. J., MacDonald, D. W., Bryce, R. and Lambin, X.. 2014. Controlling invasive species by empowering environmental stakeholders: ecotourism boat operators as potential guardians of wildlife against the invasive American mink. *Oryx* (48:4), pp. 605-612.
- Global Invasive Species Database (GISD). 2015. Species profile *Neovison vison*., pp. 1-4. Available from: <http://www.iucngisd.org/gisd/species.php?sc=969> [Accessed 18 November 2018]
- Henderson, S., Dawson, T.P. and Whittaker, R.J. 2006: Progress in invasive plants research. *Progress in Physical Geography* (30), pp. 25-46.
- Hettinger, N. 2001. Exotic Species, Naturalisation, and Biological Nativism. *Environmental Values* (10:2), pp. 193-224.
- Macdonald, D. W. and Harrington, L. A. 2003. The American mink: The triumph and tragedy of adaptation out of context. *New Zealand Journal of Zoology* (30:4), pp. 421-441.
- Moore, N. P., Roy, S.S. and Heylar, A. 2003. Mink (*Mustela vison*) eradication to protect ground-nesting birds in the Western Isles, Scotland, United Kingdom. *New Zealand Journal of Zoology* (30:4), p. 443-452.
- Nordströma, M., Högmänderb, J., Lainec, J., Nummelinc, J., Laanetud, N. and Korpimkia, E.. 2003. Effects of feral mink removal on seabirds, waders and passerines on small islands in the Baltic Sea. *Biological Conservation* (109), pp. 359-368.
- Peterken, G. 2001. Ecological effects of introduced tree species in Britain. *Forest Ecology and Management* (141), pp. 31-42.

Reynolds, J. C., Short, M. J. and Leigh, R. J.. 2004. Development of population control strategies for mink *Mustela vison*, using floating rafts as monitors and trap sites. *Biological Conservation*, pp. 533–543.

Reynolds, J. C., Porteus, T. A., Richardson, S. M., Leigh, R. J. and Short, M. J. 2010. Detectability of American Mink Using Rafts to Solicit Field Signs in a Population Control Context. *Journal of Wildlife Management* (74: 7), pp. 1601–1606.

Raynor, R. Horrill, C., Taylor, M., Taylor K. 2016. American mink. Version 1.0. In *The Species Action Framework Handbook*, Gaywood, M.J., Boon P.J., Thompson D.B.A., Strachan I.M. (eds). Scottish Natural Heritage. Battleby, Perth.

Sheail, John. 2004. The Mink Menace: The Politics of Vertebrate Pest Control. *Rural History* (15:2), pp. 207–222.

Warren, Charles R. 2007. Perspectives on the ‘alien’ versus ‘native’ species debate: a critique of concepts, language and practice. *Progress in Human Geography* (31:4), pp. 427–446.

Zalewski, A., Piertney, S. B., Zalewska, H. and Lambin, X.. 2009. Landscape barriers reduce gene flow in an invasive carnivore: geographical and local genetic structure of American mink in Scotland. *Molecular Ecology* (18), pp. 1601–1615.

Zschille, J., Stier, N., Roth, M. and Mayer, R.. 2014. Feeding habits of invasive American mink (*Neovison vison*) in northern Germany—potential implications for fishery and waterfowl. *Acta Theriol* (59), pp. 25–34.

#### **Figures Sources:**

Figure 1: Elaine Fraser, in Raynor, R. Horrill, C., Taylor, M., Taylor K. 2016. American mink. Version 1.0. In *The Species Action Framework Handbook*, Gaywood, M.J., Boon P.J., Thompson D.B.A., Strachan I.M. (eds). Scottish Natural Heritage. Battleby, Perth.

Figure 2: University of Aberdeen, 2013. Accessed via: <https://www.abdn.ac.uk/news/4907/> on 30/03/19.

# Tephra Layer Thickness Variations Can Indicate an Approaching Ecosystem Bifurcation in Geomorphologically Fragile Landscapes

*Conner Morison, Fourth Year Geography*

**Abstract** – This review details the ways in which autocorrelation can be employed as a statistical indicator of catastrophic ecosystem change. By measuring thickness variations of tephra (volcanic ash) layers, critical slowing down can be identified prior to a spatial transition from a stable vegetated state to a stable non-vegetated state. As tephra layers are less prone to post-depositional reworking when deposited on vegetation, vegetation removal reduces the extent of tephra preservation. The absence of vegetation thereby reduces the engineering resilience of the ecosystem as a whole. Consequently, increasing autocorrelation of tephra layer thicknesses acts as a warning that the potential for their preservation is decreasing (towards the direction of change). It remains uncertain as to whether such early warning signals can appear early enough to serve as a warning, and whether or not the change is inevitable by this point.

## Introduction

The last couple of decades have seen the uptake of research into environmental state thresholds and catastrophic changes in ecosystems. The term tipping point has been coined to denote a given threshold beyond which accelerating change will push a system into a new stable state (van Nes et al., 2016). It is likely that the potential for recovery of the original state (e.g. grassy heathland) is low, as positive feedbacks do not comprise damping processes which would stabilise runaway change towards a new stable state (eg. deflated). Such changes in a stable state feed back into the inputs driving those changes; recovery is unlikely achievable by simply running the system and its processes in reverse. A system will have at least two alternative stable states if the associated ecosystem response curve exhibits a backwards fold (Scheffer et al., 2001).

## The Principle of Early Warning Systems

An increase in autocorrelation is a statistical pattern which develops in a system approaching a catastrophic bifurcation. It shows that a system commonly displays critical slowing down prior to the transition to an alternative stable state, meaning recovery rates after a perturbation take longer. This reduces that which Davies et al. (2018) term the engineering resilience of the system, operating in its current stable state. Con-

ceptually, the lower the engineering resilience, the more easily a system will be able to jump towards the alternative attractor (or stable state). Systems, in which transitions are caused by sudden disturbances, do not display characteristic early warning signals, and so the summative ecological resilience (Davies et al., 2018) is very challenging to predict. Consequently, there is no way to accurately forecast the timing of a critical transition, only that a system is becoming less resilient.

Space-for-time substitution can provide a useful sampling strategy when long-term records are unavailable or difficult to source (Eby et al., 2017). If a large enough dataset is employed for statistical analysis, a recognisable spatial pattern in the stratigraphy can provide an early warning for a threshold-crossing event in the landscape. The spatial equivalent of recovery time must be seen as the increase in space needed to recover: recovery length or distance (Dai et al., 2013). If there is a local disturbance to a landscape, pushing an area into another stable state, the new patch will either grow in a ‘domino cascade’ or shrink if the new state is less resilient than the original (Scheffer et al., 2015).

## Analysing Tephra Layer Thickness Variations

The thickness variations of tephra layers can be statistically analysed to provide early warnings of such critical landscape state-changes. The methodology of Streeter & Dugmore (2013), as well as work associated with the authors (e.g. Thompson, 2016), is outlined in this review in the context of Icelandic ecological and landscape resilience. To be able to statistically identify the bifurcation, tephra thickness measurements should be taken at a fixed horizontal sampling interval along a transect which cuts across ecosystem divisions (i.e. across the spatial threshold of vegetated and non-vegetated states). This means that there should be no need to interpolate any data, and so there are no chances of false autocorrelation based on projection of the original data. Thickness measurements taken using a measuring stick ought to be accurate to the nearest millimetre. This should enable the (vertical) tephra thickness measurements to capture the approach to the critical transition. Data can be statistically analysed using freely available computer software (R). The R packages pillar and earlywarnings are installed prior to analysis. Low frequency (but high magnitude) trends can mask early



warning indicators, so it is prudent to remove them by detrending, using a Gaussian filter. Statistical indicator graphs can be produced for both original and detrended datasets. A further consideration is the filtering bandwidth (or degree of smoothing) selected for detrending, and also how sensitive the results are to changing this.

Autocorrelation at-lag-1 is a metric-based indicator of rising memory: that is, increasing similarity between subsequent measurements, where each data point is increasingly more influenced by changes before it (Dakos et al., 2012). Increasing autocorrelation along transects indicates an increasingly more diffuse connection between areas (Scheffer et al., 2015). Streeter & Dugmore (2013) use a rolling window size selected for testing autocorrelation of 50% (half the sample size). The Kendall- $\tau$  correlation coefficient test is a non-parametric statistical test (using R), which can be used to identify greater concordance of data (Thomas, 2016).

The statistical robustness of testing the detrended data must be ascertained before analysis. As the detrending process must use a set filtering bandwidth, it is important to check how robust that bandwidth actually is. This involves graphing how sensitive correlation strengths are under different bandwidths and rolling window sizes. It is also necessary to graph the p-values (significance) to understand the extent to which significant correlation is down to chance (Dakos et al., 2012). Whilst it is important to recognise that changing these parameters will impact on the final output, it is equally important not to single-out the best conditions; this introduces personal bias at the methodology level.

### Importance of Early Warnings for Geomorphology

Autocorrelation increases on the approach to a critical bifurcation of vegetation states (Streeter & Dugmore, 2013; Thompson, 2016). This has strong implications for the geomorphology of landscapes, where the sparse vegetation cover provides cohesion needed to prevent soil erosion and gullyng. It is clear that tephra thickness is related to the vegetation state on the surface. Streeter & Dugmore (2013) considered vegetated areas of moss heathland to be in a stable vegetated state, and areas of deflated, cryoturbated and often wind-blasted terrain to mark the stable non-vegetated state. The preservation of tephra in these zones is differential (Figure 1). At the site where the critical transition occurs and tephra is no longer preserved, autocorrelation should (theoretically) have reached unity, or 1.0 (Scheffer et al., 2015). In reality, this is not expected; all ecosystems tend to shift in advance

of the tipping point due to an external force which can tip the balance. At the point that the system's resilience (the vegetation, in this case) is very low, it may only be a very small external perturbation which tips the balance (Scheffer et al., 2009). Namely, a stochastic event may result in a threshold-crossing event (critical transition) before a bifurcation is reached naturally (Scheffer et al., 2001; Dakos et al., 2008; Ver-



*Snæbýlisheiði (Skaftártunga) displays both grassy heathland and deflated soil/regolith, showing a stark spatial 'frontier'. Whilst the Katla (1918) tephra layer was preserved in the grassy area (left), it was not found in the barren area (right). This might mean that the fallout was not preserved at all; it might also mean that it was subsequently reworked from this area. (Photo: Author, August 2019)*

aart et al., 2012; Dakos et al., 2015; Thomas, 2016). Geomorphological change drives vegetation change and vice versa (Streeter & Dugmore, 2013). Tephra is preserved only in places where the environment can trap it. In Iceland, birch woodlands preserve tephra more efficiently than moss heathland does - the former provide protection from wind and direct rainfall (Cutler et al., 2016). Preservation of the Mount St Helens (1980) tephra under coniferous forestry is excellent in comparison to the preservation of the Hekla (1947) tephra under grassy heathland (Cutler et al., 2018). The landscape's ability to preserve tephra is much-reduced when, stripped of soil, it becomes completely inhospitable to vegetation (Figure 1). Consequently, soil denudation by wind, water, and livestock increases exposure to further erosion (Streeter & Dugmore, 2013). Hysteresis complicates any switch-back to vegetated states; recovery from a barren state will probably require more vegetation than was needed to preserve the last tephra deposit. As barren soil is considerably less favourable to colonisation, tephra preservation is reliant on vegetation coverage at the time of eruption, which in turn is reliant on previously vegetated soils. Around 40% of Iceland's land surface is characterised by severe soil erosion, and ~95% of the original birch woodlands have been lost since Iceland's set-

tlement (Landnám). Overgrazing by sheep has been the main soil degradant in Iceland, although tourism also exerts a growing influence (Arnalds, 2015).

### Utility of Early Warning Systems

Autocorrelation is a significant and robust indicator of oncoming environmental change over space. Nonetheless, it cannot be used to forecast a tipping point. It remains the challenge for those with expertise in this area to be able to make the judgement as to whether early warning signals equate to inevitable and/or permanent change (Dakos et al., 2015). Increasing patchiness in vegetation patterns is a visual indicator of impending change. Gaps, labyrinths, stripes, and finally spots are the progression of patterns observed in a colony at the brink of collapse (Rietkerk et al., 2004). As such, self-organised patchiness is, along with tephra thickness, an additional early warning of ecosystem change which could be investigated in Iceland. Finally, it remains uncertain as to whether such early warning signals can appear early enough to serve as an alarm for inevitable change (Scheffer et al., 2009).

### References

Arnalds A (2015), *Revegetation & Landcare in Iceland*, The Geographer: Newsletter of the Royal Scottish Geographical Society: Summer 2015, 18, RSGS

Cutler N, Shears O, Streeter R & Dugmore A (2016), *Impact of Small Scale Vegetation Structure on Tephra Layer Preservation*, Nature Scientific Reports 6, Article 37260, Springer

Cutler N, Streeter R, Marple J, Shotter L, Yeoh J & Dugmore A (2018), *Tephra Transformations: Variable Preservation of Tephra Layers from Two Well-Studied Eruptions*, Bulletin of Volcanology 80, Springer

Dai L, Korolev K & Gore J (2013), *Slower Recovery in Space before Collapse of Connected Populations*, Nature 496, 355-358, Macmillan Publishers Ltd.

Dakos V, Scheffer M, van Nes E, Brovkin V, Petoukhov V & Held H (2008), *Slowing Down as an Early Warning Signal for Abrupt Climate Change*, PNAS 105, 14308-14312

Dakos V, Carpenter S, Brock W, Ellison A, Guttal V, Ives A, Kéfi S, Livina V, Seekell D, van Nes E & Scheffer M (2012), *Methods for Detecting Early Warnings of Critical Transitions in Time Series Illustrated using Simulated Ecological Data*, PLOS ONE

7, PLOS

Dakos V, Carpenter S, van Nes E & Scheffer M (2015), *Resilience Indicators: Prospects & Limitations for Early Warnings of Regime Shifts*, Philosophical Transactions of the Royal Society B 370, The Royal Society Publishing

Davies A, Streeter R, Lawson I, Roucoux K & Hiles W (2018), *The Application of Resilience Concepts in Palaeoecology*, The Holocene 28, 1523-1534, Sage

Eby S, Agrawal A, Majumder S, Dobson A & Guttal V (2017), *Alternative Stable States and Spatial Indicators of Critical Slowing Down along a Spatial Gradient in a Savanna Ecosystem*, Global Ecology & Biogeography 26, 638-649, Wiley

van Nes E, Arani B, Staal A, van der Bolt B, Flores B, Bathiany S & Scheffer M (2016), *What Do You Mean Tipping Point?*, Trends in Ecology & Evolution 31, 902-904, Cell Press (Elsevier)

Rietkerk M, Dekker S, de Ruiter P & van de Koppel J (2004), *Self-Organised Patchiness & Catastrophic Shifts in Ecosystems*, Science 305, 1926-1929, AAAS

Scheffer M, Carpenter S, Foley J, Folke C & Walker B (2001), *Catastrophic Shifts in Ecosystems*, Nature 413, 591-596, Macmillan Magazines Ltd.

Scheffer M, Bascompte J, Brock W, Brovkin V, Carpenter S, Dakos V, Held H, van Nes E, Rietkerk M & Sugihara G (2009), *Early Warning Signals for Critical Transitions*, Nature 461, 53-59, Macmillan Publishers

Scheffer M, Carpenter S, Dakos V & van Nes E (2015), *Generic Indicators of Ecological Resilience: Inferring the Chance of a Critical Transition*, Annual Review of Ecology, Evolution & Systematics 46, 145-167, Annual Reviews

Streeter R & Dugmore A (2013), *Anticipating Land Surface Change*, PNAS 110, 5779-5784

Thomas Z (2016), *Using Natural Archives to Detect Climate & Environmental Tipping Points in the Earth System*, Quaternary Science Reviews 152, 60-71, Elsevier

Thompson P (2016), *Assessing Potential Early Warning Signals in Tephra Layer Morphology*, Langanes,

Southern Iceland, unpublished MA dissertation, University of Edinburgh

Veraart A, Faassen E, Dakos V, van Nes E, Lürling M & Scheffer M (2012), *Recovery Rates Reflect Distance to a Tipping Point in a Living System*, Nature 481, 357-359, Macmillan Publishers Ltd.





*(Clockwise from top left):* **Arc De Triomphe at Sunset.** As the sun set over Paris, the sky lit up with pink and gold, the rays framing this iconic monument. Even now, surrounded by an ever-circulating rush of traffic, the Arc de Triomphe stands proudly as an ode to the soldiers who died during the French Revolution and Napoleonic Wars. Photo by Annie Pritchett-Brown **Niagara Falls.** Niagara Falls is one of the most beautiful spectacles on earth, and being able to see the sun rising over the water was amazing. This was a result of a great deal of planning, to ensure that the sun would rise in exactly the right location, but was all worth it in the end. Photo by Henry Memmott **Winter Sun and Snow in the Grampian Highlands.** Low-angle November sunlight catches the interesting textures formed by wind blown snow overlaying tuft-y grass. Photo by Geraint Morgan **Inle Lake.** Inle Lake, Myanmar, is home to a traditional technique of fishing using these large nets, and pronged sticks. The weather on this day was perfect, and I got the chance to spend it on the water, going between the famous floating villages of this area. Photo by Henry Memmott

## Interview with Daphne Biliouri-Grant co-ordinator for the ‘Towards a Plastic Free St Andrews’ initiative.

*Annabel Personeni, Third Year*



This interview was conducted with Daphne Biliouri-Grant (DBG), coordinator for the ‘Towards a Plastic Free St. Andrews’ initiative. The initiative is led by the St. Andrews Environmental Network, the local environmental charity, in partnership with the Environmental Office of the University of St. Andrews and Transition UStA, a community interest company promoting sustainability.

This interview was conducted by third year student Annabel Personeni (AP), who studies Sustainable Development at St Andrews and who actively participates in ‘Towards a Plastic Free St. Andrews’ as a ZeroWaste intern with Transition UStA.

*(Left): Daphne Biliouri-Grant – Interviewee (Right): Annabel Personeni – Interviewer*

### **AP: What does Single-Use Plastic mean?**

DBG: Single-use plastics, also known as disposable plastics, are plastic items that are used only once and then thrown away or in some cases recycled. Some of the most prominent single-use plastics include bags, straws, disposable cutlery, water and soft drink bottles and food packaging. It is estimated that over 180 million tons of disposable plastic is being produced on an annual basis and on average less than 10% of these items are recycled globally. Given that single-use plastics have a long lifespan and release toxic chemicals into the environment, it is imperative that disposable plastics are replaced by alternative sustainable products.

### **AP: Why do you think St Andrews is a good town to implement this in?**

DBG: St. Andrews is quite a unique town not only in Scotland but in the UK as a whole. It is one of the most prominent towns in Scotland due to its internationally renowned university and also because it is ‘the home of golf’. Because of its international presence, it attracts over a million visitors on an annual basis and with a student population of approximately 10,000 it could become a great example for other towns throughout the UK to follow.

### **AP: How does your past professional experience help you in leading this movement?**

DBG: I have been passionate about the environment all of my adult life and over the years I have worked closely with numerous environmental groups worldwide on a voluntary basis. Both my academic background and my professional career have focused on environmental politics and corporate governance.

I have spent the past 25 years advising governments, corporates and SMEs worldwide on reputational risk management with particular emphasis on stakeholder engagement. Therefore, having managed numerous stakeholder analysis projects and conducted reputational assessments on several corporates in terms of their corporate governance and sustainability objectives both on a national and international level, I have developed the skills essential for coordinating this initiative.

Over the past couple of years, my focus has been plastics pollution as I consider this to be one of the most urgent environmental issues that plagues the world. Single-use plastics represent the main cause of plastic pollution on a global scale and no country is immune to the devastating effects of this unprecedented level of pollution. While international initiatives are being considered, the urgency of addressing the issue of plastic pollution requires immediate action at all levels – local, national, and international – simultaneously. I have been working closely with various NGOs and conducting extensive research on what the government and the business community can do to provide viable solutions to the issue.

In terms of the St. Andrews initiative, my goal is to help develop and co-ordinate a strategic plan that will help all the involved stakeholders to eradicate single-use plastics. I want to share my knowledge with like-minded people and motivate others who are keen to get involved!

**AP: Who are the most important stakeholders in your opinion?**

DBG: The most vital stakeholders are the local business community, Fife Council, the University of St. Andrews and the R&A. Within the business community, although the food and drinks sector is the most prominent due to the amount of single-use plastics used, it is of equal importance to engage with the retail and hospitality sector.

**AP: How are you getting local businesses on board with this campaign? Why are you engaging them rather than pressuring them?**

DBG: As part of this initiative we want to ensure that St. Andrews will become single-use plastic free by engaging with all these stakeholders in order to promote behavioural changes and a better understanding of why reducing and eventually eradicating single-use plastics is the best option moving forward.

We feel that the best way to achieve results is to educate about the long-term impact of single-use plastics and recommend to all stakeholders, alternative products that could replace single-use plastics for the long-term.

We have already conducted an extensive survey to determine the level of awareness that exists within the local business community and the interest in replacing single-use plastics. The survey indicated that over half of the businesses in St. Andrews are already seeking to replace single-use plastics within their businesses – an encouraging finding!

**AP: What are the barriers to making St Andrews Single-Use Plastics Free and what measures are you implementing to overcome them?**

DBG: The survey that was conducted indicated that some businesses are reluctant to pursue alternative sustainable products because business owners are not aware of what other options are available. Therefore, part of the initiative will be to educate the business community on the benefits of investing on alternative products.

The main issue that has been identified in discussions with the business community is the higher cost of alternative products to single-use plastics. We hope that local businesses will be able to pursue alternative products to single-use plastics at comparable prices that will become available to them through the initiative.

**AP: How will this affect student life and the St Andrews community as a whole?**

DBG: I think that the student population will benefit enormously by such changes as this initiative could play a major role in changing the behaviour of students towards single-use plastics. Hopefully the students' attitude towards single-use plastics will impact their behaviour and actions on a daily basis and will continue beyond their university life, into their professional and personal life. This generation of young people will then influence others; their family and friends, their colleagues and in time their children and the generations to come.

**AP: How can students and townspeople help this movement accelerate?**

DBG: This is a great opportunity to demonstrate a collaboration between students and the town. Working towards the same objective could actually provide a reason for strengthening the 'town and gown' relationship. We also hope that by establishing the initiative as a partnership between some of the most prominent stakeholders, it has already given a sense of 'togetherness' between the students and the local residents. At a time, when often relationships between the two groups have been strained, this initiative could unite them in eradicating single-use plastics and tackle plastics pollution.

**AP: Do you think this plan is too ambitious/idealistic?**

DBG: Of course, any initiative of such magnitude is ambitious and idealistic. But action needs to be taken as change can only be implemented through individual action that can galvanise other individuals and ignite their passion in realising such as plan. In the words of Mahatma Gandhi, 'be the change you want to see in the world' and that's what should drive us all.

# Antarctica fieldtrip – a research expedition and life-changing adventure

*Iga Józefiak, Fourth Year*



**Last March, during my 4th year at the University of St Andrews studying Geography & Sustainable Development, I had the pleasure of participating in the polar expedition to the Antarctic Peninsula, as part of the BL4301 Polar Ecology module, coordinated by Dr Sonja Heinrich. The module consisted of a series of lectures, followed by a two-and-a-half-week trip to the Ice Continent. Together with 11 fellow students, I flew through Buenos Aires to the southernmost city in the world – Ushuaia. From there, after spending some days in the adjacent National Park, I boarded Plancius, the nearly 90 m long motor vessel, that took us on an adventure of a lifetime...**

## **Opportunities are out there...**

When my fellow students found out I was going to Antarctica, most of them kept asking, “How come?!” None of them had ever heard about a possibility like that, even though the Polar Biology module was clearly presented in the biology handbook and put on the list of option modules for Sustainable Development.

However, from my observations, students rarely have time or desire to read through all the handbooks, leaflets and sub-websites. If I could give one piece of advice to my younger colleagues from the University of St Andrews, it would be to really devote time to researching opportunities regularly. Especially the ones on the University website. It is always worth it to get in touch with lecturers to ask questions, propose your ideas, and show your interest and passion. Following such strategy, I was not only able to get a couple of research assistant jobs and discover different scholarships and trips, but I also managed to get to know the lecturers and build a relationship with them. Opportunities are out there, waiting for you to make use of them!

## **About the module and the fieldtrip...**

Once admitted to the module, we attended preparatory classes throughout the semester, which consisted of lectures on the biodiversity, oceanography and climate of the Antarctic Peninsula, as well as a detailed explanation of the vessel’s procedures, terminology and equipment. We also visited RRS Discovery (British Nation-



al Antarctic Expedition 1901-1904 vessel) in Dundee.

The couple of days prior to embarking on Planicius were filled with stunning views of the Tierra del Fuego National Park and an unexpected opportunity to necropsy what was identified as a beaked whale in the Estancia Haberton reserve.

Filled with theoretical knowledge and first impressions, we looked forward to the awaiting ad-



ventures over the next nine days aboard the ship. Before observing the first ice bergs, we sailed for two days through one of the stormiest spots in the ocean – Drake’s Passage. This time Drake was quite kind, but on our way back, a recorded 10 on the Beaufort Scale made over half of our group sick.

Our main task was the observation and identification of animals. Each day assigned groups, freezing on the bridge, bravely recognized species and collected data that were analyzed upon our return. Most of the group were enrolled in Marine Mammals Biology making mammals the central focus of the trip, however, we also used specific devices like CTD and Secci Disc, to collect information about water properties. Due to the expertise of the second supervisor Professor Will Cresswell, we also devoted a lot of time to bird watching while crossing the Drake’s Passage, and spotting fascinating species, such as the Wandering Albatross, in their natural habitat. Coming ashore allowed us to have a closer look at penguins and seals, hike in snowshoes, or listen to the silence and enjoy this secluded place, whereas numerous zodiac cruises permitted us to collect data from specific locations or watch wildlife. We also had the opportunity to overcome our weaknesses and plunge into the freezing waters of the Southern Ocean.

Being able to apply previously gained knowledge in real life was a truly enriching experience.

In my opinion, this module is ideal for people who are considering working in a research team, who are keen to do fieldwork, and are interested in marine biology or climate change in the polar regions.

### **A few reflections after the trip...**

Before the trip, I knew it would be an adventure of a lifetime, but I would have never expected it to affect my personality and emotions as much as it did. The expedition took place during the Spring break of my last year. With Master’s applications, dissertation and upcoming exams on my mind, I escaped literally to the end of the world... and it was the best decision I could have made.

Being completely offline brought harmony and relaxation back to my life. I have finally realized that in the age of the internet and mobile phones, we never rest. Our minds are constantly stimulated by multiple information and events, often unworthy of our attention. We are occupied by this online world to the extent that we do not notice our own feelings, sensations or emotions anymore. I will never forget the moments of evening reflection, when snow was falling outside the window, when I endlessly stared at the waves with a cup of hot chocolate in my hands. Such “here and now” moments enhanced my consciousness, re-



kindled my ability to feel and revived all my senses.

It's truly touching that there still exists a place so pristine, so untouched by humans. Where time does not pass, where the only sounds are nature... Antarctica teaches humility, shows us how small we are. It is the only place on the planet where human beings are still guests, where we must submit to Mother Nature. Currently, according to the Antarctic Treaty from 1959, it is a place for "peace and science". I need to emphasize how important it is that it remains so, even in the era of constant disputes over political influence and the pursuit of economic growth.

I have to admit that overall, the expedition was a difficult experience. Especially mentally. Imagine being locked on a ship, at the end of the world, relying on people you don't know well, exposed to unexciting weather conditions, all from which you cannot escape; it's tough. There is no better way to get to know yourself and overcome your weaknesses and barriers, to develop your knowledge, courage, endurance and mental strength simultaneously. These are the true values that I gained from this trip. Pictures of penguins and breathtaking views were just a nice addition.

After returning, I quickly learned to appreciate the surrounding world more, to be more aware and present, to enjoy the moments. I only managed to be fully grateful, when I exposed myself to such a challenging trip. I came back calmer and stronger.

Antarctica is a very unique place. The journey there takes so long, almost as though it were on another planet. And upon return, you are left with a weird sense of fiction; as if it never happened. Although I only have blurred memories left in my mind of the picturesque landscapes, the conclusions I reached will stay with me forever; they changed my perspective and approach in numerous domains of life.



*All photos by author.*





