Atlas

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Correspondence should be addressed to:

DU Geographical Society,

Box 65,

Regent House,

Trinity College Dublin,

Dublin 2,

Ireland

Or

geogsoc@csc.tcd.ie

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Lisa Fay

Sub-Editors:

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Cover Design:

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Acknowledgements

The publication of DU Geographical society's 'Atlas' has become a much anticipated annual tradition. Despite the complexities the Covid-19 pandemic has brought to college this year, I am more than happy to share with you Volume 19.

Firstly, I would like to thank all the students who submitted their work to our journal this year. Solenn, Emily, Jacob and myself had the tough task of selecting papers for publication. The high standard of essays received is a testament to the hardworking and bright Geography students here in Trinity. I would like to express my sincerest gratitude to Eimear Johnson our PRO this year for designing the fantastic cover of Vol 19. Eimear has showcased her amazing graphic design skills throughout the year, creating banners and posters for this year's events. I am very appreciative of the advice from previous editors, which proved invaluable to the creation of Volume 19. Many thanks to our honorary president Philip Lawton for his enthusiasm this year, and for his encouraging President's Forward.

Publishing Atlas would not be possible without the financial support of the TCD Association and Trust, funded by the Alumni of Trinity College Dublin. DU Geographical society is very appreciate and grateful for their assistance in keeping up the tradition of our Journal.

I would also like to thank all our members who came to our virtual events this year, from Bingeo, to Quizvid-19 to the Netflix parties. Keeping the society going virtually has been so important throughout the past year, providing an outlet for myself and other students to relax and have fun.

Finally, the success of our society this year would not be possible without our amazing and dedicated Chairperson, Emily. Our very own superwoman, Emily has successfully pulled off amazing

events including our ‘Geography on the Frontier’ talk series, taking every technical difficulty Zoom throws at her with such ease and composure. I don’t know where our society would be without her.

As college life in the subsequent semesters and years returns to a new normal, I am certain our society, alongside our dedicated members will continue to flourish!

Lisa Fay

Editor

Atlas #19

President's Foreword

This time last year, as I wrote the forward for Atlas, 2019-2020, I really had no expectation that we would again be sitting here one entire year later under similar circumstances. The Covid_19 crisis has had significant impacts upon all of our lives, whether it be at a personal or familial level, or in terms of our experiences of life in Trinity. The activities of the DU Geographical Society has always been a central feature of everyday life in TCD Geography. That students cannot get to use the Museum Building in its normal manner, and enjoy the unique social opportunities of the Freeman Library is a truly sad reflection of the reality of this past year. These spaces contain the memories of past students, to which each group adds their own special memories each year. The feeling of the buzz around the Christmas party, the annual table quiz, or the launch of Atlas are special days in the year. It is on these days that the sense of Geography at Trinity comes into its own through informal interaction and celebration. I know I speak for all staff when I say that it is of great sadness that we cannot share these moments with geography students for this year. In particular, to our departing Senior Sophister students, we are all too aware that a significant portion of your experience at Trinity College has been impacted by Covid_19. We can only hope that through initiatives such as Atlas, that you managed to maintain and build the social contacts that will have been started in your earlier years.

On a more positive note, I would once again like to express how proud I am of the DU Geographical Society for maintaining the running of the society under such constrained circumstances. The endeavour of putting together a journal is difficult even under the best of conditions. To do this under the constraints of Covid_19 is a

testimony to your strength of character and your abilities to overcome significant barriers.

A core part of your geographical learning revolves around bringing together environmental and human attributes of space. The crisis of Covid_19 have brought these to the fore in a manner not experienced in recent memory. If there is something to be taken from this as geographers it might be the importance of an integrated approach to understanding our planet and taking care of it for the future. Bringing together the different aspects of geographical knowledge in a journal such as Atlas serves as the opportunity to express this unique aspect of our discipline to the world. I hope that it becomes a stepping-stone to great initiatives for the years to come.

As was extended to the students finishing in 2019-2020, to all Senior Sophisters in TCD Geography, please be assured that you are always welcome to visit us in the Museum Building so please do drop by in what I hope is the near future. For those of you in your earlier years in University, I hope that you will soon get to experience the campus and the Museum Building in all its glory.

Philip Lawton
Honorary President
April 2021

Chairperson's Greeting

Welcome to the Dublin University Geographical Society's 19th volume of its annual publication, Atlas.

Firstly I would like to congratulate all entries to this year's publication, the standard throughout was excellent. I gained great insight and enjoyment in reading them. I would like to extend my sincere gratitude to Lisa Fay, our secretary, for all her dedication and work in leading the editing team for this year's edition of Atlas. Thank you to Jacob Hartley and Solenn Reeves-Long for your help on the editing team and Eimear Johnson for creating the beautiful graphics for the cover.

This year in GeogSoc has been like no other, with zero in-person events allowed due to the lockdown restriction of the COVID-19 virus we were unable to hold many of the biggest events that the society is renowned for. However, this has not stopped the society from being one of the best parts of university life. Throughout the year we have held numerous online events, from the well-loved Bingeo to a brand new online talk series 'Geography on the Frontier', from online pancake creating and pumpkin carving challenges to the fabulous 'Where in the world?' competitions run on the society's Instagram account. GeogSoc has continued to bring joy and laughter, inspire and educate, and be an all-around class society.

An enormous thanks to all the committee members for your passion, positivity, and perseverance, without you, there would be no GeogSoc. A special thanks in particular to Eimear, our public relations officer, who has tirelessly created the online content for social media, giving the society a wonderfully sophisticated look. It has been a true honour to be the chairperson of the Dublin University Geographical Society. The experiences and memories made in the society are ones I will treasure always.

Thank you to our members, our honorary president Philip Lawton, and you the reader, for your support and enthusiasm for the society through probably one of the most peculiar years yet.

Enjoy reading, keep safe, and wash those hands!

GeogOn

Emily Cantwell-Kelly

Chairperson 2020/21

The case for rewilding the Tasmanian devil on mainland Australia: overcoming assumptions and realigning priorities

Alice Murnaghan

Abstract

This paper summarises and critically evaluates the case for rewilding the Tasmanian devil (*Sarcophilus harrisii)* on the Australian mainland, from which it has been extinct for over 3000 years. Many potentially damaging assumptions involving the reasons for their original extinction and their ability to survive the various climatic conditions across Australia arise, and are overcome through analysis of recent scientific evidence. It is found that widespread trophic rewilding of devils could have multiple environmental and social benefits, particularly through the suppression of introduced feral cat *(Felis catus)* and fox *(Vulpes vulpes)* populations that would allow for smaller mammals to flourish and reach their potential as ecosystem engineers. However, the only project currently attempting devil rewilding (Aussie Ark in the Barrington Tops national park) urgently requires a realignment of priorities in order to reap the most benefits and lead the wider devil rewilding effort down the most sustainable path. Recommendations to the Australian Minister for the Environment are made to ensure this transpires.

Introduction

Rewilding represents a regeneration of conservation practice and is becoming an increasingly popular tool used to advance a number of ecological aims. Trophic rewilding, in particular, seeks to restore the keystone role played by larger carnivores that have often become extinct or been driven to low levels by human activities and other factors (Cunningham et al., 2019). This keystone role essentially entails the maintenance of top-down trophic interactions and processes, particularly if the species is highly interactive. Thus, the rewilding of top predators can restore these processes and thereby promote biodiverse and self-regulating ecosystems, as well as potentially address biological invasions (Derham et al., 2018).

Over the last 200 years, Australia has lost more species of mammals than any other country in the world (Woinarski et al., 2015). This can be attributed to a multitude of factors, but significant weight has been given to the role of red foxes *(Vulpes vulpes)* and feral cats *(Felis catus)* since their introduction around the same time. These species represent two introduced meso-predators that have preyed on, suppressed, or even wiped out the populations of smaller mammals. Smaller mammals, and particularly those in the critical weight range (CWR) of 35g - 5.5kg (Burbridge & McKenzie, 1989), often perform indispensable ecosystem functions. The suppression of CWR mammals' populations can be attributed to the flourishing populations of cats and foxes that are not kept in check due to a lack of apex predator. The dingo *(Canis dingo)* usually performs this function. However, dingoes have been systematically exterminated from many parts of Australia due to their unpopularity with farmers as a result of their predation on livestock.

The Tasmanian devil *(Sarcophilus harrisii)* became extinct from mainland Australia approximately 3200 years ago (White et al., 2018), persisting only on the island of Tasmania. Their extinction has been linked to the arrival of the dingo in Australia at least 300 years prior (Derham et al., 2018). The Tasmanian devil is considered a highly interactive species and an ecosystem regulator (Hunter et al., 2015), in that it has potential to affect the behaviour and abundance of both meso-predators and smaller ecosystem engineers below it, allowing for certain processes to arise or be restored. It has been posited that devils could eventually replace or complement the diminished role of dingoes in Australian ecosystems (Hunter et al., 2015). Some concerns and contradictions have emerged, but we will explore how these can be remediated. A programme led by Aussie Ark (2020) has very recently released 26 devils into a semi-wild sanctuary North of Sydney. This represents the first of many steps towards rewilding the Tasmanian devil all over Australia. An analysis of the programme, its aims so far and possible improvements to it are also laid out below.

Methodology

In order to provide a detailed and well-informed summary and evaluation of the current situation concerning the rewilding of the

Tasmanian devil on mainland Australia, an analysis of highly relevant literature was undertaken. This literature was identified through keyword searches on google scholar, as well as through the reference lists of initial papers found. Considering that the Aussie Ark Tasmanian devil release project was only undertaken very recently in October 2020, no academic literature on it yet exists. Therefore, an analysis of the project description and objectives on the official Aussie Ark and Rewilding Australia websites was instead undertaken to fill this gap.

Analysis

As briefly discussed, it is widely considered that the introduction of red foxes and feral cats to Australia, combined with the lack of apex predator to control them, has had adverse effects on Australian environments. This is because their populations have exploded and both species often kill beyond their immediate needs, therefore representing an increased threat to CWR mammals (Short et al., 2002). This means a reduction in biodiversity as several species are driven to near extinction, along with an associated shift in the ecological processes and environmental functions that these species maintained. To reduce the perceived negative impacts that introduced meso-predators are having on lower trophic levels, an introduction of a top predator is necessary to act as a biological control (Westaway et al., 2019). The Tasmanian devil is suggested for this role due to the current inability of the dingo to fulfil it.

If dingoes did play a pivotal role in the original extinction of the devil from the mainland, then a concern arises in that rewilding of the devil may not be feasible in many regions of Australia where dingoes still have a presence. This is reinforced by the observation that devils can easily be killed by domestic dogs (Jones et al., 2003). However, it is now posited that whilst dingoes did have some effect on devils' extinction, there were also many other factors at play – such as increasing human population densities and the effects of drought which drove them into a 'predator pit' (Hunter et al., 2015). Furthermore, research has suggested that dingoes and devils would be able to coexist if kept at the right balance (Derham et al., 2018). Nevertheless, land in Southeast Australia that has been identified as suitable for initial devil introductions also happens to coincide with

where dingo populations are low (Hunter et al., 2015). Therefore, initial rewilding efforts can go ahead without concern for their effect until more research is undertaken. The widespread eradication of dingoes has led to eruptions in macropod populations, as well as cats and foxes, that can cause significant damage to vegetation. The Tasmanian devil may not occupy the exact same niche as the dingo but evidence from Tasmania suggests they could have similar positive effects on small mammals (Hunter et al., 2015).

Dramatic decline in the population of devils in Tasmania due to the outbreak of Devil Facial Tumour Disease (DFTD) has had one positive outcome in that it has allowed scientists to study the effects of devils on lower trophic levels and the environment around them (Johnson, 2019). They have observed that they do indeed control populations of cats and possums *(Trichosurus vulpecula)* as well as clean up carcasses of larger animals, that are now left in the open for much longer since devils' demise (Johnson, 2019). Since devils have been plagued by DFTD, cats have moved into some of the territories that they've relinquished, suggesting that devils previously suppressed their advancement (Hollings et al., 2014; Westaway et al., 2019). Moreover, the effect of devils is offered as the reason that foxes have barely flourished at all in Tasmania (Hunter et al., 2015). However, this also means that no concrete data on fox and devil interactions exists. In terms of CWR species though, devils are found to have minimal impact on them in Tasmania as their diversity has not declined to anywhere near the same extent as the mainland's over the same timescale (Westaway et al., 2019).

The positive effects that devils (could) have on small and medium mammal populations are posited by many studies (Cunningham et al., 2019; Derham et al., 2018; Hollings et al., 2014). Rewilding the devil in conjunction with other threatened species such as potoroos *(Potorous)*, bettongs *(Bettongia)*, bilbies *(Macrotis lagotis)* and bandicoots *(Peramelidae)* would offer the most benefits to the mainland landscape due to the role of the aforementioned species as ecosystem engineers. This critical engineering, when allowed to take place through a sufficient suppression of meso-predators that predate on the species (which the devil could provide), can significantly reduce bushfire risk in a region (Johnson, 2019). This

should be an absolute priority of the federal and state governments considering the catastrophic nature of the recent fire seasons (particularly that of 2019/20). Rewilding therefore represents a preventative remedy that encourages biodiversity and has wider social benefits.

Fuzzy cognitive map (FCM) modelling undertaken by Hunter et al. (2015) to investigate the possible effects of different rewilding scenarios revealed that introduction of the devil would indeed foster more positive outcomes than if it were not introduced. Devil introduction along with no dingo or fox control was found to have the most desirable outcomes from a biodiversity and vegetation complexity perspective, however, is likely to be unpopular with communities due to the relatively central role of dingoes in this scenario (Hunter et al., 2015). A scenario in which devils are introduced, foxes are reduced in abundance and dingoes are completely eradicated was found to have similar positive effects on vegetation complexity, although the abundance of the most threatened species like spotted-tail quolls *(Dasyurus maculatus)* and rock wallabies *(Petrogale penicillate)* was found to differ little from the current scenario (Hunter et al., 2015). This may be due to the fact that they are in the optimal prey size range for devils and foxes which is exacerbated by the lack of competition from dingoes. With this in mind, it is important to determine what the primary purpose of devil rewilding would be, because if it is to protect specific threatened species then it may end up having little effect. A rewilding project involving the spotted-tail quoll already exists in Australia (Rewilding Australia, 2020), so research into the possible conflicting objectives of this and the devil introduction movement would be necessary.

This issue is linked into the wider concerns surrounding the potentially unintended and undesirable consequences that reintroductions can have on trophic cascades. For example, release of koala (*Phascolarctos cinereus)* populations in reserves on mainland Australia have sometimes been disastrous; several koalas starved to death in Sandy point, Victoria, after they defoliated and killed most of the manna gum *(Eucalyptus viminalis)* trees and removals proved unsuccessful (Derham et al., 2018). This provides a lesson and insight for future trophic rewilding efforts in that not all consequences can

ever be fully foreseen, and therefore the degree to which projects are 'successful' or not depends almost completely on local conditions (Derham et al., 2018). Thus, even observations from Tasmania could ultimately prove unhelpful to the devil rewilding effort on the mainland.Of course, there must always be consideration given to safety concerns within such radical projects. Whilst there is no reason to believe that Tasmanian devils would pose any threat to humans, there has been evidence to suggest that they do sometimes attack livestock. However, they do not present as large a threat to livestock as dingoes (Hunter et al., 2015). Notwithstanding, societal values and acceptance are very important to the success of trophic rewilding of this sort, and therefore concerns over space for larger predators amongst human populations have been raised (Sweeney et al., 2019). As a whole, Australia is very sparsely populated, and so widespread rewilding of the devil should still be possible despite these concerns. A nationwide rewilding effort is still far off though, and the broad Southeast regions that are recommended for, and indeed house, the first attempts at rewilding of the devil are some of the most densely populated in the country. As a result, fostering support for devil rewilding amongst communities in this region will prove essential.

It has been suggested that extant devils may not be adapted to the warmer climate of the mainland after so long in Tasmania (Hunter et al., 2015). This is why Hunter et al.'s (2015) species distribution modelling, aimed at identifying the most suitable landscapes for their reintroduction, returned results predominantly in the southeast where it is cooler. However, this may have been an underestimation based on a broad assumption that they are not sufficiently adapted – which has little to no supporting evidence (Fancourt & Mooney, 2016). When considering the palaeontological record on the mainland, it is evident that devils survived, and indeed thrived, in a wide range of environments including the desert, the northern tropics and the temperate south (Westaway et al., 2019). Whilst more fossil records are found in the south, this can primarily be attributed to the bias in levels of fieldwork conducted in the region compared to elsewhere (Westaway et al., 2019). Importantly, the Australian climate is not drastically different from the time of the devils' mainland extirpation, and therefore, ceteris paribus, is unlikely to cause them any detrimental effects if they were to be reintroduced to a wider scope of

environments (Louys et al., 2014). The fossil record can provide additional insights into the effort to rewild Tasmanian devils. Analysis of fossils from the Willandra Lakes Region in New South Wales suggests that devils and CWR species coexisted for more than 30,000 years (Westaway et al., 2019). This reinforces findings that devils do not have a negative impact on CWR populations, unlike cats and foxes.

Aussie Ark's (2020) 'Devil Ark' project originally began in 2011 as the largest devil conservation breeding program on mainland Australia. It aimed to provide an insurance population of devils as a result of the catastrophic effects of the spread of DFTD on devil populations (Aussie Ark, 2020). It has now expanded beyond conservation into the realm of rewilding with the launch of the '#DevilComeBack' program. This program has seen the release of 26 devils into a 400ha 'wild sanctuary' within the Barrington Tops national park (north of Sydney) in October 2020. Two additional releases of 20 devils each are also planned in the next two years (Aussie Ark, 2020). One of the primary aims of the project is that the devils will breed and eventually produce a self-sustaining wild population. This aim will be achieved through constant monitoring of the devils through radio collars, camera traps and surveys in order to gain information on their progress and make relevant adjustments. Global Wildlife Conservation and Wild Ark represent partners to Aussie Ark in the project.

The wider vision of Aussie Ark (2020) and its partners is apparently to "return Australia's ecosystems to that of pre-European settlement, free from introduced feral predators – an island oasis", and the initial release of the devils represents the first step to achieving this mission. Unfortunately, this 'oasis' vision is not feasible given the current environmental as well as political, social, and economic landscapes. Many species existed in this pre-European period that simply do not anymore, and the levels of funding and political will necessary to achieve such a drastic vision are not present in Australia, nor in any country in the world at the present moment. 'Pre-European' also suggests the preference of a diminished human role in the devil rewilding efforts, since there were much lower populations in Australia at that time. Whilst this may initially be beneficial, in the

medium to long term meaningful involvement of communities in the rewilding process may prove essential to its success. More focus needs to be directed towards the restoration of specific ecological processes rather than an out-of-reach pre-European state.

Aussie Ark's other desire for freedom from introduced feral predators would require large-scale extermination of foxes and cats and a further intensification of measures to exclude dingoes. This extermination is also backed by other groups such as Rewilding Australia (2020) who wish to make Australia fox free by 2050. Whilst a level of control may be necessary, these goals encourage a dangerous rhetoric of extermination that does not aid species coexistence and understanding of rewilding in the long term. As well as this, Aussie Ark (2020) state their belief on their website that the extinction of devils on the mainland was primarily down to the role of dingoes, despite the research discussed that suggests more complex reasons. This indicates that they would be unwilling to attempt or fund devil rewilding efforts that incorporate the role of dingoes. This could mean that the beneficial effects of devil rewilding do not reach their full potential, considering devil and dingo coexistence was found to have the greatest effect on improving vegetation complexity (Hunter et al., 2015). Furthermore, dingo exclusion is usually achieved through the use of fencing. In the long term, fencing is ultimately inconsistent with the goal of re-establishing self-sustaining populations, that Aussie Ark wish to achieve, due to the constant maintenance required (Sweeney et al., 2019).

Conclusions

Although there is no way to truly predict all the outcomes and consequences of any rewilding project, observations from Tasmania and palaeontological evidence in particular suggest that rewilding devils could have multiple ecological benefits. Fossil analysis is an effective tool that can be used to help understand interactions across trophic levels (Westaway et al., 2019), and more research into devil fossil records in all regions of Australia is strongly recommended to further inform the trophic rewilding effort. These ecological benefits broadly include the suppression of introduced cats and foxes which would in turn allow the populations of threatened CWR species to recover, fostering increased ecosystem engineering and thereby

increasing vegetation complexity and reducing fire risk. The potential social benefit of such a project is therefore evident, and there is a need to emphasise this social gain to the public, as discussed in the policy recommendation section below. Through analysis of the scientific literature, it appears evident that widespread rewilding of the Tasmanian devil on mainland Australia is not only doable, but is necessary in order to preserve and cultivate Australia's threatened flora and fauna. However, as discussed, devils do prey on some threatened species that are also being 'rewilded' and therefore appropriate methods to manage this issue, such as communication between and a convergence of different rewilding projects is recommended. It is also important to emphasise the potential found in the literature for rewilding the devil across all regions of Australia, not just the southeast, in order to generate the most benefits. The current efforts at devil rewilding being made by Aussie Ark are encouraging and represent a step in the right direction, however, are built upon damaging and unhelpful discourses, and therefore require re-evaluation. The focus of trophic rewilding should be on the restoration of processes, not historic states (Sweeney et al., 2019).

Summary for policy makers

Addressed to: The Australian Minister for the Environment, Sussan Ley

As discussed, there is an urgent need for cultivation of community appreciation of devil rewilding if any projects are to be successful in the long term or on a wide scale. Across Australia there is a rampant discourse that dingoes represent 'pests', and any efforts to introduce another large top predator into the landscape may prove unpopular with those who take this stance. This is particularly the case within rural agricultural communities, where attitudes favour predator persecution rather than tolerance (Sweeney et al., 2019). Therefore, government agricultural policy on dingo extermination and land clearing first needs to be amended in order to align with the goals of rewilding (Sweeney et al., 2019), which should represent a top priority of the government given the various environmental and social benefits discussed in this paper, particularly concerning fire risk. Furthermore, an education program aimed at agricultural communities is recommended in order to foster engagement in and an understanding

of the trophic rewilding process as well as support for amended government policies. The potential benefits to their communities specifically should be emphasised. A fund dedicated to the compensation of farmers for livestock lost to devils (or indeed dingoes) may initially be necessary to cultivate this support.

A thorough government evaluation of the Aussie Ark devil rewilding project is recommended in order to ensure that it is headed in the most beneficial direction for the nation as a whole. Constant collaboration with Aussie Ark and its partners is strongly encouraged in order to educate them on the benefits of overhauling and realigning the project's long term aims. Emphasis should be placed on the need for: meaningful inclusion of relevant communities, the promotion of dingo and devil coexistence, a specific focus on restoring ecological processes, and a potential expansion of the project into other environments in Australia. As mentioned, research funding into the fossil record in areas of Australia other than the southeast is urgently required in order to inform the potentially wider scale rewilding effort, and it would be wise for the Minister to encourage this redirection of funds where possible. It is perhaps also necessary that the Minister considers the formulation of a set of criteria that an organisation must meet in order to be able to embark on a project focussed on rewilding the Tasmanian devil. Along with this, a sum of government funding could be assigned to projects that adequately meet these criteria in order to encourage the steady acceleration of trophic rewilding efforts all over Australia, and the myriad of benefits that come with their success.

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Robotics and Automation in Agriculture and their Environmental Consequences

Yasha Pilarsky

Introduction

Though our economies have shifted away from agricultural production since the industrial revolution, agriculture remains crucial to the well-being of the human population. Due to issues which have been accumulating since the industrial revolution, however, this most important sector is increasingly coming under pressure, demanding a thorough change in the food supply. This essay will examine the current drive of robotics and automation in agriculture, which is seen as enabling this crucial transformation.

In the first section, I will cover some of the factors pressuring agriculture, before exploring recent developments in agricultural technology. I will further examine the pressure facing farms, causing them to pursue more efficiency and productivity, and how they are hoping to achieve these through more advanced measurement, while minimising environmental impact. The second section will cover some of the benefits which these technological changes can bring to agriculture, including better decision-making and optimising their business. The third section relates the current technological drive to the theory of ecological modernisation (Barry, 2005) and its associated critiques. The last section examines the potential environmental impacts of new technologies, by extending Gabrys' (2014) criticisms of 'electronic environmentalism' to the present context, as well as providing some of my own.

Robotics and Automation in Agriculture

The agricultural sector could be considered the most important sector in our economies, as it provides the overwhelming majority of the world's food supply. Its sustainability, therefore, is paramount in order to ensure the health and well-being of the global population. However, the demands on agriculture are rising (Sheikh, 2020) and the global food chain is increasingly under pressure: global population growth, climate change, international migration, increasing urbanisation and

an ageing population in many countries are some of the main contributors (UK-RAS, 2018). The intensifying variability in weather caused by climate change will accelerate environmental degradation and reduce agricultural productivity over the coming decades (FAO, 2016). Direct consequences of climate change to agriculture include higher average temperatures, more extreme weather events which can lead to crop loss, and new disease threats (Halleron, 2017). In light of these challenges, having to feed a world population expected to reach 9.7 Billion by 2050 is a dire prospect, creating a powerful drive to increase productivity in agriculture (Mayersohn, 2019).

What is needed is a transformation of the food chain, and robotics and autonomous systems (RAS) and associated digital technologies are positioned to be the enablers of this critical change (UK-RAS, 2018). Robots on farms and in factories are expected to support the sustainable intensification of agriculture, drive productivity in manufacturing and thereby ensure future food security (UK-RAS, 2018). There is a need to produce crops with strongly reduced use of pesticides and herbicides due to the environmental and health damages they cause, as well as a need for automated farming equipment in response to increasing labour shortages (Mayersohn, 2019). The opportunities which RAS could provide include robots that assist workers in conducting agricultural operations such as crop and animal sensing and weeding, as well as an integration of autonomous systems into existing farm technology (UK-RAS, 2018).

For example, “TerraSentia”, a small and lightweight robot – equipped with all-terrain wheels and high-resolution cameras on each side – is being developed to assist farmers in their work (Sheikh, 2020). Its functions include measuring plant size, health and quality of produce. Plant breeders can use it to measure phenotypes, detecting the plants’ best characteristics to create hybrids. Automation already plays a big role in agriculture, such as farm equipment outfitted with sensors to identify weeds, calculate the appropriate amounts of herbicides to be used and detect and pick produce, using machine learning and robotics. The data which these technologies collect are uploaded to a cloud server for analysis (Sheikh, 2020). Another application of RAS is the fitting of auto-steer systems to large farming

equipment, enabling them to be satellite guided to accuracy of an inch (Mayersohn, 2019).

Due to narrowing profit margins, global competition and increased attention to limited resources, farmers are increasingly forced to carefully measure, monitor and micromanage their resources to increase their farm's efficiency and overall profit (National Institute of Food and Agriculture, n.d.). Most aspects of agricultural production, processing and management involve measurement of resources, products, and their environment. The sheer amounts of variables, high measurement frequencies and levels of detail demand automated, rapid and high-resolution technologies (National Institute of Food and Agriculture, n.d.). The use of information and precision technologies delivers decision tools, which are already in use. Designed to ingest data from a variety of sources - such as satellite imagery and local sensor data on seed counts, nutrient and fertiliser levels - these platforms incorporate vast analysis and storage capabilities to provide local long-term weather predictions, crop yield predictions and health diagnoses, and suggest remedies. All this is possible through the computerised monitoring of temperature, humidity, soil moisture, nutrient levels and other conditions (Mayersohn, 2019).

Another contribution of Information and Communications Technologies (ICT) are cost savings through an increase in efficiency and productivity (Milovanović, 2014). Fields exhibit inherent variabilities, so that traditional mechanised farming could only apply treatment to crops of "average" soil, nutrient, weed and other conditions. This leads to under- and over-applications of irrigation, fertilisers, pesticides and herbicides across the field, with chemical excesses from these blanket applications running off into ground and surface waters. Precision agriculture solves this problem with localised, site-specific applications of resources, which can reduce costs while minimising environmental and ecological impacts of their use (National Institute of Food and Agriculture, n.d.). Precision agriculture combines data from a number of different field and machinery sensors with localised weather, soil and growth data from satellites to help farmers make precise decisions regarding resource inputs and management practices (Halleron, 2017).

Benefits of Robotics and Automation in Agriculture

With rising labour, machinery, fertiliser and pesticide costs – and environmental costs being accounted for – producers are looking to variable-rate technologies to minimise input costs and address ecological concerns (National Institute of Food and Agriculture, n.d.). The new wealth of information which now can be collected helps farmers in making better decisions, compared to conventional sources of information which can be unreliable and lack in timeliness (Milovanović, 2014). Internet-of-Things (IoT) technology and advanced analytics of the data are already providing insights into optimisation of yield, improved planning and smarter resource use (UK-RAS, 2018). Autonomous robots can sense crop health through cost-effective data collection and, in combination with different sources of data and sophisticated analysis techniques, focus on areas of greatest need to reduce primary input costs (UK-RAS, 2018). Automated robots can perform dull and dangerous jobs, which can improve worker safety and move human jobs up the value chain. For example, robotic milking machines reduce the hard work of milking cows by hand, giving farmers more time to better manage their business. Furthermore, robots milk cows more efficiently, do not tire and always carry the task out to a high standard, all while collecting data on the performance of each cow (Halleron, 2017).

In the UK, 18% of national energy consumption happens in the food chain, heavy farm machinery is causing compaction damage to the soil and many wildlife species are at risk of extinction due to modern farming practices such as the use of hazardous chemicals, industrial machinery and reductions in hedgerows (UK-RAS, 2018). A transition from large, fossil-fuel powered machinery to fleets of smaller electric powered robotics has the potential for reduced emissions, provided the energy is generated locally using renewable sources. A fleet of cooperating lightweight robots would equally reduce the damage caused to the soil and crops by large machines, as well as saving energy – 80-90% of energy in traditional cultivation goes into repairing damage caused by heavy machinery (UK-RAS, 2018). Precision agriculture, meanwhile, allows for sub-field level crop management and better handling of the spatial and temporal variability of any number of variables (National Institute of Food and

Agriculture, n.d.). Field robots can help farmers optimise irrigation, fertiliser and pesticide use through intelligent irrigation systems (Jha, et al., 2019), crop weeding robots, and robots that detect pests and diseases and precisely target the application of treatments (UK-RAS, 2018).

Lastly, robots can automate the phenotyping process, thereby increasing the reliability of those measurements. This allows for breeding of better crops which helps optimise the yield of farms beyond previous capability (Sheikh, 2020).

Ecological Modernisation

The development and implementation of advanced data analytics, automation and robotics in agriculture can be assessed as a manifestation of 'ecological modernisation' (Barry, 2005). The basic tenet of ecological modernisation is that trade-offs between the environment and economic interests are not of a zero-sum nature, suggesting that economic growth is not incompatible with environmental protection. On the contrary, it proposes that the ecological harm caused by economic development can be rectified by more economic growth, of a more technologically enhanced, greener and smarter kind. Barry (2005, p. 311) states that "ecological modernisation is concerned mainly … with finding more sustainable means (through technical innovation, new production methods) to more or less the same ends (continuing increases in material goods and services)", which can be seen in the goals which are set through the technological advancement of agriculture. The emphasis very much lies on increasing productivity and efficiency, all while minimising the necessary inputs and costs through the effects of better technology.

Ecological modernisation further posits that pollution ultimately is a product of inefficiency, which explains its emphasis on innovation in technology and efficiency in production, management and distribution processes (Barry, 2005). The assumption is that through technological improvements in resource efficiency – in this case energy (fuel) and inputs such as water, fertilisers and pesticides – along with increased labour productivity – using robots which do not tire, automating more of the farmers' tasks so that they may better

manage their business – we can continue to enjoy economic growth without resulting in ecological damage.

Barry (2005) provides some criticisms of these ideas. He characterises ecological modernisation as a supply-side approach to environmental policy which focuses on changes in production rather than consumption, thereby not engaging with the issues surrounding the modes of consumption in our modern industrial societies, nor with the issues of socio-economic and environmental injustices within the distribution of the fruits and burdens of economic growth. Furthermore, the dominant conception of progress and development as economic growth, which in part leads to these profound injustices, is not challenged but instead seen as the non-negotiable end of ecological modernisation. In its current mode, whereby the innovation – developing technology for agriculture – is left to the private sector and to be distributed through the markets, ecological modernisation raises a question: if the ends pursued remain unchanged from those that brought us to the current state of ecological crisis, how likely is a profound and *appropriate* change in the means to achieve those ends? This critique of ecological modernisation suggests that even while producing more food more efficiently in the face of a growing population is certainly a necessary component of the solution, it alone cannot stand up to the challenges facing our societies today and in the foreseeable future.

Environmental Effects of Automation and Robotics in Agriculture

The incorporation of sophisticated technology into agriculture for purposes of environmental benefit can be seen as a facet of what Gabrys (2014) calls 'electronic environmentalism': "digital technologies have become central to how we identify and act on environmental problems to arrive at solutions" (p. 5). Electronics are being developed to achieve environmental protection targets by achieving efficiencies, all the while generating new problems of their own. Increasing amounts of energy and resources are needed to produce, power and maintain our technology: we increasingly rely on digital devices and data centres in our everyday lives (Gabrys, 2014). Although individual actions may seem to have a small energetic footprint, the massive amounts of data which are transmitted, stored

and processed every second add up to considerable energy use. The current wave of technological innovation is driven by increased data collection, agriculture being no exception. The data which are sensed by new farming technologies are uploaded to a cloud for analysis and storage (Sheikh, 2020), requiring energy at every stage of data collection, transmission, analysis and storage, all the while increasing our dependency on data centres which are energy- and resource-intensive to build and maintain.

Furthermore, Gabrys highlights that energy efficiency does not automatically lead to reduced energy consumption – as lower prices and greater availability may stimulate less frugal use – nor does it address the need to switch away from fossil fuel energy sources. Similarly, technologies which aim to achieve efficiency in other areas (such as water, fertiliser and pesticide use) equally do not address the underlying causes of problems such as soil degradation due to monocultures, soil erosion due to droughts and biodiversity loss. Instead, they present ways to perpetuate current consumption and production habits and enable the status quo to persist. Environmental impacts and accountability for them are pushed into the future and relocated elsewhere, as they are externalised in the form of increased energy use, emissions and resource intensive and harmful production methods, giving rise to issues of environmental and climate justice which are explored below. Further extending Gabrys' ideas to this context, relying on technology to achieve efficiency may make it more difficult to recognise and change our wasteful and polluting consumption habits, instead sustaining existing ways of life by relieving us of the burden to change our habits.

The use of these technologies raises potential issues of environmental and climate justice. Richer farmers in the global north will most likely be the ones who are able to afford and make use of them, thereby increasing their yields and profits and reducing the environmental impact on their land and the surrounding ecosystems, securing their future livelihood. Meanwhile, the resource-intensive production of these technologies is moved away from the point of consumption, hence externalising the environmental damage to (most likely) global south regions. For example, in current global modes of production, the manufacture of robots would likely take place in

China, burning coal for energy (Gabrys, 2014) and using hazardous chemicals leading to pollution; rare earth metals needed for electronics would likely be mined in the Democratic Republic of the Congo, under inhumane working conditions and worsening local environmental degradation; and at the end of their lifetime, the robots would end up in electronic waste landfills in Africa, leading to local soil and water contamination and damaging residents' health. Additionally, if their use contributes to climate change, this will disproportionately affect already vulnerable populations which are unable to adapt using these technologies, further jeopardising their livelihoods. This presents a profound injustice.

If these technologies do experience global adoption – and are not coupled with advances in sustainable energy generation – the increased energy consumption could perpetuate the use of fossil fuels to power them. This will only contribute to climate change, one of the main causes of the initial drive for more efficiency in agriculture, thereby intensifying the need for ever-more efficient and extractive farming practices. Hence, too much dependency on these technologies may establish a vicious circle that is difficult to escape.

Conclusion

There is a very clear need for a transformation of the global food chain in order to cope with the combined effects of population growth, climate change, environmental degradation and intra- and international migration. The approach currently being taken by industrialised societies is to solve these problems through more advanced technology applications in agriculture. While the contributions and progress that these technologies offer are important, the drawbacks of their current implementation are simply too serious and impactful to ignore. In this essay I have shown how, if their use is not coupled with parallel developments in sustainable energy production, sustainable use of materials and resources, as well as fundamental change in our consumption habits, these technological improvements alone at best cannot convincingly relieve the world of the issues they promise to solve, and at worst may continue to contribute to the underlying causes of them, as well as exacerbate existing inequalities locally as well as globally.

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"The Traveller Problem"? Environmental racism and state/local authority governance of Irish Travellers in Dublin

Susannah Sampson

Introduction

Irish Travellers, *Mincéirs*, are one of the most marginalised communities in Irish society. The 2016 census reported approximately 30,900 Irish Travellers are living in Ireland and this number is ever-growing. The widespread casual and acute racism inflicted against Travellers is reflected in the state's departments, particularly concerning poor and inadequate living conditions. Spatial segregation within cities is a historical phenomenon associated with complex power divisions between rich and poor and the powerful and powerless. Joyce (2015:10) illustrates that 'the physical and social separation between groups of people in a city not only supports segregation, but it also reproduces it.' This can be illustrated through Dublin's spatial segregation whereby the state's exclusion of Travellers to the peripheries of cities has caused consequent segregation from the settled community and detrimental environmental effects. A study, by Treadwell-Shine et al. (2008), found that 82.5% of halting sites or group housing schemes for Travellers have some form of environmental hazard nearby (electricity pylon, telephone mast, dumps, major roads, industrial pollution). Moreover, there is a tendency of overcrowding on sites that pose the risk of accidents and fire hazards, as was the case with at the Traveller halting site in Carrickmines, in 2015, where ten Travellers lost their lives. This project aims to shed light on how the travelling community is subject to environmental racism and the state and local governing bodies' role in perpetuating it.

Literature review

The term 'environmental racism' seeks to address the injustice surrounding the proportion of environmental harms associated with race, ethnicity and indigeneity. Racism has social, material and environmental consequences. Dr Benjamin Chavis, the former head of the United Church of Christ's Commission on Racial Justice, coined

the phrase in Warren County, North Carolina in 1982. The birth of the movement was in retaliation to the creation of a landfill site, within the predominantly black community of Aton. Here, the state disposed of 30,000 cubic yards of soil laced with PCBs (Bullard, 1993; Geiser and Waneck, 1983 and Mushak, 1993). Bullard (1993:73) argues, 'the protestors put "environmental racism" on the map.' Much of the literature on environmental racism focuses on how minority groups are exposed to lower-quality neighbourhoods and more significant environmental threats because of their race. Furthermore, environmental racism exacerbates the existing social inequalities embedded in today's society.

The study and analysis of the unjust geographical distribution of hazardous sites across American cities have confirmed that race and ethnicity play a key role in determining the probability of exposure to environmental and health risks, as well as accessibility to health care. Whilst much of the literature around the topic has been focused on the U.S., there has been less focus on the issue of environmental racism within European cities, specifically the UK: Dobson (1998:26) states there has been 'no direct equivalent' in Britain. This is not to suggest that it does not exist, but it is less widely recognised as an environmental justice movement. Pulido (2017:525) notes that the reason behind this stark gap in literature is that 'it is in the U.S. that environmental justice has most fully articulated a racial framework and relied heavily on the state.' The lack of direct literature and studies surrounding environmental racism and Irish Travellers can be evoked by the disturbing fact that Irish Travellers were only officially recognised as a distinct ethnic group within the State until March 2017.

There has been a heavy focus on exposing the state's role in creating "sacrifice zones" within urban cities, which has caused a double sword effect of pollution and poverty. Scott and Smith (2017:861) describe the impact of sacrifice zones on 'low-income and racialized communities shouldering more than their fair share of environmental harms related to pollution, contamination, toxic waste, and heavy industry.' Bullard (1993:23), the professed 'father of environmental justice', evokes that in the U.S. 'race interpenetrates class and creates special vulnerabilities for locally unwanted land

uses.' In the past, exclusionary zoning has been used by the state, subtly to foster and perpetuate discriminatory practices. The *Toxic Waste and Race* (1987) report concludes that the 'possibility that these patterns are resulted by chance is virtually impossible.' The state's justification for the positioning of these sacrifice zones tends to be economic; it is seen to be more economically beneficial to build on cheap lands where less socio-economically advantaged people and minority groups live. As Worland (2020) states, 'racist lending practices meant that land in those neighbourhoods was worth less just because minorities resided there.' This highlights a crucial issue within environmental racism and how it 'combines with public policies and industry practices to provide benefits for whites while shifting costs to people of colour' (Bullard 1993: 23). Moreover, this can be reflected in the layout of Irish towns and cities whereby, 'the fragmentation of urban spaces and separation out of larger disadvantaged areas from the working cities often isolates the better-off from the less well off in contemporary Irish society' (Mclaughlin 1998: 429).

Whilst Bullard's writings are focused around the 1990s, the same discrimination and racism continue to dictate which areas are selected today. Within these sacrifice zones, the innocent victims of the environmental impacts are children of ethnic minorities. For example, a 2017 NAACP report showed that in Detroit, '2402 black children have asthma attacks due to the natural gas pollution per year and miss 1,751 days of school as a result' (Costley, 2020). Moreover, a further threat that children living in the brownfield sites face is lead contamination through soil and water. This is harmful to children as they can experience developmental behaviour and learning problems, lower IQ, hyperactivity and slow growth if they have low levels of lead in their blood (Bullard, 1993). Traces of lead contamination in young Detroit children rose by 28% in 2016 (Costley, 2020). Bullard (1993:23) discovered that 'African-American children are two to three times more likely than their white counterparts to suffer from lead poison'.

Similarly, Irish Traveller children and teenagers suffer physical and mental health effects living in sacrifice zones on the outskirts of cities and from being socially excluded from the settled

community. Traveller sites and housing groups face significant problems, including overcrowding, lack of water and sanitation, inadequate drainage systems, no refuse collection, and consistent dampness problems. The health difficulties associated with overcrowding refer to the increasing likelihood of infectious disease amongst children, particularly gastroenteritis, skin disorders and chest infections. Moreover, the *All-Ireland Traveller Health Study (2010)* documented a child asthma rate of 70% in Traveller children. The toll on mental health from living in poor conditions and the feelings of isolation from the settled community can be evoked by the fact that suicide rate in young male Travellers being a statistically significant 6.6 times higher than in the general population (All Ireland Traveller Health Study, 2010).

The inaccessibility of decision-making regarding environmental issues faced by low-income communities is a broader concern for environmental racism. Scholars have argued that this is due to the lack of power that residents of the communities have because they are not themselves homeowners. The members of these communities are unseen, unheard and undervalued. Bullard (2001:79) notes, 'housing discrimination contributes to the physical decay of inner-city neighbourhoods and denies a substantial proportion of the African-American community a basic form of wealth accumulation and investment through home ownership.' In essence, it is difficult for minority communities to subscribe to the argument of 'not in my backyard' if they do not have a backyard. Data from the U.S. Census Bureau (2020) highlights that in the second quarter of 2019, black homeownership had hit a record low of 40.6%. Moreover, the census shows that Black Americans have the lowest homeownership rate compared to other racial groups, with White Americans having a homeownership rate of 76%. In Ireland, Traveller families are forcibly excluded from the private rented market due to high levels of prejudice and discriminatory practices, landlords and letting agencies refusing to rent to Travellers (Irish Traveller Movement, 2017). A study conducted by Watson et al. (2016) discovered that only 16% of Travellers owned their own home, compared to 72% for the non-Traveller population. Consequently, this makes it difficult for Travellers to develop any significant community-based politics to rectify their socio-economic and geographic marginalisation in Irish

society. The social capital received from owning property contributes to the breakdown of a physical barrier linked to affluence. However, racial and ethnic barriers tend to complicate this process. There has been an eagerness by the state to exploit this process and the vulnerability that lies behind it.

Methods used

In order to contextualise the state's and local governing bodies roles, in promoting Travellers to be victims of environmental racism, I chose to undergo discourse analysis. Through text analysis of the Irish government's policy documents and newspaper articles, I highlighted key themes surrounding the issues surrounding Traveller accommodation and the Carrickmines tragedy. For example, some of the key themes that emerged were the pattern in the location of halting sites, poor living conditions of halting sites and the lack of safety regulation. Moreover, it was important for my study to engage with discourse analysis as it allowed me to recognise the vital role of language in the policy arena (Jacobs, 2006). A key reason why discourse analysis was appropriate for my project is its accessibility, especially in light of COVID-19 where field research is heavily limited. In order to find relevant resources regarding traveller accommodation, I started by identifying key Traveller movement groups specifically, Pavee Point and the Irish Travellers Movement. From their websites, I found key housing policy papers and government acts that shape how Irish Travellers are environmentally racialised in Ireland. Moreover, through Jstor, I was able to find readings that contextualised the historic systemic racism that Irish Travellers have faced within Irish society.

Case study

The most prolific case that exacerbates how Irish Travellers in Dublin have suffered under environmental racism can be evoked through the Carrickmines fire tragedy. At 4. 24 am on the 10th of October 2015 a fire broke out at a Traveller halting site on Glenamuck Road, Carrickmines. Consequently, five children and five adults perished, and fourteen Travellers were left homeless. The survivors' immediate attempts to stop the blaze were limited due to the water at the closest fire hydrant being shut off by local authorities several months prior.

Moreover, this 'delayed Dublin Fire Brigade by up to five minutes as they located the next nearest hydrant, some 50m down the road' (Holland, 2016). The site was originally developed in 2008 as a 'temporary' halting site for families awaiting more permanent housing; therefore, it was not subject to any planning or accommodation guidelines. The survivors were subsequently rehoused at an isolated location adjacent to a decommissioned rubbish dump, in immediate proximity to a high voltage power station. Therefore, this evokes the extent to which the local authorities are willing to let Irish Travellers be subjected to the risks of environmental harms. This begins to beg the question as to whether the government would resettle another community close to such environmental hazards.

Analysis

From my findings, it is apparent that environmental racism is promoted through the state's Traveller housing policies and Dublin's local council's general disregard for following set government guidelines. The Irish government first decided to intervene to tackle what they called the "Traveller Problem", due to increasing urbanisation of Traveller families which caused local tensions with the settled community. The 1963 Report of the Commission on Itinerancy was the first piece of policy document on Travellers that aimed to reduce the nomadic nature of Travellers and attempt to force assimilation into settled society. The Commission aimed to "enquire into the problems arising from the presence in the country of itinerants in considerable numbers" (p.110). The report symbolised the state's first written ideological opposition to nomadism and framed Travellers as the problem. This mirrors Bullard's (1993) theory of the state shifting the costs of environmental harms onto ethnic minorities. Thereafter, the Housing (Traveller Accommodation) Act of 1998 was introduced. This requires each local authority in Ireland, following a consultation process, to prepare, adopt and implement a five-year Traveller accommodation programme (TAP) to meet the and future accommodation needs of Travellers in their respected areas.

Furthermore, TAP's are required to set out a road map for local Authority investment priorities throughout the programme and thus, are the basis for allocating funding from the Department of

Housing, Planning, Community and Local Government. An Independent review (2019) carried out by an expert group for the Department of Housing highlighted some critical issues in the formulation and implementation of TAP's: the lack of a strong evidence base, the disconnect between the TAP formulation and implementation, the lack of monitoring of TAP's and the lack of sanctions when local authorities do not meet targets. Moreover, the review found that most County Councils have consistently failed to deliver TAP's over the past 18 years to provide adequate and culturally appropriate accommodation for Travellers.

In the case of the Carrickmines halting site, severe health and safety issues were surrounding the layout and design of the site. Fire safety guideline 8.14 from the Department of Environment and local government (1998:6) states that 'the location of caravans should be such as to reduce the risk of fire spread between caravans and a building, or from a building to a caravan. Generally speaking, there should be a minimum separation distance of 6metres between caravans.' The term 'generally speaking' evokes the casualness to the government's approach towards fire safety in Travellers halting sites. The careless attitude embedded into the state's housing department papers came at a harsh cost, the cost of life, as the two units on the Carrickmines site destroyed by the blaze, were situated just a metre apart. In response to the tragedy at Carrickmines, the government issued a national fire audit of Traveller accommodation by the National Directorate of Fire and Emergency Management. The report found that 62% of traveller accommodation had unsafe electrical connections, 81% did not have working smoke alarms, 57% of units were placed too close to others, 86% did not have fire blankets and 31% had inadequate access for emergency vehicles (Holland, 2016). This evokes the extent to which Travellers are subject to unsafe and hazardous living situations.

The state's colossal cuts to Traveller accommodation budgets reflect the local authorities' failure to deliver successful TAP's. In 2008 the Traveller accommodation budget was €40 million, and by 2013 the budget was cut to a mere €4m in 2013 (South Dublin County Council, 2019). Since 2000 there has been a considerable lack of local authorities' spending as more than €69million has been returned

unspent. These figures do not suggest that local authorities have solved the housing standard for Travellers and that local authorities do not need to use the money. In reality, conditions have worsened, and environmental racism is more prevalent than ever. In 2016, a year after the Carrickmines fire, newspapers and media started to emphasise that the government had been negligent towards the victims. Russell (2016) wrote an article for the *Journal.ie* titled 'One year on: No empathy for families of five children and five adults burned to death'. Moreover, the lack of care was further highlighted by the fact that the Dun Laoghaire-Rathdown County Council failed to draw-down less than a third of funding allocated to them by the Department of Housing. The victims who were left homeless by the fire, continued to live on a temporary halting site in a public car park despite being promised to be housed on a proper site. One must emphasise the state and local councils' choice of the word 'temporary'. The concept of a halting site as temporary is misleading and erroneous, as families often end up never leaving these "temporary" sites. For example, Labre Park in Ballyfermot was built in 1967 and is the oldest purpose-built Traveller halting-site in the state (Holland, 2013). Labre Park's creation is interesting, as it highlights how environmental racism is embedded in the geography of halting sites. Cindy Joyce (2018) tweeted that the site was 'ironically named after Saint Benedict Joseph Labre, Saint for the homeless, beggars and the mentally ill.' McGrath (2016) for the *Dublin InQuirer* discovered there are five active waste sites within a kilometre of Labre Park which directly affects the Travellers resident's quality of lives. From the Ballyfermot Travellers Action Programme, Lorraine McMahon was quoted in the article saying that "In the warm weather, the stench is absolutely unbelievable," she says. "And there's flies everywhere" (McGrath 2016). The government and local councils must deliver the promise that halting sites will only be utilised for the shortest time possible to ensure the development of well-planned Traveller sites.

Similarly, as American polluting industries exploit the racial barrier, Dublin politicians use anti-Traveller sentiments as propaganda in their political campaigns. Namedly, to gain popularity and stop and block TAP's that attempt to provide environmental and culturally appropriate accommodation to the Travelling community. This can be highlighted by Josepha Madigan of Fine Gael. She distributed a local

election leaflet in 2014 stating that it would be "a dreadful waste of taxpayers' money" if the site [Mount Merrion] were used for 'Traveller accommodation' (Kelly, 2019). The settled community's opinion on traveller accommodation seems to be the most prevalent issue as to why the local authorities have not acted on their past accommodation plans. This refers to the Housing (Traveller Accommodation) Act that specifies that consultation processes must occur, before any plans are finalised. A few days after the Carrickmines fire, the Dun Laoghaire-Rathdown County Council planned to erect a temporary site to house the survivors at the end of Rockville Drive housing estate. In response, Rockville residents blockaded the street with the cars and condoned the council's choice of site location stressing that it would promote anti-social behaviour. Furthermore, they emphasised that they had not been consulted and were concerned about the lack of discussion between themselves and the council, with residents suggesting that the 'one-acre plot was too close to their homes' (Holland, 2015). This highlights how the settled community promotes environmental racism as they actively reject the integration of Travelling communities into their living spaces. Consequently, Irish Travellers are subject to environmentally harmful living conditions on the outskirts of Dublin. The theory of racial and ethnic minorities being silenced in decision-making processes because they have a backyard mirrors this situation. The settled community however exercise their rights, due to their homeownership and demanding of the Travelling community's spatial exclusion. The media sought to emphasise these inequalities with Mullally (2015) writing in *The Irish Times* that 'if south Dublin was a sovereign state, NIMBYism would be the national sport.'

Conclusion

In light of the event that took place at Carrickmines, a general discussion began about Irish society's treatment towards Irish Travellers. This raised important questions about the government's hierarchy of priorities, the provision of adequate sites and housing and the harsh reality of social inequalities between Traveller and settled communities. The project's findings suggest that the government and local authorities do play a key role in facilitating environmental racism towards Irish travellers. However, the unsuccessful implementation of

TAP's is due to local politics and historical prejudice against Travellers. Mullaly (2016) concurs that Travellers 'occupy a fenced-off place in our national psyche, immune from the progress and tolerance given to others.' The implications of the findings suggest that in order for TAP's to be successfully implemented and for environmental racism to be expelled from Irish society, there must be an emphasis on bringing together local authorities, local communities and the traveller communities. Instead of continuing social and physical segregation between the settled and Traveller communities, there must be a focus on integration through culturally and environmentally appropriate housing for Travellers. Future research would be interesting into environmental racism in Ireland by conducting interviews with Traveller organisations. Ultimately, raising the public's awareness of these issues will be beneficial to mitigate the effects of environmental racism and encourage political powers to take action against the marginalisation of Traveller communities.

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Uneven Development and the Nature-Culture Divide

Iseult Sheehy

This essay will consider uneven development through the lens of the nature-culture divide established by the Christian tradition and reaffirmed during the Enlightenment. It will trace the use of the scientific method as the primary means of constructing knowledge and illustrate how this method, through its use in neo-liberal economics has contributed to environment degradation, climate change and uneven development.

Section one will give an overview of the evolution in social values that led to the primacy of reason and the separation of nature and culture and demonstrate how modern economics, specifically the neo-liberal model of capitalism has developed to benefit society at the expense of nature. Section two will assess the ethos of sustainability as a development response to climate change and environmental degradation. It will summarise the dialogue surrounding the reintegration of nature into the development conversation through the framing of planetary boundaries in regards to production and consumption. This section will define sustainability and highlight the financialization of nature as the neo-liberal response, illustrating the struggle to fit nature back into human systems that were created without it. Section three will look forward to possible development directions by exploring Indigenous futurities that champion value frameworks such as the Seven Generation Model and the Honourable Harvest and feminist development praxis. This section will argue the incompatible nature of the perpetual growth model and sustainable development in both the human and more than human contexts.

Section One

Aboriginal Australians have a deep familial relationship with their environment which includes animal and plant life as well as minerals, bodies of water and the stars (Rose, 1996). Their civilization is the oldest continuous one on earth and is dated back at least 60,000 years (Pascoe, 2018). These Indigenous nations are embedded in their local ecosystems and have a cultural responsibility to maintain their well-

being. Fulfilling this responsibility has become impossible in most parts of Australia since colonisation in the 18th century due to the imposition of Western values regarding the separation of nature and culture on to the country's remaining Indigenous population.

The contrast in environmental values between these two cultures highlights the spectrum of human-nature relational polarity existing in the world today, however it is the anthropocentrism of Western thought that constitutes the dominant social order. Furthermore, it is this dominant order that has resulted in the climate catastrophe that we are presently experiencing.

Commodification as Development

The nature-culture divide has its foundations in Western religious tradition wherein nature was interpreted to be the dominion of man (Bauman, 2011). The scientific revolution established experimental science as the gold standard of thought leading to the Enlightenment, wherein belief in divine right was replaced by rationale and reason based in the empiricism of science (Boucher and Kelly, 2017). Despite moving away from religion, the nature-culture divide remained embedded in modern thought and was further strengthened by the scientific method of categorisation which separates and siloes all life on earth so that each thing appears to exist completely in isolation (Smith, 2012). The implications of this re-framing of the world have been significant, heralding a departure from the wisdom of stewarding our environment, to the practice of commodifying it.

The commodification of nature was exemplified during the colonial pursuits of European states. This ethos made space for policy makers to develop moral arguments for the appropriation of foreign lands, based on the belief that the traditional owners were not exploiting them to their fullest extent (Locke and Macpherson, 1980). Colonialism, in this respect is one of the first examples we can point to of uneven development, wherein one group of countries wield power over another group in order to increase their own development potential at the expense of the development of the others.

The Industrial Revolution was funded by the colonial project and would not have been feasible without the free labour of generations of slaves across the Americas, Africa and the West Indies

(Malik, 2018). It was during this time that cities as we know them today began to take shape and the great exodus from rural to urban areas began in earnest. A place for industry and society, nature was corralled in these spaces, relegated to public parks and gardens and carefully controlled to reflect the still-central ideal of man's supremacy over the environment.

At the same time the 'civilisation' of Indigenous Peoples around the world, where genocide was not entirely realised, consisted of indoctrination into the Western value system. This included in many contexts, the outlawing of paganist, eco-centric belief systems in favour of Christian power structures and practices as well as the replacement of place specific languages which reflected traditional relationships with nature, with European alternatives. The loss of Indigenous language constitutes a loss of Indigenous ways of knowing which perpetuated the cleavage of people from nature (Davis, 2009).

Capitalism in the Anthropocene

The removal of nature from society and social life has remained a distinguishing feature of the Anthropocene, the period of time including the Industrial Revolution wherein human beings have triggered geomorphic changes through the extensive use of fossil fuels and the widespread practice of land clearing for agriculture (Crutzen and Stoermer, 2000). The categorisation of this era is an important departure from that of the Holocene epoch which describes the post-glacial period of 10-12 thousand years in human history. The acceleration of environmental decline during the Anthropocene has brought us, within a very short time period to a climate and biodiversity catastrophe that threatens to make earth uninhabitable for human beings and many other species. The designation of the era then is useful because it points directly to the human activities that need to be curbed in order to avoid the worst effects of climate change: greenhouse gas emitting, deforestation, livestock farming, land-clearing etc.

Despite wide consensus on its utility, there has been debate over the appropriateness the title 'Anthropocene' which reflects further examples of uneven global development. Morrison (2015) calls out the Eurocentrism that is hidden in the concept of the

Anthropocene, noting that it is European states that have driven geomorphic change through their development strategy of colonialism, therefore extending the responsibility to all humans is somewhat of a reach. Moore (2017) takes a human systems approach pointing to the project of Capitalism and its inherent need for perpetual growth as the driving force behind geomorphic change, suggesting the 'Capitalocene' as the more appropriate term.

Morrison illustrates that the global development regime of the Anthropocene has been a European project with the nature-culture divide at its core. Moore further argues that it is Capitalism that operationalises that divide as it simultaneously increases productivity and creates 'Cheap Natures' that can be quantified and rationalised away in service of economic growth (Moore, 2017).

Capitalist global development, though sold as a charitable endeavour of rich Western countries helping poor, disease burdened countries of the global south, can be seen as a neo-colonial project in that it requires assimilation into the life ways of Capitalism, wage-labour and international trade (Chang, 2003). The global roll-out of market liberalisation through conditional aid to under-developed countries has failed on a grand scale to lift those nations out of poverty, as the development agenda insisted it would (Serra and Stiglitz, 2008). Trickle-down economics has been shown not to significantly increase to the incomes of the poor but to intensify inequality leading to social unrest, increased levels of rent-seeking, decreased levels of democracy and greater probability of revolution (Thorbeche and Charumilind, 2002).

Immoral Markets

Capitalism relies on a culture of commodification that starts with nature (Prudham, 2009) and extends outward to anything and everything that can be consumed (Sandel, 2013). The market functions through transactions that, under perfect conditions, keep money circulating through the community. However, the evolution of Capitalism through the globalisation of markets in the past 50 years has resulted in a funnelling of finite capital toward corporate shareholders and CEOs exacerbating between-country, or location-

based inequality and resulting in uneven geographic development favouring the global North (Milanovic, 2012).

Inequality is in fact a function of Capitalism in a globalised world, with the winners and losers changing over time as production moves through societies that will provide the cheapest labour. These are generally places with the weakest institutions, which in turn engender the worst working conditions. This pattern is antithetical to the democratic ideals that donor countries espouse. They hold their own highly developed institutions up as the gold standard for developing countries to achieve, while undermining institutional change through their patronage. It is an uncomfortable fact that development through commodification and consumerism requires an influx of consumables from countries whose specialisation is precisely their underdevelopment.

This system has also had a negative effect for rich countries in recent years with a significant backlash to globalism from the political right. As rich nations change specialisation away from industry and toward services, within-country or class-based inequality has increased (Horner et al., 2018). This has been most prevalent in countries such as the US, UK, Poland, Hungary and Brazil where elected leaders have run on anti-globalism, anti-immigration, protectionist and nationalist platforms. Critically there is a common rhetoric of returning to self-sufficiency combined with a rejection of those from other cultures. This fear of otherness is a highly developed personality trait in countries such as the UK. It could be argued that this is the result of the association by Britons of order with sameness that was promoted during colonial integrationism (Kaufman, 2016; Stenner, 2005).

The Problem With GDP

The accepted indicator of global development has been GDP growth since it was adopted by at the Bretton Woods conference as a measurement of welfare (Eichengreen, 2008). This however was not its intended use and it is now understood that GDP is an inadequate measure of development because it gives no indication of the distribution of income across a population (Milanovic, 2012).

GDP also does not account for the lived reality of the health consequences of 'success' in capitalism for those in rich countries. Originally known as 'diseases of affluence' these diseases have transferred from high income earners (in the 1950s and 1960s) to low income earners (1980s and 1990s) in the West and reflect changes in eating habits and stress levels. Measured in DALYs (disability adjusted life-years) and YYLs (years of life lost), top conditions in 2010 included ischaemic heart disease, lower respiratory infections, stroke, diabetes, chronic obstructive pulmonary disease, major depressive disorder, lower back pain and self-harm (Armstrong-Mensah, 2017). As highly produced Western foods replace traditional diets in low to middle income countries, these non-communicable diseases are also effecting LMICs now adding significantly to the large communicable disease burden many of these countries already face (Armstrong-Mensah, 2017). In short GDP is not a quality of life indicator and so it carries that perpetual growth should not be a development goal unto itself.

Section one has argued that the history of 'colonialism as development' and the recent trend of 'capitalism as development' have resulted in a hegemonic global culture that requires constant production and consumption to maintain itself. The results are inequality, exploitation and ill-health on a global scale as well as the separation from and commodification of nature culminating in mass extinction and climate change. The next section will focus on the effect of climate change on the global development agenda with the introduction of 'sustainable development' as a concept and its implications for the future of development.

Section 2

The Sustainability Project

The Environmental movement of the 1960s gained traction with popular releases such as Rachel Carson's Silent Spring, which documented the detrimental environmental effects of pesticides. As the Green Movement grew across the world scientists started to communicate more often with governments and the media to bring to light serious environmental threats such as the ozone hole caused by GHGs and acid rain. These became matters of public concern in the

1980s and 1990s. In 1988 the International Panel on Climate Change (IPCC) was established by the World Meteorological Organisation and the United Nations Environment Program (UNEP) to provide scientific evidence to governments on the broad consensus that anthropological activities were causing climate change (IPCC, n.d.).

The UN launched the Millennium Development Goals (MDPs) in 2000 with a dedicated goal to 'Ensure Environmental Sustainability' and target 7A specifying to 'integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources' (UNDP, n.d.). The MDPs were nicknamed the minimum development goals and widely discounted as over simplistic, however they were created with the intention of developing "a new rationale for aid in the context of post-Cold War geopolitics and neoliberal globalisation" (Fukuda-Parr, 2016, p. 1). Although the inclusion of environmental protection into the international development agenda represented this new departure, the language describing 'environmental resources' reflected the continuing approach to nature as a resource for human production and consumption, grounding it in the neo-liberal tradition.

Financializing Nature

Similarly, methods of achieving environmental sustainability have often centred on neo-liberal solutions constituting for-profit conservation such as carbon-trading and green or sustainable investment portfolios (Dempsey and Suarez, 2016). Cap and trade programmes have commodified carbon with limited success internationally as emissions are often capped at far too high a limit to have a reducing effect on GHGs (Dardati and Saygili, 2020). Cap and trade programmes have also been found to be subject to lobbying by oil and gas companies, showing how easily the winners of capitalism can undermine market-based environmental policy (Song, 2019a).

The Green Development Mechanism and UN REDD+ seek to promote sustainable energy projects and protect old growth forests in developing countries respectively, by generating carbon-offset funding to pay governments to choose renewable energy and retain their forests as carbon sinks rather than clear them for timber or agriculture. These programmes have been mired with both technical

and human rights abuses as a lack of proper oversight and regulation on both donor and receiver sides has resulted in abuses of Indigenous peoples whose traditional lands are co-opted for 'conservation' and the eventual clearing of protected forests to increase the national account (Song, 2019b).

Why is it that market mechanisms fail when it comes to the environment? Sandel (2013) posits that there are moral limits to markets. Where something becomes commodified (such as pollution or the right to hunt an endangered animal) market values crowd out non-market values. Luckily, Indigenous societies can remind Western economies of what non-market values pertaining to nature look like. The Potawatomi Nation of North America, for instance, practice the 'honourable harvest' a method of harvesting food and materials such as rice, maple sap and sweetgrass that promotes healthy ecology for the continued success of the crop and also leaves a significant portion for consumption by other animals (Kimmerer, 2013).

The cultural value of reciprocity with nature is central to the Potawtomi and there is a deep respect brought into human-nature interactions which are often marked by ceremony. This connection to the earth or 'land-ethic' instilled by traditional ecological knowledge contributes to the basic personal values, beliefs and attitudes of each member of the group, ensuring their moral obligation to act in the best interests of their environment without the need for incentivisation, financially or otherwise (Tourangeau and Rasinski, 1988).

From MDGs to SDGs

In 2015 the MDGs were updated with the Paris Agreement to the Sustainable Development Goals, centring 'sustainability' as the key value associated with the modern development agenda. The UN defines Sustainable Development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations, 2020). Environmental well-being is mainstreamed across the 17 goals with 7 goals pertaining directly to the environment and others recognising the need for environmental conservation within their targets. This recognition of environmental well-being as the underpinning for

human success is a major departure from the historically prevalent Western belief in subordinate nature.

This recognition however is in conflict with SDG Goal 8 which expressly focuses on the need for 'decent work and economic growth' (United Nations, 2020). Climate change is a problem caused by the requirement of capitalism for continuous economic growth, which has depleted the environment past its capacity to regenerate (Hickel, 2019). This can be usefully framed as an issue of planetary boundaries, supported by the first and second laws of thermodynamics that state a) that energy (or matter) cannot be created or destroyed and b) that in a closed system entropy does not decrease (Callan and Thomas, 2013).

Together these laws convey that as matter is used to produce useless waste, the useful stock of energy (or matter) in the world decreases. As matter cannot be created (nothing can be created from nothing) there is a limited planetary capacity for environmental resourcing. Resourcing is necessary to create products and services that can be consumed to spur economic growth. This implies that economic growth is at odds with environmental well-being and the long-term aspirations of the human race (Jackson and Webster, 2016).

The present moment is one of evolution in the mindset of development practitioners who on the one hand have recognised the pressing need for environmental stewardship, but on the other are tied to the mechanism of economic growth. As a result, today's uneven development is due increasingly to the issues of climate injustice that prevent those who have polluted least from thriving in their own societies, with many set to become climate refugees in years to come (IPCC, 2019).

Section Three

The Future of Development

What might the future of development look like given the current sustainable development agenda? Indigenous and feminist development praxis may help steer the conversation away from growth as a goal unto itself and consider instead better indicators of well-being in human and non-human populations. Recognition of the

responsibility of this generation for future generations in the SDGs echoes the Native American Seven Generation model of development, wherein each community planning design and policy must be reviewed by a member whose responsibility is to speak on behalf of those seven generations in the future. This process necessarily centres environmental well-being and is a practical way to ensure non-market values are championed at the policy making stage.

Nussbaum's Capability approach centres development on creating the opportunity and capacity for individual flourishing in communities through state interventions on a number of core areas that include previously unrepresented functions such as Senses, Imagination and Thought, Emotions and Other Species (Nussbaum, 2008). The conception of 'The Good Life' that these functions represent is one that recognises relationships with the more-than-human world and an evolution from economic man.

Federici (2004) points to the fact that women are the world's primary agricultural producers and defenders of non-capitalist uses of nature such as subsistence farming and communal access to land, forests and waterways. She points out that women's struggle to remain in connection to the land is present from the forest of South America to the pastures of Africa and even the city allotments of New York. Neo-liberal economics consider subsistence work as unproductive because it is not income generating and so does not contribute to growth, however if development evolves beyond growth, space could open up for a sharing economy to work alongside the wage economy. The encouragement of subsistence agriculture in cities may even serve to generate a new land-ethic in the 'second peoples' (those who are not indigenous to place) who populate them, instating the non-market values that will shape policy away from commodification of land, nature and the environment toward a relationship of reciprocity and protection.

In moving in this direction we are creating the conditions for the creation of eco-cultural identities where our relationship to the non-human world intersects with race, gender, class and ethnicity to form our identities as individuals and groups (Milstein and Castro-Sotomayor, 2020). In doing so we may aspire to close the gap between Indigenous futurities and futurities of the hegemonic West in an

emergent geography that shifts the development paradigm away from perpetual growth in recognition of the inseparability of nature and culture (Bergmann, 2017; Goldman and Schurman, 2003; Harjo, 2019).

Conclusion

Uneven development is a product of the Capitalist regime that requires losers in order to have winners. The ecological wisdom of Indigenous Nations and the feminist land ethic can inform the hegemonic Western development paradigm at this historic turning point as we are called to reassess our economic practices or face the worst effects of climate change. By embracing the concept of sustainability and letting go of the fallacy of perpetual growth, we have the opportunity to imagine futures that are more connected and equitable.

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Regional Rivalries and Alternative Narratives: Finding the True Cause of the Yemeni War

Alex Tone

In November 2018, Save the Children reported a "conservative estimate" that 85,000 children under 5 in Yemen may have died of hunger and disease since the beginning of the Yemeni War in 2015 (Magdy, 2018). Since 2015, more than 12,400 civilians have been killed in conflict (Slemrod, 2020). To find a solution to this "humanitarian nightmare" (Orkaby, 2017), it is crucial to understand the underlying causes of the war, and to establish the central actors, their reasons for engaging in conflict, and their conditions for ceasing violence. In this essay, I will explain and compare the two main geographic narratives of the Yemeni War – the geopolitical and the internal narratives – and apply them towards its resolution. Such discussion is highly relevant to political geographers as they untangle increasingly complex scales of analysis in a globalized world.

The Geopolitical Narrative: Yemen as a Proxy War

The first story begins in 2001, when the American Bush administration launched the War on Terror as a response to the September 11th attacks. After deposing the Taliban government of Afghanistan for harbouring al-Qaeda terrorists, the United States invaded Iraq in 2003, accusing the regime led by Saddam Hussein of possessing weapons of mass destruction. Over the next decade, the Middle East's security grew increasingly unstable with the Arab Spring uprisings in 2011, and subsequent internal conflicts in Lebanon, Iraq, Syria, Yemen, and other countries. Saudi Arabia, fearing competition from Iran for regional influence, began to support opposition groups and insurgencies within Iraq and Syria by framing its rivalry along sectarian Sunni/Shi'a lines (Hazbun, 2018). In a "regional counter-revolution", Saudi Arabia sought to unilaterally shape the Middle East in its interests in a style reminiscent of Bush's War on Terror that began the story (Hazbun, 2018, p. 34).

In this narrative, Yemen's conflict springs from a battle for influence in which "Iran and Saudi Arabia have their fingerprints on

every battleground in the Middle East" (Jayamaha et al, 2019, p. 1). After a 2011 uprising of students and northern tribesmen in Yemen dissolved the government of Ali Abdullah Saleh – who they accused of corruption and human rights abuses – Houthi-led forces captured the Yemeni capital of Sana'a. In response, Saudi Arabia formed a coalition of countries from the Gulf Cooperation Council in 2015 to militarily reinstate the exiled Yemeni government.

Saudi Arabia claimed that the Houthis, who follow a sect of Shi'a Islam called Zaidiyyah, were financed and armed by Iran, who Saudi Arabia accused of trying to capture the weak Yemeni state (Orkaby, 2017). It pointed to the anti-Western slogan of the Houthi movement – "Allah is Greater, Death to America, Death to Israel, Curse on the Jews, Victory to Islam"– as evidence of the Houthis being Iranian proxies, as the slogan was adopted from one used in the 1979 Iranian Revolution (Orkaby, 2017, p. 99). In doing so, the Saudi-led coalition was able to win the military and diplomatic support of countries such as the US and the UK, who sought to curb Iranian expansion and coordinate counterterrorism operations (Hazbun, 2018). Thus, what began as disputes between northern tribes and the Yemeni government has ballooned into a global theatre of war, ensnaring Western and regional governments into an intractable conflict of warring sectarian interests.

In this geopolitical narrative, the source of Yemen's conflict lies in the destabilizing competition for security among regional powers, which is "rooted in the repeated US efforts to re-make the region to its advantage through the use of coercive force" (Hazbun, 2018, p. 32). This reshaping transformed a power-balancing security architecture into a fragmented, multipolar system where no one is in charge. According to structural realists such as Waltz (2000), a system with multiple players vying for dominance is doomed to violence, as no single power can ensure stability, nor can two powers balance each other's expansionary ambitions.

Inside Yemen, opposition forces are too fragmented to form a coherent bloc at international diplomatic talks, which – drawing from Kinninmon's geopolitical analysis of the conflict in Syria – can only be solved through "secur[ing] an agreement among the external players [i.e. Iran, the United States, and the Saudi-led coalition] to

work to end the conflict" (2014, p. 49). The geopolitical narrative attributes the seeming intractability of the war to its proxy status. Third parties are "able by and large to pull the strings of these wars in ways which may constrain a domestic bargain" (de Soysa, 2017, p. 18), making it impossible for local actors to enter peace talks on the ground.

In this story, the Yemen conflict is caused by Iran and Saudi Arabia attempting to contain the other's influence in a bid for regional dominance. The only way it can be solved is either for one country to win regional dominance and create stability, or for both to become democracies and no longer consider each other adversaries (Jayamaha, 2019).

The Internal Narrative: Political Division and Saudi Influence

The second story, however, has different answers as to what caused the war, who is responsible for it, why it has lasted so long, and how it might be solved. According to Orkaby, "this war is not about regional interests; it is a continuation of a long-standing conflict between the Yemeni government and marginalized northern tribes" (2017, p. 93). The internal narrative of the Yemeni War starkly contrasts the geopolitical one by tracing its cause to a political division between the north and the south, and historically contextualizing the interests of belligerent groups.

The second story starts in 1962. By this point, Yemen's north and south were distinct entities, with the north under the imam monarchy of the Kingdom of Yemen and the south under British colonial rule as the Aden Colony. In 1962, nationalist republicans removed the monarch Imam Muhammad al-Badr in a *coup d'état* to establish the Yemen Arab Republic (YAR), or North Yemen. The Imam fled to Saudi Arabia and mobilized northern Zaydi Shi'a tribes to reclaim power, resulting in an eight-year civil war with the republicans emerging victorious. The new secular government, basing their legitimacy on their revolutionary roles, cut off support to the northern tribes for supporting the deposed imam, and "their region stagnated and their problems festered" (Orkaby, 2017, p. 94).

After multiple civil wars in 1972 and 1979, YAR and the People's Democratic Republic of Yemen – which had been

established in 1967 by Marxist Yemeni revolutionaries – unified in 1990. Oil had been discovered near the shared border, and the two countries saw it in their economic interests to unite. Discrimination against the northern tribes continued, and the northern tribes – led by the prominent Houthi *sayyid* family – mobilized in protest. In 2004, one of the Houthi leaders, Hussein Badreddin al-Houthi, was killed by the Yemeni military, which "marked the beginning of the northern tribes' armed insurgency and gave the rebels their name" (Orkaby, 2017, p. 94).

While clashing with the northern insurgency, the Yemeni government faced a crisis: as its revolutionary generation began to pass, the government could no longer claim legitimacy to rule. Amid this instability, as the government attempted to redefine national identity and find a new source of authority, the Houthis – who already served as an organized opposition – stepped forward to assume power in the weak republic.

The Houthis supported Yemen's Arab Spring demonstrations against the corrupt regime of Ali Abdullah Saleh, and forced him to step down at the end of 2011 (Sharp, 2019). After rejecting a new power sharing deal that would disadvantage them, the Houthi movement led anti-government demonstrations. They eventually captured the southern capital of Sana'a in 2014, forcing then-president Abdrabbuh Mansur Hadi to resign and flee to Riyadh in February 2015. Days later, a Saudi-led coalition of Arab states began a military campaign of airstrikes and blockades, plunging the country into its current conflict (Orkaby, 2017, p. 93).

Saudi Arabia entered the conflict not as a hopeful hegemon, but as a nervous neighbor. To understand the Kingdom's motivation for entering the war, it is necessary to explain its historical relationship with Yemen.

Since its creation, Saudi Arabia has sought to secure its southern border at the cost of Yemeni sovereignty and political stability. The Kingdom's first military engagement was against Yemen in the War of 1934, in which Saudi Arabia annexed three Yemeni provinces (El Azhary, 1984, p. 278). Border security remained unstable with intermittent skirmishes over the annexed

regions between Saudi forces and North Yemeni nationalists. This insecurity pervaded Saudi-YAR relations, notes El Azhary, as new YAR leaders went to Riyadh "to allay Saudi fears… [and] reassure the Saudis that the YAR will continue to respect [its territory]" (1984, p. 278). The situation was so delicate that, according to a Yemeni politician at the time, "previous governments have not been able to resolve it without provoking a revolt" (El Azhary, 1984, p. 278).

Saudi anxieties were further exacerbated as southern Marxist revolutionaries promised support to socialist revolutions in the Arabian Peninsula. To depose the southern Marxists, Saudi Arabia financed and armed exiled South Yemenis to launch guerilla attacks on the shared Yemen border, escalating tensions until they erupted into an interstate war in 1972. The Saudi plan profoundly backfired as the two Yemens quickly ceased hostilities and laid the foundations for unification in 1990. The Kingdom responded by deporting nearly 800,000 Yemenis in 1994, cutting off remittances that kept North Yemen's economy afloat, and sending the two countries yet again into civil war (Foad, 2009).

Since the beginning of both countries, "Saudi foreign policy toward Yemen has been driven by the need to maintain a weak central government in Sana'a that does not threaten Saudi security" (Orkaby, 2017, p. 96). When a Yemeni movement rises to assert popular control, the Kingdom uses military action and indirect financial support to pro-Saudi groups within Yemen to reassert its influence. As Orkaby observes, the Houthi capture of Sana'a in 2014 risked establishing an unfriendly government, so "Riyadh was only too happy to oblige" Hadi's request for help and launched a military intervention (2017, p. 97). By framing its engagement in terms of regional power dynamics, Saudi forces justify direct attacks on Yemenis as "containing" Iranian proxies. The majority of the 12,400 civilian deaths in the conflict are attributed to Saudi airstrikes (Human Rights Watch, 2018).

Analysis and Conclusions

As the internal narrative shows, there is more to the Yemeni War than great powers shuffling their pawns across the global board. Starting the war's timeline at the outbreak of the current conflict in 2015 – as

reports for members and committees of the U.S. Congress do (Sharp, 2019) – obfuscates important historical and political relationships. A comparison between the geopolitical and internal narratives of the Yemeni War sheds insight into the true causes and actors behind the conflict, and the necessary conditions for peaceful resolution.

The political division between the north and south is the central dispute of the conflict, not a bid for dominance by Iran and Saudi Arabia. This unresolved political dispute has been exacerbated by Saudi Arabia – who has feared an unstable border with Yemen since its establishment – undermining popular anti-Saudi movements and supporting pro-Saudi governments and militias. Any table for reconciliation must have a seat for the Houthis, the Yemeni government, and Saudi Arabia – not an "agreement between external actors" (Kinninmon, 2014, p. 49). While there are other actors on the Yemeni stage – such as al Qaeda affiliates, the Southern Transitional Council, and Emirati military – their roles in the cause and resolution of the conflict are not significant enough to merit discussion in this analysis.

It is incomplete to classify Yemen as a proxy war, as the geopolitical narrative does. According to de Soysa, a proxy war is "a war fought at the behest of a third party" (2017, p. 17). Only the Yemeni government fulfils this condition, and even then, it has dissimilar goals from Saudi Arabia in its secular vision of governance.

The Houthi uprising and militant fragments are not Iranian proxies, either: the sparse financial and military support they receive from Iran is far from constituting an alliance (Orkaby, 2017), and the Houthis assumed power without any kind of relationship with Iran. Whatever Houthi-Iran relationship exists is likely due to the commonly observed reality of insurgencies, which is that "it is hard to imagine rebel advantages in battle against the organized forces of governments without external support" (de Soysa, 2017, p. 18). Based on a history in which Saudi Arabia has used Yemeni sovereignty and welfare to secure itself, and in which the Yemeni government has often put Saudi interests before its citizens, it is doubtful that the Houthi's anti-Saudi sentiment is solely derived from Iran.

This is not to say that the Houthis are righteous revolutionaries. While the 2015 Saudi blockade has cut off aid and food to Yemeni civilians, Houthi rebels have further exacerbated the humanitarian crisis by threatening aid workers and refusing to comply with fraud checks (Slemrod, 2020). The Houthis frequently commit violence against civilians, using indiscriminate weapons such as IEDs and car bombs, and sending mortars over the Saudi border (Orkaby, 2017).

However, the Houthis enjoy an amount of popular support within Yemen, and the refusal of the international community (except a few neutral humanitarian organizations) to grant them the same legitimacy as the exiled government impedes resolution by discouraging the Houthis from entering peace talks. Orkaby suggests that this can be addressed using tactics from the 1962 Civil War, in which the United Nations opened a direct line with Houthi leaders to legitimize their diplomatic position, and the Red Cross facilitated prisoner exchanges to enforce the Geneva Convention (2017, p. 98).

If the border is the central motivation behind Saudi Arabia's intervention, then any resolution must recognize its importance to the Kingdom and ensure measures to protect it. The Saudi-led coalition would have no reason to continue its blockade and airstrikes if the UN sent peacekeepers to the Saudi border, "alleviating one of the main drivers of the conflict" (Orkaby, 2017, p. 99). The United States, while not playing as large a role in the Yemeni War as Hazbun (2018) claims, may still have power to pressure Saudi Arabia to cease hostilities. Having sold arms to Saudi Arabia since 1932 and the Yemeni governments since 1976, the US shares responsibility for the diffusion of weapons through the region (El Azhary, 1984, p. 281). By threatening to withdraw military support, the US can – if it chooses to – exercise its leverage to make the coalition withdraw and accept a resolution.

If anything is to be gathered from comparing these narratives, it is that the causes of the Yemeni War are far from simple. A peaceful resolution must address the core disputes behind the conflict – the north/south divide and the Saudi border – and legitimize the actors involved in them in the peace process. At the same time, however, it must recognize that the intensified relationships between countries

and peoples from globalization adds important dimensions to conflict and involves more than just those on the ground. The international community has a responsibility to build an inclusive table for peace talks, hold all sides accountable for crimes against humanity, and assist in helping rebuild a country destroyed by violence. While explaining the Yemeni War with geopolitics alone is too reductive, focusing solely within Yemen's borders obscures regional and international dynamics linked to its cause and solution.

Political geographers can take two important lessons from Yemen. The first is that, in a globalized world, no story can be explained on a single scale, and different levels of analysis must explain different parts of it. As de Soysa observes, endogenous factors alone cannot explain civil wars as "conflicts may cluster in space, spill over borders… and be supported and sustained by transnational sources of finance" (2017, p. 16). To understand conflicts like Yemen in the context of globalization, it is necessary to understand both forces that *push* the support and agendas of external players for purposes beyond the territory in question, and forces that *pull* as internal actors vie for advantage in appealing for external support.

Secondly, building a complete narrative is vitally important for resolving conflict, as incorrect understandings may result in incorrect solutions. Thus far, the international community's response has been based upon the incorrect understanding of Yemen as a war of regional influence, and mistakenly focused on Iran and the Saudi-led coalition as the main actors. As a result, the conflict continues with no concrete steps towards resolution.

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Understanding Environmental Change

Eimear Prendergast

"Scientists continue to disagree about the degree and extent of global warming and its connection to the actions of mankind. That debate should be encouraged —in classrooms, public forums, and the halls of Congress. It should not be silenced with threats of prosecution. Dissent is not a crime."

Abstract

In this essay the quote from Pruitt and Strange's article " The climate change gang" will be analysed. There is much climate change denialism in public discourse, especially among conservatives such as the authors of this quote. Scientists studying the climate overwhelmingly agree with each other about human influence in global warming. However confusion arises when in the media a " false balance" is portrayed. Meaning that the evidence for climate change denial is given more weight than it should. This allows for deniers to call out that arguments against global warming are as equally valid as pro-climate change ones. This quote by Pruitt and Strange is untrue and misrepresents the nature of scientific debate. The threat of prosecution is also misrepresented. Companies who sow doubt in order to profit from it are the ones at risk, not the general public.

Context

This quote comes from a piece written in the national review by Scott Pruitt and Luther Strange called "*The climate change gang"* in 2016. At this time, the Obama administration was trying to implement a policy called the clean power plan, to combat anthropogenic climate change. It mandated that the American EPA step in if states did not submit a plan for how they would achieve cleaner energy. Pruitt and Strange saw this as a "*tactic of advancing the climate-change agenda by any means necessary".* They also stress that climate change activists are persecuting sceptics, and that the debates on climate

change have two valid viewpoints. They said they wanted to hold the EPA and the American government accountable for these injustices.

The authors Pruitt and Strange were lawyers at the time this was written and the attorney generals of Oklahoma and Alabama respectively. The republican party to which they belong was not always anti-science and anti-climate change. Dunlap and McArtight (2008), discusses the widening gap between democrats and republicans with respect to their views on climate change. In the 80's this trend started with republican president Reagan's relaxation of environmental regulations, continuing with increased mobilization into the 90's. The anti-climate change views held by republican leaders today are informed by these conservative movements of the 80's and 90's. However the divide between the parties has only started to widen dramatically in more recent times, in line with the polarization of American politics. Perhaps this is why we have seen more anti climate science rhetoric such as this article in the past few years. Especially as new policies aimed at combating climate change such as the Obama administration's clean power plan and the green new deal have become more frequent. It is therefore not such a surprise to see two republican attorney generals take the sceptical stance we see in the article.

This stance of republican denialism was highlighted as one of the authors of this article was appointed head of the EPA by Donald Trump in 2017, leaving in disgrace in 2018 after allegations of corruption. This made Scott Pruitt, a lawyer from Oklahoma responsible for protecting Americas environment. Dillon et al. (2018) describe the types of changes that Pruitt made to the EPA, which are in line with the republican attitude towards climate change and the environment. They say that movements were made to limit the EPA's capacity to regulate polluting industries and protect environmental health. These types of changes are in line with his vison for the EPA described in "*The climate change gang"*.

At the end of this quote Pruitt and Strange tell us that "*Dissent is not a crime"*. This relates to the idea that those who deny climate change will be criminally prosecuted. They mention in their article that fossil fuel companies may face prosecution for denying man made climate change, portraying this as a miscarriage of justice which is

backed by "green energy interests" and environmental lobbying groups. The idea of prosecution has been circulated online, with many calling for climate denialists to be brought to justice for delaying progress on combating climate change. Many see climate sceptics as causing a danger to the planet's future, and that people need to face repercussions for the harm that they are doing.

Merits

The statement made by Pruitt and Strange "*That debate should be encouraged —in classrooms, public forums, and the halls of Congress"* seems benign at first. Everyone can agree that it is good to talk about important issues, and that people should be free to debate. However this statement proposes the idea that climate change is even up for debate in the first place, when the evidence fully supports anthropogenic global warming. Telling people "*Scientists continue to disagree about the degree and extent of global warming and its connection to the actions of mankind* " is also not fully true. While there may be discussions on the extent of climate change it is accepted in the scientific community that human actions are directly causing global warming.

If we look at the evidence from carbon isotopes it becomes clear that carbon in the atmosphere today has a human origin. When an organism is alive it takes in the isotope carbon 14, when it dies this process stops. As carbon 14 is radioactive, the amount of it will decay over time. When these fossil fuels are taken out of the ground, it has been a long time since the organisms they are made from died. They are therefore depleted in Carbon 14. Burning them produces carbon depleted in carbon 14, and this causes the ratio of Carbon 14 to Carbon 12 in the atmosphere to be diluted. This is known as the Suess effect after one of the people to discover it (Keeling, 1978).

This proves that humans are the ones releasing carbon into the atmosphere by burning fossil fuels. Not only is human involvement known, but so is the mechanism by which the planet is warming which is the greenhouse effect. The suns radiation passes through the atmosphere in order to heat the earth. The earth then re-radiates this energy out as heat. As this is a different wavelength than the incoming radiation some of it does not pass back out through the atmosphere.

This is due to the presence of greenhouse gases such as CO_2 and water vapour. An increase in the concentration of these gasses in our atmosphere traps and builds up heat in the earth system, therefore heating the planet (Gray, 2015). So with this information we know the mechanism of climate change and can directly link global warming to human activity.

In recent years public and scientific discourse have grown further apart, which we can see with Pruitt and Strange's attempt to push debate and further discourse. They push the idea that both sides are equal, and that the scientists are at fault for refusing to debate the issue. The reason for this kind of thinking comes from the portrayal of debates in the media. The average joe is of course not an expert on climate science, they rely on the media and expert opinion to communicate the evidence to them so they can form an opinion. The general public then goes on to elect officials who will in turn make climate change policy.

However, this method of educating the public has a major flaw. In order to create a sense of balance when reporting or hosting a debate media often shows the two points of view, both pro and anti-climate change. This however is a "false balance" and does not accurately portray the true nature of the scientific debate. Koehler (2016,p.1) describes "*the journalistic standard of balance is now so ingrained in reportage that it is reflexively applied even to issues for which the weight of evidence overwhelmingly supports one "side".* Even as the scientific evidence and consensus is on the side of climate change, opponents are brought into debates to create the semblance of a balanced discussion. This creates the view in the minds of the general public and non-scientists that the weight of the evidence on both sides is equal, that as Pruitt and Strange say "*scientists continue to disagree".*

This is untrue, Cook et al. (2013) found that around 97% of papers about anthropogenic global warming supported the consensus that humans are causing a warming of the earth. They also found that the number of papers disagreeing with this is very small. So we have a situation where scientists broadly agree with each other, but in media this is obstructed by the "false balance" which pushes forward anti-

science narratives. This confuses the general public and hampers progress on combating climate change.

While it can be said that scientists don't fully agree on the future extent of climate change, Pruitt and Strange misrepresent the nature of the debate. Modelling the future climate is difficult, researchers are constantly creating new models to try and predict this. Sometimes a better model comes along and replaces an old one. Sometimes a model does not have 100% accuracy and needs to be changed or altered. This does not mean that scientists are wrong or trying to trick the general public. It certainly does not mean that some scientists think global warming is nothing to worry about.

In 2017 this issue was highlighted when many conservative news sites such as the Sun reported that the planet had not warmed as much as predicted. The paper inspiring this was Millar et al. (2017). Which describes how with strengthened emission pledges and fast mitigation warming can be limited to 1.5 degrees, this was previously thought not to be possible. It was said that therefore scientists had backtracked and admitted they were wrong about the whole thing. When Pruitt and Strange say that scientists disagree on the extent of climate change they frame it incorrectly. Conservative denialists often imply that scientists not agreeing is proof that the evidence behind climate change does not have a solid foundation. However this just shows a lack of understanding about the nature of scientific debate and progress.

The threat of prosecution made in the statement is also interesting. In the article Pruitt and Strange describe how a group of attorney generals plan to criminally investigate companies who dispute climate change. The idea that people are persecuted for being anti climate change is popular with deniers. However I doubt that these attorney generals are going after those who simply have an opinion , to "*silence critics of its climate-change agenda*". It is unlikely that this will happen. With increasing coverage of the harmful effects of fossil fuel emissions on our planet it makes sense that some would rather use renewable energy. For fossil fuel companies to ignore the evidence and try to convince consumers there is nothing to worry about and to buy more oil and gas is misleading. Companies like this stand to gain profit by spreading dubious claims about climate change. This is the

problem and possible crime, not a simply disbelieving in global warming. It should also be said that no one since this article was written has been prosecuted for disagreeing with scientists over climate change.

In conclusion the statement by Pruitt and Strange is not valid. Scientists know how global warming comes about and have proof of humanities involvement. They do not disagree with each other on this topic. Telling the public that scientists disagree is untrue and sows doubt and confusion. The idea that disbelievers are going to be prosecuted is also false. Prosecution would only fall to those who deny climate science for financial gain, such as oil and gas companies . The statement by Pruitt and Strange has therefore been found to be false on many levels.

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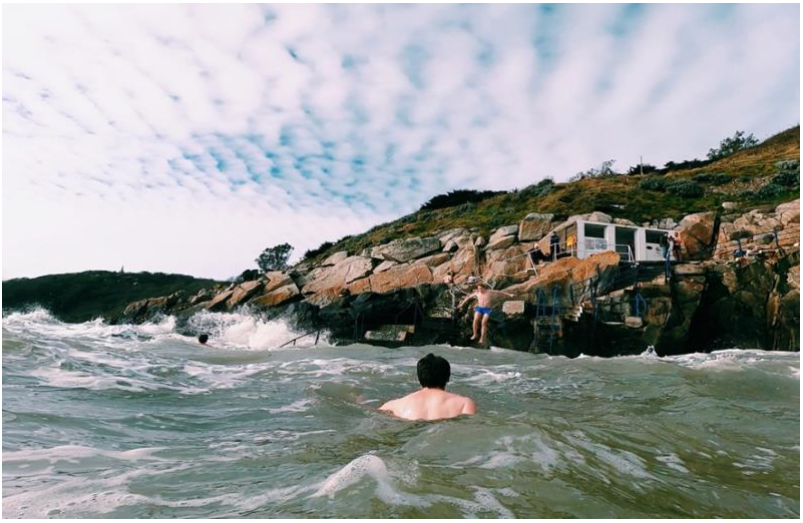
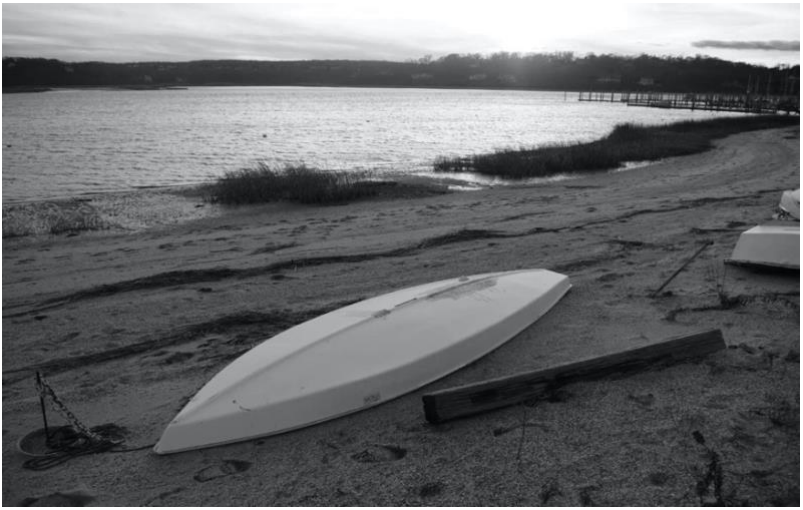
Through a Lockdown Lens: snapshots of life in a pandemic



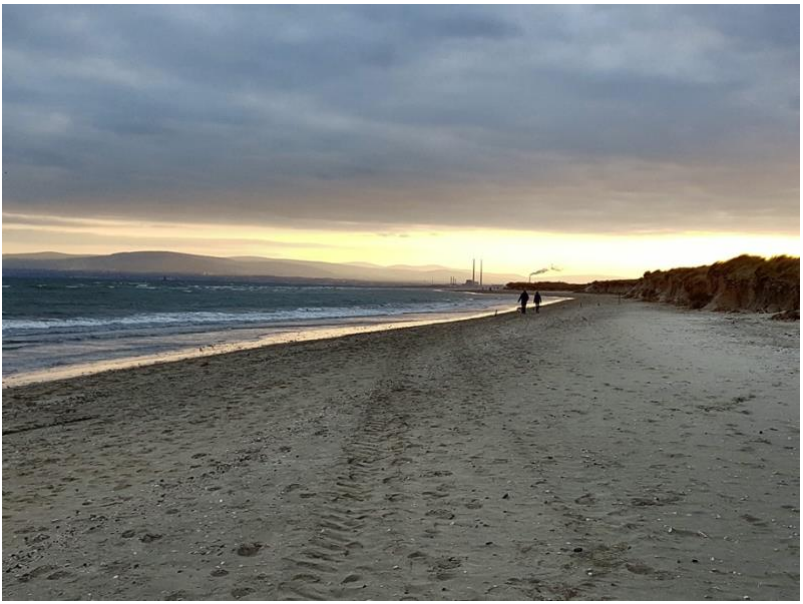
Down at the Vico in Dalkey, Dublin - *Adam O'Ceallaigh*



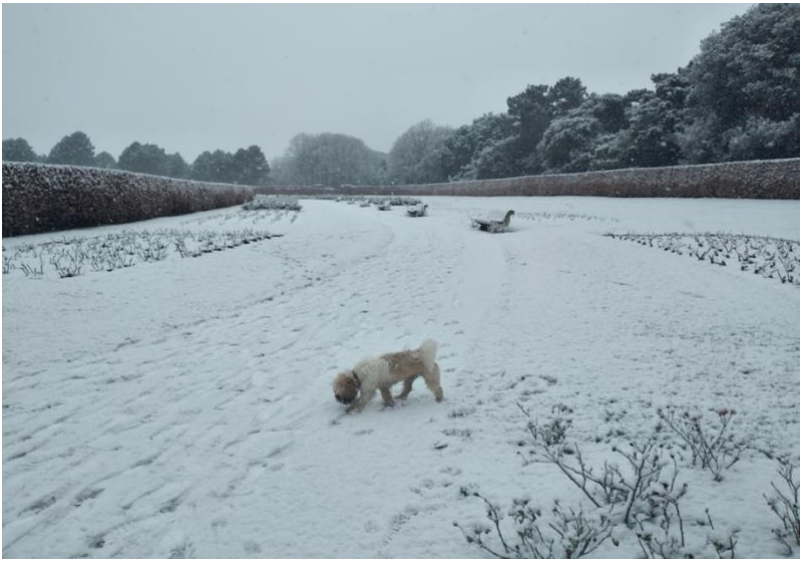
Ceadar Beach, New York - *Emily Peña*

A lockdown walk at Poolbeg in Dublin - *Yasha Pilarsky*

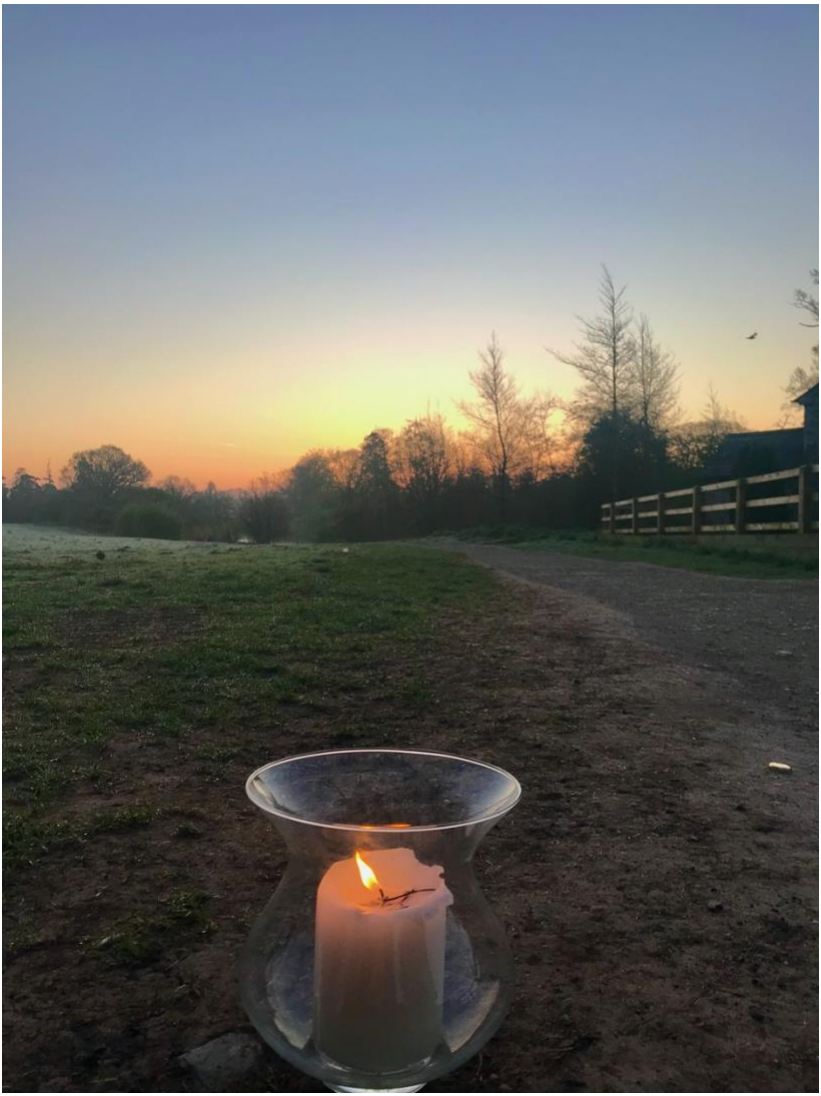
Leafless branches brought to life by vibrant colours of the pond - *Emily Peña*



Sunset in spring at Bull Island - *Adam Mann*



Sheba's first time experiencing snow - *Eoin Kennedy McPartlan*



Dawn at Easter - *Emily Cantwell-Kelly*


GEOG
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