Green nudges: Applying behavioural economics to the fight against climate change

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The climate emergency requires prompt, wide-scale, all-encompassing action. Here, we discuss how insights from behavioural economics and decision-making have been applied to the fight against climate change in the form of 'green nudges', or behavioural interventions prompting individuals to make more environmentally friendly choices. We further consider how the potential positive impact of green nudges can be maximised and sketch out future steps in the field of green nudging based on a framework which considers the characteristics of targeted behaviours, such as scale of impact, susceptibility to intervention, and heterogeneity across the population.

2019 was a year of staggering climate change disasters: with Typhoon Hagibis striking Japan and becoming the costliest Pacific windstorm with an estimate of over $15 billion in damages[1], with France recording a boiling 45.9°C temperature[2], its highest to date and Australia's wildfires wrecking a havoc of more than $100 billion in economic destruction[3]. Beyond the financial measures, the WHO estimates that air pollution already kills around seven million people annually across the globe and some scientists predict that, with continued growth of emissions, by 2100 about 74 per cent of people around the world could be exposed to heatwaves extreme enough to kill (Mora et al., 2017). Scientific consensus has widely indicated that human activities have led to noticeable climate warming trends (Cook et al., 2016). The effects of climate change are now notable across the globe as drought, deforestation, increasingly acidic oceans, melting ice, climate-caused animal and human migration, and extreme weather events, like hurricanes and megafires, increase in both frequency and severity[4]. The reality that climate change and its effects are now an ubiquitous fact of modern life is no longer surprising. What remains startling is the disbelief of many people in the existence of climate change and, crucially, the lack of action to address a true planetary emergency (Gifford, 2011). To address these issues wide scale, all-encompassing action should be taken on national and international levels, involving significant cultural, governmental, and economic changes. Here, we outline a framework to promote positive action on the smallest level: the single person.

Driving behavioural change
To address the modern climate crisis, there is a need for radical behavioural change across many levels and domains of human life. Ideally, in the long-term this change will be largely carried out as a bottom-up process driven by citizens who vote for policies that support ecological preservation. However,

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[1] Centre for Research on the Epidemiology of Disasters (2020). EM-DAT The international disaster database. Retrieved from www.emdat.be/database

[2] MétéoGroup (2020). Météo-France. Retrieved from http://meteofrance.com/actualite

[3] CNN (2020). Tens of thousands protest Australian PM's climate policies amid bushfire crisis. Retrieved from https://edition.cnn.com/2020/01/10/australia/australia-fires-climate-protest-morrison-intl-hnk/index.html.

[4] The U.S. Global Change Research Program (2018). *Fourth national climate assessment, vol.II: Impacts, risks and adaptation in the United States.* Retrieved from https://nca2018.globalchange.gov/.

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in the short-term positive change can be achieved in a top-down manner, such that policies are implemented to prompt individuals to take actions and choices which are better for the environment (Wagner & Zeckhauser, 2012). Here we focus on one such top-down regulatory strategy which has risen in popularity over recent years – nudging. While conventional policies targeting behavioural change focus on information – and incentive-based interventions (e.g. providing information or employing taxes), nudging drives behavioural change through changes in the choice environment (Schubert, 2017).

Humans are often biased by the context in which they make their decisions, falling into predictable suboptimal patterns of context-dependent behaviour (Thaler & Sunstein, 2009). These patterns have been chartered by psychologists and economists and serve as a helpful road map to the characteristics of context which would nudge people towards better decisions. Designing a more appropriate context, or tweaking the choice architecture, works by leveraging the shortcuts most humans typically take when making decisions. Following the rational course of action is expensive, both in terms of computational resources and time necessary to find and process all of the information relevant to a given problem. Instead, humans tend to use satisficing heuristics which simplify the decision-making problem, but sometimes, in particular contexts, lead them off the course of optimal choice. Thus, human rationality is bounded by external (e.g. information available, time constraints) and internal (e.g. cognitive factors) limits. Changes in the choice architecture can counteract the consequences of bounded rationality. In fact, this strategy has been established as more impactful in terms of optimising human behaviour relative to traditional public policy approaches across multiple domains where individuals systematically fail to act in line with their interests or declared preferences, such as increasing retirement savings, college enrolment,

influenza vaccinations and energy conservation (Benartzi et al., 2017).

In the domain of ecological action, human rationality is particularly disadvantaged. As a phenomenon, climate change is veiled in complexity and uncertainty: it is global but has distinct and varied local expressions. Its effects have already been immediate and significantly pronounced for some populations, yet for others those effects are temporally and geographically distant. These signature characteristics make climate change a particularly difficult domain for human decision-making. In fact, the literature has mapped various psychological mechanisms and biases which thwart cognition on climate change and prevent humans from taking effective ecological actions (Shu & Bazerman, 2010; Gifford, 2011). Optimising the choice architecture constitutes a promising way to overcome some of these obstacles on the path to ecological action by nudging people towards greener choices.

Green nudges
Most interventions in the field of green nudging aim to encourage ecological behaviour by making green actions more salient, appealing and/or easy. While various different approaches have been devised to accomplish this, these may be roughly categorised in four streams: Green defaults, green social incentives, green feedback and removing barriers to green action.

A significant body of work has focused on harnessing the power of green defaults, leveraging the finding that choice is systematically swayed towards the status-quo option. Successful illustrations of this principle can be found across different domains, such as a university printing system which sets the default printing option as double-sided, or energy providers automatically enrolling clients to green energy sources (Schubert, 2017). Setting a target option as a default has proven a very effective tool to attract choice towards it and green defaults rank among the top suggested nudge interventions across the literature (Shu & Bazerman, 2010).

A parallel stream of work in green nudging has been devoted to social incentives for green actions. This approach relies on the assumption that people are influenced by social norms and comparisons. To illustrate, sending consumers leaflets promising public recognition (via publication on their city website) for reductions in water use (Brick et al., 2018) or monthly reports comparing their energy use to their neighbors' average use (Allcott & Rogers, 2014), both proved as highly effective in reducing water and energy use respectively. Social incentives may be invoked in a variety of different ways, such as descriptions of others' behaviour or normative attitudes, recognition (or social status), to name a few.

The third stream of green nudges homes in on making the environmental costs more salient to the consumers. Saliency can be optimised, for instance, by vivid eco-labeling (e.g. carbon footprint prominently displayed on packaging of goods), by smart technologies (e.g. smart electricity meters), or by creative feedback solutions (e.g. a picture of green continent on a paper towel dispenser, dimming with each towel used, Sörqvist & Langeborg, 2019). Some researchers have warned, however, that stricter regulation is necessary for eco-labeling by businesses (Sörqvist & Langeborg, 2019), to prevent misleading consumers into believing that a certain product is more environmentally friendly than it is in reality. Ultimately, green nudge design should aim to minimise actions which are harmful for the environment (e.g. purchases of consumer goods), which is perhaps incompatible with businesses' profit-maximisation incentives.

The final cluster of green nudges pertains to removing the barriers to green action. These nudges constitute making an action easier or more straight-forward, such as providing bigger recycling bins to induce an increase in recycling (Cosic et al., 2018) or mailing people compostable bags to prompt food composting (Linder et al., 2018). While this approach has proven effective, it has received relatively less attention from the literature, perhaps due to the higher costs associated with some interventions (e.g. purchasing recycling bins).

Framework for the future of green nudging

We propose a framework of green nudging that considers (1) which human behaviours carry the most significant impact on climate change, (2) which behaviours are the easiest or most susceptible to change, and (3) how individual-level characteristics can influence outcomes.

Firstly, prioritising impactful behaviours will allow us to produce the highest possible effect in the shortest amount of time. While changing one's light bulbs to a more energy efficient choice would certainly conserve energy, moving to a more plant-based diet or limiting the number of flights that the same person takes would be a much more significant behavioural change in terms of improving energy efficiency and reducing CO_2 emissions (Wynes & Nicholas, 2017). Further, when highly impactful behaviours are scaled up over greater population numbers, the effect compounds significantly.

Secondly, targeting the behaviours that are most susceptible to modification will help to ensure that intended outcomes are achieved and goals are met. The science of habit formation has demonstrated that while some behaviours might prove more challenging to change via interventions, others may be more susceptible to change, and a relatively cheap and easy-to-implement solution would suffice for doing so. Thus, the feasibility of the targeted behavioural change should be taken into consideration to weigh in the costs and benefits of intervening. To maximise impact, resources should be allocated to nudges which would be effective for changing behaviour. Thus, interventions in the choice architecture should be continuously interlinked with and improved by research evaluating their effectiveness.

Thirdly, the success of a given nudge may be influenced by individual-level characteristics, including culture, person-

ality traits, moral beliefs, attitudes, strong group membership such as religious affiliation (Gifford, 2011). When designing and implementing a nudge, careful consideration should be placed on individual variables as the intervention may backfire. Research has demonstrated that political beliefs and socioeconomic status mediate the effect of some green nudges. In the case of eco-labeling, conservatives were deterred from purchasing costlier energy conserving light bulbs when those were accompanied by an environmental message compared to when they were not (Gromet et al., 2013). In the case of social incentives, wealthier households in South Africa altered their water use more in order to obtain public recognition compared to poorer households (Brick et al., 2018). Democrat-voting households in the US decreased their energy use more in order to align with their neighbours compared to Republicans (Costa & Kahn, 2013). Thus, a personalised nudging approach, leveraging the most appropriate characteristics of the choice architecture for each individual, may be a promising avenue for increasing impact.

While the field of green nudging is still emerging, research has already demonstrated that it can provide effective methods for fostering greener behaviour. As a regulatory tool, green nudges are particularly flexible and easy to implement across various levels of governance, such as at the state-, city council- or neighbourhood-level, as well as at the level of private businesses and organisations. Further, changing the choice architecture is an inherently creative process, allowing more room for inventive-ness compared to more traditional regulatory approaches. Finding new and better ways to implement the general nudging methods outlined above and combining them with the technological advances at our disposal opens an exciting realm of possibilities for better outcomes. To maximise impact, continuous research is necessary on the cost-effectiveness of nudging interventions (especially in terms of costlier but promising interventions, e.g. as outlined above regarding removing barriers) as well as on the heterogeneity of the impact of interventions across the population. Here too do technological developments prove useful – with advances in data science and increased availability of big data, future nudging can be tailored to an individual's preferences, attitudes and other traits.

In total, green nudging constitutes a promising path to move forward in addressing the significant challenges of climate change. By utilising the best of what humanity can offer – our shared intellect, knowledge, and creativity – we can design and create a future where our behaviours are no longer damaging to the environment, but instead preserve and nurture it.

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