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The 'net zero' carbon needs 'billions of zeros' capital. But what about cheaper solutions?

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ABSTRACT

Time flies, as CO_2 and global temperatures continue to rise rapidly. We can no longer rely on expensive and unachievable or long-delayed new technologies, requiring investment and development to reduce carbon emissions in future decades. Current geopolitical uncertainties are looming while climate change and food insecurity are increasing, and the world's economy is struggling following the two most recent major crises of COVID and war in Europe. Here, emphasis is placed on the demand-side role of urban populations to influence carbon emissions. Focusing on two key carbon emitters – the agricultural and transport sectors, contributing a third of global greenhouse gas emissions combined – a few existing and well-established practical 'soft' measures are suggested, in addition to emission reductions. These measures can be implemented effectively at no or little extra cost, while new digital technologies can contribute to managing our daily carbon emissions.

The world is struggling with scholarly-coined terms such as 'zero net land degradation, zero hunger, and net zero carbon'. While the first two commitments have not been achieved, or their situations even worsened (FAO et al., 2021; IPCC, 2019), the new term, net zero carbon emissions, has been created. Nevertheless, these *net zero commitments* need investment with *billions of zeros* because population growth is continuing, and food and energy prices are soaring (e.g., Omotayo et al. 2022). Forests are replaced by agricultural lands (Franco-Solís & Montanía, 2021), lakes are lost, and permafrost and ice-cap thawing is occurring at an unprecedented scale (IPCC, 2022). It is obvious, on clear evidence and findings, that carbon emissions need to be reduced to fight climate change and carbon uptake on land needs to be increased. The latest IPCC report re-emphasised that action is needed now (IPCC, 2022). On the 4th of April 2022, the UN Secretary-General criticised governments and businesses who "are saying one thing but doing another. Simply put, they are lying" (UN, 2022). While in his speech, investing in new fossil fuels infrastructure was deemed to be "moral and economic madness", countries were urged to move "investments and subsidies from fossil fuels to renewables". The UN Secretary-General continued to say that "the truly dangerous radicals are the countries that are increasing the production of fossil fuels" (UN, 2022). Let us remember those political sentiments and decisions during the latest UNFCCC COP in Glasgow in 2021 (COP26) that have not resulted in any tangible and immediate carbon reduction action among the major oil and coal producers and their consumers.

The 17 Sustainable Development Goals (SDGs) have been devised to direct the world toward more tangible results. Nevertheless, like its predecessor, the Millennium Development Goals, progress towards many of these goals face serious impediments in the form of natural and climate-fuelled disasters, wars, and conflicts that do not affect the world equally but are largely beyond the control of individual countries or communities. Nevertheless, we must not lose sight of the critical importance of striving to achieve the SDGs, while acknowledging the differences that exist between developed and non-developed nations in terms of access to resources and capacity for action.

Countries have already suffered from a more than two-year Covid pandemic. GDPs have fallen sharply (UNDP, 2022) and most countries have already borrowed or used their financial reserves on rescue packages, spent on Covid's repercussions such as unemployment, vaccines, and emergency funds. Yet, a recent increase in Covid cases in China has added more economic uncertainties to these existing challenges. Although China escaped the worst health and economic ramifications in 2020 and 2021, there are no guarantees that they will keep moving forward at the same pace in the face of new Covid variants.

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Consequently, worsening global financial news could be anticipated. An unexpected war in Europe has cast even more doubt on progress in humanity's frontiers of food and energy security, while 1.2 billion people already live in conflict-affected areas elsewhere (UNDP, 2022). Developing renewable energy supplies in some parts of the world is promising, but this energy transition depends on continued political commitment, initial investment and relevant skills. As such, access to these energy sources is still far from the reach of the least developed nations because they cannot afford essential investments and may not have the necessary technological skills.

So, is it possible to imagine a world where *all* countries could afford to invest in approaches to cut carbon emissions and achieve net zero targets, including in urban areas? What will be the best possible solutions for curtailing a global rise in carbon? A few achievable approaches are proposed here.

Everybody can take steps to cut down household consumption and shorten shopping lists by considering their 'wants' and 'needs'. This requires education to raise awareness about the contribution global citizens can make to solving the global environmental crises. Innovative psychological and marketing approaches should be explored to convince ordinary consumers to lessen unnecessary demands and to avoid wasting food and other commodities. In the EU, it is evident that reasonable levels of adoption of green consumer actions can reduce the CO2 footprint by 25% (Moran et al., 2020).

New development must proceed only with proper consideration of how to minimise greenhouse gas emissions. Any complicated modelling and research must run simultaneously with practical actions. Communities can work together to reduce urban waste, including the ever-expanding waste of consumer goods, and to establish environmentally friendly transport strategies. The need for costly physical infrastructure development can be partly replaced by a new human mind set. Communities need to be better informed and trained about available, practical, and cheaper options for actions (Khatibi et al., 2021), thereby changing society's perception of net zero from being too costly, too hard, or too irrelevant, to being challenging but manageable.

Transport is responsible for 23% of total energy-related CO_2 emissions (Sims et al., 2014), though it may be even higher in a few countries (e.g., 29% in the US: Anon 2010). Urban areas are large carbon emitters because of rising transport demands. At the local level, government commitments to effective route planning strategies can shorten urban travel distances. Every single mile/person reduction is relevant and provides individual well-being benefits by shortening commuting time. In densely populated areas, the use of public transport needs to be promoted, as US-based research indicates that public transportation produces significantly lower greenhouse gas emissions per passenger mile (Anon, 2010) than individually-run vehicles. Cycling should be encouraged and safe cycle-ways provided, as cyclists have 84% lower life cycle CO_2 emissions than non-cyclists (Brand et al., 2021), while profiting from health benefits. In addition, the purchase of electric bicycles could be subsidised to encourage substitution of individual car usage. Reducing total travel distances by reducing travel frequency can be assisted by new digital technologies which can help to redesign or develop cheaper solutions of co-working. Apps similar to those used for monitoring daily calory intake may aid in tracking our daily carbon emissions and provide a metric for incentive payments to encourage their use. Consumers could be encouraged to avoid purchasing new internal combustion car models by modifying their old cars or becoming part of a car pool. Such behavioural solutions could be encouraged by tax reductions or subsidies. Although large car companies are expanding electric vehicle strategies to reduce the life cycle GHG emissions, they are still heavily dependent on rare minerals and fossil fuels for their components, from tyres to engine lubricants to batteries. Recycling technologies to minimise resource exploitation through less wasting of these manufactured materials are still under development. Air-based travel is responsible for 2.4% of global CO_2 emissions from fossil fuel use (Graver et al., 2019). By focusing on their predominantly urban market, tourism agents and stakeholders can be encouraged to capture virtual real-time daily events and experiences instead and be compensated for lost income. Such a cognitive approach promotes human–nature interactions and experiences and is compatible with environmental management and planning (Pramova et al., 2021).

Agriculture, predominantly for food production, accounts for between 10% and 12% of all anthropogenic GHG emissions (Green et al., 2017). With deliberate regional land and urban planning, farms can become more locally accessible, so farmers may benefit financially from lowered transport, spoilage, energy and personnel costs. While food security remains of critical importance and meeting complete food needs from local production will not be possible for all communities (Kinnunen, 2020), a local focus will provide multiple benefits and help to ease the current chaotic food logistics and supply chains. Off-season food supply and demands need to be modified. Food waste can be eliminated in some situations and, in others, greatly reduced at the farm, processing, distribution and household levels. Organic (household) waste can be transformed into organic soil amendments instead of going to landfill. The involvement of local communities and farmers in developing countries as well as developed countries is pivotal. Food cooking is responsible for carbon emissions, with huge production differences between plant-based and animal-based foods in energy use and greenhouse gas emissions. Cooking reduces the differences in the energy carbon footprint gap between animal and plant foods (Arrieta & González, 2019) and contributes to deforestation in regions where alternatives to firewood for cooking are not available or not affordable. Local restaurants can be rewarded as hubs for sharing extra homemade foods and social interactions. Through these measures, a huge amount of energy, water, transportation and fertilisers could be saved. Encouraging less wasteful food use may also extend more thoughtful consumer behaviour towards other essential household commodities, such as clothing which has become a contributor to increasing greenhouse gas emissions, resource exploitation and pollution since the rise of fast fashion industries (Kerr & Landry, 2017). Awareness of the need for increased reuse and recycling is growing but, as for food, more consumer change is needed (e.g., Hole & Hole 2019).

Vegetation can act as a carbon sink and urban trees contribute to lower air temperatures which increase human comfort in hot climates while indirectly reducing energy consumption through decreased demand for air conditioning. Campaigns have been initiated in numerous countries for volunteers to assist in planting native and well-adapted tree and shrub species to absorb carbon. However, making tree planting a success is not trivial and may have economic, political and societal drawbacks (Gramling, 2021), and therefore tolerant native plants must be explored and used preferentially. For instance, the native plants grown on atypical sites, such as urban landfills (e.g., Song, 2018), can tolerate harsh environments while having potential for carbon sequestration and soil remediation. Local water conservation and recycling must become a norm, helping to avoiding the need to construct new dams and water storage facilities, thereby reducing energy needed for large-scale water treatment processes.

Attempts are urgently needed to understand the problems of poorer countries concerning climate change mitigation and adaptation. While few options are currently possible due to a lack of resources or skilled public administrators, this should not be used as a reason for delaying action. For example, despite the difficulties due to Covid and the global economic situation, India's Ahmedabad District released a Climate Change and Environment Action Plan in 2022 that takes a bottom-up approach to short, medium and long-term actions. It includes simple steps that could be taken at local scale to mitigate and adapt to climate change and make progress towards the SDGs (Anon, 2022). Richer countries must provide leadership including investment in research on actions that fit different stages of development and environmental situations, but efforts such as managing consumption and minimising waste are globally relevant to individuals and communities.

Successful urban governance plans to reach net zero need to

incorporate actions to tackle the within-urban challenges of careful and adaptable resource use under climate change as well as responding to the broader issues associated with the continuing enlargement of the urban footprint. As stated by the UN Secretary General (UN, 2022), we need to stop talking and take (local) action. The blame game or leaving the responsibility to someone else does not reduce emissions or sequester carbon. We can achieve some part of the net zero emission target without the need for billions of zeros capital, by making a joint effort in our daily life to manage carbon and other resources locally, efficiently and more sustainably. Such an approach is relevant to people in all countries, whether their economies are developed or developing.

Author contributions

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CRediT authorship contribution statement

Farshad Amiraslani: Conceptualization, Methodology, Investigation, Supervision, Writing – original draft, Writing – review & editing. **Deirdre Dragovich:** Investigation, Supervision, Writing – review & editing. **Beverley Henry:** Investigation, Supervision, Writing – review & editing. **Cornelia Rumpel:** Investigation, Supervision, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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