



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Viewpoint, Policy Forum or Opinion

## Sustainability and development after COVID-19

Edward B. Barbier<sup>a,\*</sup>, Joanne C. Burgess<sup>b</sup><sup>a</sup> Department of Economics and School of Global Environmental Sustainability, Colorado State University, Fort Collins, CO 80523, USA<sup>b</sup> Department of Economics and School of Global Sustainability, Colorado State University, Fort Collins, CO 80523, USA

## ARTICLE INFO

## Article history:

Available online 10 July 2020

## Keywords:

COVID-19

Developing countries

Natural climate solutions

Sustainable development goals (SDGs)

Sustainability

## ABSTRACT

Developing countries are highly vulnerable to the COVID-19 pandemic, in part due to the lack of international support for ensuring progress towards the 17 Sustainable Development Goals (SDGs). Yet the mounting financial burden faced by all countries means that additional support is unlikely to be forthcoming in the near future. It is critical that developing countries find innovative policy mechanisms to achieve sustainability and development aims in a cost-effective manner. This requires identifying affordable policies that can yield immediate progress towards several SDGs together and aligns economic incentives for longer term sustainable development. We identify three policies that meet these criteria: a fossil fuel subsidy swap to fund clean energy investments and dissemination of renewable energy in rural areas; reallocating irrigation subsidies to improve water supply, sanitation and wastewater infrastructure; and a tropical carbon tax, which is a levy on fossil fuels that funds natural climate solutions. Such innovative and cost-effective policy mechanisms do not require substantial external support, and they foster greater progress towards achieving the SDGs in poorer economies.

© 2020 Elsevier Ltd. All rights reserved.

## 1. Introduction

The UN Secretary General's report, *Shared Responsibility, Global Solidarity* calls for "coordinated, decisive, and innovative policy action from the world's leading economies, and maximum financial and technical support for the poorest and most vulnerable people and countries, who will be the hardest hit" (UN, 2020, p. 1).

This will be a difficult task. As the report acknowledges, the lack of international support for ensuring progress towards the 17 Sustainable Development Goals (SDGs) has made developing countries more vulnerable to the pandemic than they should be. In addition, the ongoing global public health and economic crisis will make it hard for the international community to mobilize "maximum financial and technical support for the poorest and most vulnerable people and countries hardest hit" (UN, 2020, p. 1).

In the absence of additional financial support, it is critical that developing countries find innovative policy mechanisms to achieve sustainability and development aims in a cost-effective manner. This requires identifying affordable policies that can yield immediate progress towards several SDGs together, rather than sacrificing some goals to achieve others, and aligns economic incentives for longer term sustainable development.

## 2. Progress towards the SDGs

Before the pandemic, progress in attaining all 17 SDGs has been mixed (Barbier & Burgess, 2019; UN, 2019; Moyer & Hedden, 2020). Although extreme poverty and infant and maternal mortality have declined since 2000, low-income countries have achieved less poverty reduction, and this progress came at the expense of other important goals, especially the five "environmental" SDGs 11–15 (Barbier & Burgess, 2019).

COVID-19 has hit developing countries particularly hard (Ahmed, Ahmed, Pissarides, & Stiglitz, 2020; Sumner et al., 2020). As Fig. 1 indicates, the pandemic is likely to adversely impact 12 of the 17 goals. This will occur at a critical juncture for some of the SDGs. 736 million people still live in extreme poverty, 821 million are undernourished, 785 million people lack even basic drinking water services, and 673 million still practice open defecation (UN, 2019). About 3 billion people lack clean cooking fuels and technology, and of the 840 million people without electricity, 87% live in rural areas. 28 poor countries are unlikely to attain SDGs 1–4, 6 and 7 by 2030 (Moyer & Hedden, 2020).

Although global carbon dioxide (CO<sub>2</sub>) emissions have fallen sharply during the pandemic, the trend in recent years has been rising emissions as growth in energy use from fossil fuel sources outpaced the rise of low-carbon sources and activities, especially in developing countries (Jackson et al., 2019; Peters et al., 2020). The pandemic could further undermine progress towards SDG 13,

\* Corresponding author.

E-mail addresses: [Edward.barbier@colostate.edu](mailto:Edward.barbier@colostate.edu) (E.B. Barbier), [Jo.Barbier@colostate.edu](mailto:Jo.Barbier@colostate.edu) (J.C. Burgess).

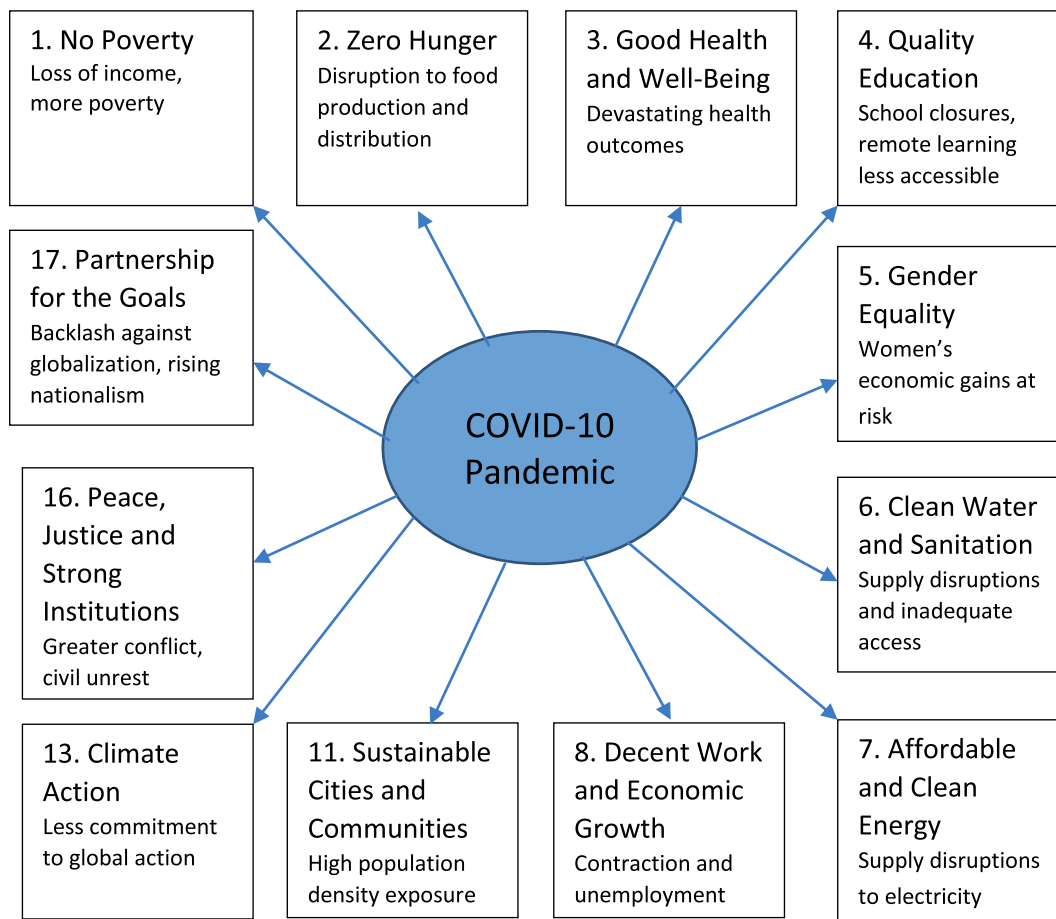


Fig. 1. The Impact of COVID-19 on the SDGs. Source: Adapted from UN (2020), Figure 5.

by reducing the commitment to global climate action (see Fig. 1 and UN, 2020).

### 3. A post-pandemic strategy for low and middle-income countries

It is critical that developing countries find innovative policy mechanisms to ensure immediate socio-economic support after the COVID-19 crisis as well as continued progress towards the 17 SDGs. A post-pandemic strategy should remove existing policy distortions and correct perverse incentives that inhibit sustainable development. Policies should also create synergies across several SDGs simultaneously, such as boosting economic activity, job creation, poverty reduction, environmental improvement and health outcomes. Policies should also be cost-effective, raise or save revenue, and be quickly and effectively implemented. This calls for prioritizing policies that yield immediate progress towards several SDGs together without sacrificing other SDGs, require little external financing, generate the necessary funding for any additional investments and have a proven track record.

A range of innovative policies meet these criteria. These include “subsidy swaps”, investment in natural capital, social protection and safety nets, sustainable intensification in agriculture, automation of services, and job training. Given the priority for impactful, affordable policies that create synergies with other SDGs, we outline three major policies that developing countries can adopt immediately to achieve these objectives and provide evidence of their proven effectiveness.

First, low and middle-income countries should adopt a “subsidy swap” for fossil fuels, whereby the savings from subsidy reform for coal, oil and natural gas consumption are allocated to fund clean energy investments (IISD, 2019a). In 2018, fossil fuel consumption subsidies reached \$427 billion annually, of which nearly \$360 billion were in developing countries.<sup>1</sup> IISD (2019a) maintains that a 10–30% subsidy swap from fossil fuel consumption to investments in energy efficiency and renewable energy electricity generation could substantially improve the transition to a low-carbon economy. Already, some progress along these lines been made in India, Indonesia, Morocco and Zambia. A study of 26 countries – 22 of which are low and middle income – found that the removal of fossil fuel subsidies on its own reduce greenhouse gas emissions reductions by 6 percent on average for each country from 2018 until 2025 (IISD, 2019b).

A fossil fuel subsidy swap should also be used to facilitate greater dissemination and adoption of renewable energy and improved energy efficiency technologies in rural areas. This is critical for reducing energy poverty across developing countries (Casillas & Kammen, 2010; Rogelj, McCollum, & Riahi, 2013; Pahle, Pachauri, & Steinbacher, 2016; Barbier, 2020). Morocco, Kenya, South Africa illustrate how different public policy approaches can facilitate the adoption and deployment of renewable energy and improved energy efficiency technologies in rural areas (Barbier, 2020; Pahle et al., 2016).

A fossil fuel swap to support energy efficiency and renewable energy in rural areas would also have important equity gains. In

<sup>1</sup> From <https://www.iea.org/topics/energy-subsidies>. Accessed on May 8, 2020.

low and middle-income economies, it is mainly wealthier, urban households that benefit from fossil fuel consumption subsidies, whereas it is rural households that increasingly comprise the extreme poor (Castañeda et al., 2018). Across 20 developing countries, the poorest fifth of the population received on average just 7% of the overall benefit of fossil fuel subsidies, whereas the richest fifth gained almost 43% (Arze del Granado, Coady, & Gillingham, 2012).

Second, developing countries should also implement a “subsidy swap” for irrigation to support investments in clean water and improved sanitation. Irrigation subsidies lead to over-use of water, inefficiencies and inequality, as irrigation is often allocated by land holding area and thus any subsidies disproportionately benefit larger and wealthier farmers (Gany, Sharma, & Singh, 2019). Two types of subsidies are frequently employed (Brelle & Dressayre, 2014; Kjellingbro & Skotte, 2005; Toan, 2016; Ward, 2010). Irrigation water is often priced below its cost of supply, and may not even cover the operation and maintenance costs of irrigation systems. A conservative estimate of such subsidies in developing countries is \$30 billion per year (Kjellingbro & Skotte, 2005). Irrigation also benefits from cross-subsidies from power generation, whereby buyers of hydroelectricity pay for the dam and other infrastructure and the stored water is allocated to irrigation with little cost recovery. Although the amount of such cross-subsidies is unknown, they are used frequently in low and middle-income countries (Brelle & Dressayre, 2014; Ward, 2010).

Reallocating irrigation subsidies to improve water supply, sanitation and wastewater infrastructure is an urgent need in all developing countries (Whittington et al., 2008; Grigg, 2019; Hope, Thomson, Koehler, & Foster, 2020). The strategy for targeting and sequencing water-related services in developing countries should prioritize the needs and income levels of the intended beneficiaries, their ability to pay for improved clean water and sanitation, and the overall costs of providing clean water and sanitation services. For example, three small-scale interventions that do not involve large-scale infrastructure and supply networks for delivering clean water and sanitation include rural water supply programs that provide communities with deep boreholes and public hand pumps, community-led total sanitation campaigns, and biosand filters for household water treatment (Whittington, Hanemann, Sadoff, & Jeuland, 2008). These interventions are not only affordable by poor households and communities but also generate essential health and economic benefits post-pandemic, and protect women and children, who are worst affected by lack of clean water and sanitation. Both boreholes and biosand filters can be scalable to large number of communities in developing countries, and the filters can be used by households in both rural and low-density urban areas. The resulting cost reductions make such interventions affordable and facilitate user payments even in the poorest regions, such as rural Africa (Hope et al., 2020).

Lastly, developing countries should also consider adopting a “tropical carbon tax” (Barbier, Lozano, Rodriguez, & Troeng, 2020). This is a levy on fossil fuels that is invested in natural climate solutions (NCS) aimed at conserving, restoring and improving land management to protect biodiversity and ecosystem services. NCS are a relatively inexpensive way of reducing tropical land use change, which is a major source of greenhouse gas emissions. For example, cost-effective tropical NCS can mitigate 6,560 10<sup>6</sup> tonnes of CO<sub>2</sub>e in the coming decades at less than \$100 per 10<sup>3</sup> tonnes of CO<sub>2</sub>e, which is about one quarter of emissions from all tropical countries (Griscom et al., 2020). Costa Rica and Colombia have already adopted a tropical carbon tax strategy. If 12 other megadiverse countries roll out a policy similar to Colombia's, they could raise \$1.8 billion each year between them to invest in natural habitats that benefit the climate (Barbier et al., 2020). A more

ambitious policy of taxation and revenue allocation could yield nearly \$13 billion each year for natural climate solutions.

Moreover such a strategy can be “pro-poor”. Ecosystem services such as drinking-water supply, food provision and cultural services are estimated to contribute between 50% and 90% of income and subsistence among the rural poor and those who live in forests (CBD, 2019). Such services can make an important contribution to ending extreme poverty (SDG 1), achieving zero hunger (SDG 2), improving health (SDG 3) and meeting many of the other 14 SDGs.

Together, these three policies can make an important contribution towards meeting immediate SDG objectives, such as boosting economic activity, job creation, poverty reduction, environmental improvement, support of health care needs. Moreover, they do so in a cost-effective manner that raises rather than requires scarce financial resources. These policies also provide strategic support for the development of a solid framework of incentives for long-term sustainable development. However, recent evidence indicates that policy makers may be focusing on one or two goals, such as boosting the economy and job creation, at the expense of other goals, such as carbon emissions and tropical forest conversion, and overall sustainable development objectives. Furthermore, political unrest and instability makes the ability to adopt and implement any such policy options more challenging. Finally, the uncertainty imposed by the COVID-19 pandemic has undermined the resilience of countries, which could affect their willingness to work together for common socio-economic objectives (Oldekop et al., 2020).

#### 4. Conclusion

The COVID-19 pandemic is causing a growing financial burden on all countries, disrupting economies and causing hundreds of thousands of deaths globally. Low and middle-income economies will additionally suffer from the lack of international funding available for achieving the 17 Sustainable Development Goals (SDGs), climate change mitigation and adaptation, and biodiversity conservation. The pandemic is likely to further undermine progress towards the SDGs by 2030, which was already faltering even before the outbreak.

If sustainability is to be revived as a development objective, then low and middle-income economies will need to come up with policies that are affordable and achieve multiple SDGs simultaneously. We have identified three policies that meet these criteria: a fossil fuel subsidy swap to fund clean energy investments and dissemination of renewable energy in rural areas; reallocating irrigation subsidies to improve water supply, sanitation and wastewater infrastructure; and a tropical carbon tax, which is a levy on fossil fuels that funds natural climate solutions. Through such interventions, developing countries can foster greater progress towards achieving the SDGs through cost-effective and innovative policy mechanisms that do not rely on external funding to implement.

#### 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.

#### Acknowledgements

We are grateful for comments provided by Arun Agrawal on a previous version of this manuscript.

## References

- Ahmed, F., Ahmed, N. E., Pissarides, C., & Stiglitz, J. (2020). Why inequality could spread COVID-19. *The Lancet Public Health*, 5(5) e240.
- Arze del Granado, F., Coady, D., & Gillingham, R. (2012). The unequal benefits of fuel subsidies: A review of evidence from developing countries. *World Development*, 40, 2234–2248.
- Barbier, E. B. (2020). Is green rural transformation possible in developing countries?. *World Development*, 131, 104955.
- Barbier, E. B., & Burgess, J. C. (2019). Sustainable Development Goal Indicators: Analyzing Trade-offs and Complementarities. *World Development*, 122, 295–305.
- Barbier, E. B., Lozano, R., Rodriguez, C. M., & Troeng, S. (2020). Adopt a carbon tax to protect tropical countries. *Nature*, 578, 213–216.
- Brelle, F., & Dressayre, E. (2014). Financing Irrigation. *Irrigation and Drainage*, 63, 199–211.
- Casillas, C. E., & Kammen, D. M. (2010). The energy-poverty-climate nexus. *Science*, 330, 1181–1182.
- Castañeda, A., Doan, D., Newhouse, D., Nguyen, M. C., Uematsu, H., Azvedo, J. P., & World Bank Data for Goals Group (2018). A New Profile of the Global Poor. *World Development*, 101, 250–267.
- Convention on Biological Diversity (CBD) (2019). *Biodiversity and the 2030 Agenda for Sustainable Development: Technical Note*. Montreal: Secretariat of the Convention on Biological Diversity. <https://www.cbd.int/development/doc/biodiversity-2030-agenda-technical-note-en.pdf>.
- Gany, A. H. A., Sharma, P., & Singh, S. (2019). Global Review of Institutional Reforms in the Irrigation Sector for Sustainable Agricultural Water Management, Including Water Users' Associations. *Irrigation and Drainage*, 68, 84–97.
- Grigg, N. S. (2019). Global water infrastructure: State of the art review. *International Journal of Water Resources Development*, 35, 181–205.
- Griscom, B. W., Busch, J., Cook-Patton, S. C., Ellis, P. W., Funk, J., Leavett, S. M., et al. (2020). National mitigation potential from natural climate solutions in the tropics. *Philosophical Transactions of the Royal Society B*, 375, 20190126.
- Hope, R., Thomson, P., Koehler, J., & Foster, T. (2020). Rethinking the economics of rural water in Africa. *Oxford Review of Economic Policy*, 36, 171–190.
- International Institute for Sustainable Development (IISD) (2019a). *Fossil Fuel to Clean Energy Subsidy Swaps: How to pay for and energy revolution*. Winnipeg, Canada: IISD.
- International Institute for Sustainable Development (IISD) (2019b). *Raising Ambition Through Fossil Fuel Subsidy Reform: Greenhouse gas emissions modelling results from 26 countries*. Winnipeg, Canada: IISD.
- Jackson R.B, C. Le Quéré, R.M. Andrew, J.G. Canadell, J.I. Korsbakken, Z. Liu, G.P. Peters, B. Zheng and P. Friedlingstein. 2019. Global Energy Growth Is Outpacing Decarbonization. A special report for the United Nations Climate Action Summit September 2019. Global Carbon Project, International Project Office, Canberra Australia.
- Kjellingbro, P. M., & Skotte, M. (2005). *Environmentally Harmful Subsidies: Linkages between subsidies, the environment and the economy*. Copenhagen: Environmental Assessment Institute.
- Moyer, J. D., & Hedden, S. (2020). Are we on the right path to achieve the sustainable development goals. *World Development*, 127, 104749.
- Oldekop, J. A., Horner, R., Hulme, D., Adhikari, R., Agarwal, B., Alford, M., et al. (2020). *COVID-19 and the case for global development*. World Development.
- Pahle, M., Pachauri, S., & Steinbacher, K. (2016). Can the Green Economy Deliver it All? Experiences of renewable energy policies with socio-economic objectives. *Applied Energy*, 179, 1331–1341.
- Peters, G. P., Andrew, R. M., Canadell, J. G., Friedlingstein, P., Jackson, R. B., Korsbakken, J. I., et al. (2020). Carbon dioxide emissions continue to grow amidst slowly emerging climate policies. *Nature Climate Change*, 10, 2–10.
- Rogelj, J., McCollum, D. L., & Riahi, K. (2013). The UN's 'Sustainable Energy for All' initiative is compatible with a warming limit of 2°C. *Nature Climate Change*, 3, 545–551.
- Sumner, A., E. Ortiz-Juarez C. and Hoy. 2020. Precarity and the pandemic: COVID-19 and poverty incidence, intensity, and severity in developing countries (No. wp-2020-77). World Institute for Development Economic Research (UNU-WIDER).
- Toan, T. D. (2016). Water Pricing Policy and Subsidies to Irrigation: A Review. *Environmental Processes*, 3, 1081–1098.
- United Nations (UN) (2019). *The Sustainable Development Goals Report 2019*. New York: United Nations.
- United Nations (UN). 2020. Shared Responsibility, Global Solidarity: Responding to the socio-economic impacts of COVID-19. UN Secretary General, New York, March 2020. [https://www.un.org/sites/un2.un.org/files/sg\\_report\\_socio-economic\\_impact\\_of\\_covid19.pdf](https://www.un.org/sites/un2.un.org/files/sg_report_socio-economic_impact_of_covid19.pdf)
- Ward, F. A. (2010). Financing Irrigation Water Management and Infrastructure: A Review. *Water Resources Development*, 26(3), 321–349.
- Whittington, D., Hanemann, W. M., Sadoff, C., & Jeuland, M. (2008). The Challenge of Improving Water and Sanitation Services in Less Developed Countries. *Foundations and Trends in Microeconomics*, 4(6–7), 469–609.