Position Note on Economic Aspects of Climate Change

Lead author: *Balázs Horváth*

The world needs an effective mechanism for
GLOBAL COORDINATED ACTION

Align macro- and micro-level policies

A globally stable solution requires a critical mass of actors and "changing the rules of the game".

Any country seeking to do better will lose out if others persist in their current behavior.

01 Phasing out all fossil fuel subsidies

whether provided through pricing, taxation, or in-kind transfer

Regulatory steps would need to complement the efforts to address market failures associated with fossil fuel consumption, production and related investment.

International coordination of the time profile and sequencing of these changes would help preclude distortions that can give rise to arbitrage opportunities.

"efficient fossil fuel pricing in 2015 would have lowered global carbon emissions by 28%, fossil fuel air pollution deaths by 46%, and increased government revenue by 3.8% of GDP."

- IMF (2019)

3.8 %
of GDP

The real question we face:

Whether to take action against climate change promptly at relatively lower cost, or later at far higher cost.

Position Note on Economic Aspects of Climate Change

I. Executive Summary

Global climate change is materializing. It can reach catastrophic levels unless consumption, production and investment behavior patterns change in the coming years.

The UN has focused on quantity targets in countries' Nationally Determined Contributions (NDCs) to reduce GHG emissions so far. These point in the right direction, although they could usefully be made more ambitious. However, they are not enough to mitigate climate change, since they are contradicted by micro-level signals stemming from carbon pricing (which currently fails to fully reflect all costs of using fossil fuels) and regulatory gaps.

Further factors complicate the path toward a low-carbon world. Political decisionmakers exhibit short-horizon, linear thinking. As a result, considerations of non-linearities, irreversibilities and long-term feedback loops set in motion are missing from their calculus. The world lacks an effective mechanism for global coordinated action; countries face uncertain costs and benefits whose incidence is weakly related to country effort. Finally, any country seeking to do better will lose out if others persist in their current behavior.

This position note explains the need to align macro-level and micro-level policies to avoid massive climate change and explores specific policy instruments to do so. It stresses that a globally stable solution requires a critical mass of actors and "changing the rules of the game". It notes that the choice we face is whether we take action at still relatively low cost and while the severe effects are still reversible, or act only later at much higher cost and when room for maneuver is severely diminished. It is not what public discourse features: whether to act against climate at considerable cost, or not to and continue living as before.

The key measures are rapidly phasing out all fossil fuel subsidies; auctioning emission permits for large emitters in an aggregate amount aligned with the NDC targets; and implementing a broad-based carbon tax for small emitters. Importantly, these steps substantially reduce ill-targeted, highly regressive budgetary spending or raise revenues. Thus, they create ample, recurrent fiscal space that can cover the resource needs of supporting policies to make the carbon price shift economically and socially sustainable. That in turn requires transparent, SDG-conform, inequality-reducing redistribution that also pays off—with a clear phase-out date—potential spoilers.

The above measures will take some time to implement. In contrast, shadow carbon pricing, already adopted by several multilateral development banks, would largely eliminate the incentive for carbon-intensive investment overnight by more closely reflecting in investment decisions the economic, social and environmental costs of relying on fossil fuels.

Fully pricing in all costs of fossil fuels would help shift consumption, production and investment decisions, accelerate the shedding of obsolete high-carbon technology, and incentivize innovation in low-carbon technologies including carbon capture—all needed to help avert catastrophic climate change. It would be the primary instrument to act in the domain where the market works.

But among the causes of climate change (and of biodiversity loss, and deteriorating ocean health and pollution) are also instances of massive market failures. To address these aspects, complementary regulatory measures would also be needed. These include financing and investment standards focused on economic, social and environmental sustainability, as well as technical standards fostering sustainability, the circular and sharing economy, and the use of best-in-class technology.

Coordinated global collective action is needed to make this policy package work. No country—however large—can make the changes on its own without placing its short-term economic interests in jeopardy unless others play along. A critical mass of countries, cities, states and corporations need to agree on the sequencing, pace, and other modalities of the necessary shift in relative carbon prices, and on incentivizing others to join the emerging coalition of the willing.

Such collective action will require transfers toward less developed countries who have the right to develop but for whom in aggregate the traditional "grow prosperous with polluting technologies, then clean up" development path is no longer available. Support will also be needed to ease the transition of sectors and countries that lose out in the short run from the shift away from fossil fuels. This should not take the form of permanent income support. Rather, it needs to enable a market-conform transfer of best-in-class technologies to facilitate the emergence of low-carbon consumption, production and investment patterns, and reinforce circular and shared economy interactions.

UNDP, with its mandate centered on sustainable development and critical global public goods can play an important role in facilitating this, working as part of the UN system—representing the joint long-term interest of all member states. It can help address a critical obstacle by bringing in a long-term horizon to addressing global climate change.

II. Background

Climate change jeopardizes the sustainability of global development, both directly and indirectly, and erodes the likelihood of achieving all SDGs. It brings weather volatility, rising ocean levels, desertification, salinization and droughts, causing reduced harvests, spreading diseases, conflicts over access to dwindling resources (e.g., arable land), and possibly mass migration. Together with biodiversity loss and escalating plastic pollution, these factors increasingly diminish the Earth's biocapacity to sustain life.

To address these issues, UN(DP) efforts have so far focused on mobilizing all actors to contain the *quantity* of GHG emissions—most importantly carbon dioxide (CO_2) on account of it having the largest impact. Successive COPs aimed at reaching country-level commitments to reach targets expressed in million tons of CO_2 equivalent emissions. They also helped mobilize support for exploring and deploying new carbon-reducing technologies in electricity generation, transportation, and in other sectors. These set out the right targets, and the related activities need to continue.

However, the 2018 IPCC "Special Report on Global Warming of 1.5 ℃" conveyed ominous messages. It highlighted the much greater adverse impact likely under the agreed-upon 2 ℃ goal than under the stricter 1.5 ℃ goal; and noted that given current policies and trends, no realistic GHG emission scenario was consistent with achieving even the 2 ℃ goal. The report found that to limit global warming to 1.5°C, "global net human-caused emissions of CO_2 would need to fall by about 45% from 2010 levels by 2030, reaching 'net zero' around 2050," requiring "rapid, far-reaching transitions in land, energy, industry, buildings, transport, and cities".

The main thesis of this Position Note is that macro-level signals of desired quantity reductions expressed by governments point in the right direction, but are not enough. This because the same governments are complicit in sending *contrary micro-level economic signals* through the relative price of fossil fuels compared with non-GHG emitting alternatives; and through major gaps in regulation. Moreover, moves by individual actors, without them reaching a critical mass and the moves adding up to globally coordinated action, is unlikely to work. Thus, the policy toolkit applied so far to address climate change needs to be substantially enhanced to make the necessary 'rapid and far-reaching transitions' a reality. Without that, we are set to fail.

III. Analytical Aspects

The Stern report[1] rightly called global climate change a global market failure of massive proportions. It involves a complex bundle of externalities, public goods, asymmetric information, and increasing returns to scale. Addressing this bundle of problems requires careful coordination of multiple policy instruments and of global collective action.

As with most market failures, the best way to effect change is to alter the incentives driving everyday decisionmaking—in this instance, carbon-intensive economic choices of producers, consumers and investors. A critical instrument to do so is to shift the post-tax relative price of coal and other fossil fuels using regulatory, tax, and institutional instruments to reflect factors that are currently not (entirely) priced in, notably:

- full production and transportation costs, including investment and debt service costs;
- negative externalities on the welfare of others, including future generations, of producing, transporting, and burning fossil fuels. These include the contribution to global warming, as well as to ground, water, and air pollution, and to congestion;
- the non-renewable nature of fossil fuels implying an opportunity cost, since they could be put to possible—including currently unknown—uses other than burning them today.

A pair of 2015 and 2019 IMF Working Papers[2] estimated global subsidies in post-tax fossil fuel prices compared with a level that captures the first two factors above. The

[1] https://www.cambridge.org/us/academic/subjects/earth-and-environmental-science/climatology-and-climate-change/economics-climate-change-stern-review?format=PB

[2] See D. Coady, I. Parry, L. Sears and B. Shang, "How Large Are Global Energy Subsidies", IMF Working Paper WP/15/105; and D. Coady, I. Parry, N. Le, and B. Shang, "Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-level Estimates", IMF WP/19/89.

updated estimate for 2017 was $5.2 trillion or 6.5% of global GDP, broadly unchanged from 4 years earlier. These mainly reflected undercharging for environmental costs related to energy consumption (some ¾ of which was caused by domestic environmental damage, and only ¼ by climate change).[3] The updated paper found that "efficient fossil fuel pricing in 2015 would have lowered global carbon emissions by 28%, fossil fuel air pollution deaths by 46%, and increased government revenue by 3.8% of GDP."

IV. What needs to be done?

Setting appropriate carbon price signals through tax and price changes would be a key market-conform policy step. It would revamp micro-level market incentives and help coordinate rapid shifts in production, consumption and investment that are needed to avert catastrophic global climate change.

Regulatory steps would need to complement these to address market failures associated with fossil fuel consumption, production and related investment. International coordination of the time profile and sequencing of these changes would help preclude creating distortions. Effective, market-conform support would also be needed for fluid flow of best-in-class technologies to all sectors/countries as well as for enhancing the role of renewable energy and of the circular and sharing economy.

All this is very hard to do. It requires a host of carefully calibrated fiscal steps on both the revenue and expenditure side and apt regulatory measures, while attending to ensuing social tensions and withstanding strident lobbying by special interest groups. Alternatives to current production and consumption patterns need to be found at competitive cost. There are important problems to be resolved around sequencing, coordination, facilitating the transition, and public advocacy for change. Financial support is needed to facilitate market-conform transfer of technologies and know-how domestically, as well as to developing countries to preserve their right to development as they give up carbon-intensive technologies. These aspects jointly pose massive costs and risks in the current political environment that is becoming less conducive to coordinated global collective action.

But not taking this action implies further increases in cumulative global GHG emissions, leading over time to far larger, escalating costs and risks, and a rapidly shrinking room for maneuver. Put simply: none of the problems related to climate change are going to dissipate on their own, and by definition, an unsustainable path will not be sustained. The world will be forced off this path at some point. Thus, the choice we face is whether to take action against climate change promptly at relatively lower cost, or later at far higher cost. Not taking effectively coordinated action now is tantamount to opting for the second option.

Fortunately, a set of steps can set this in motion by decisively altering incentives for fossil fuel production, consumption and investment. First and early on, impose shadow carbon

3 Climate change cost estimates are critically affected by the discount factor in calculating present values. A lower discount rate—valuing future welfare more—would dramatically increase these cost estimates.

pricing—pioneered by the European Investment Bank, and then the World Bank[4]—to evaluate all proposed fossil fuel projects. Second, rapidly phase out remaining fossil fuel subsidies, whether provided through pricing, taxation, or in-kind transfers. Third, put in place emissions permit trading to cover large emitters building on global experience (Box 1). Fourth, use the emerging, increasingly accurate price signal from emissions permit trading to calibrate the other important component for shifting carbon prices to underpin sustainability: carbon taxes for guiding the behavior of millions of fragmented small emitters, whose aggregate impact is critical.

Box 1: Elements of a Workable Emissions Permit Trading System

Setting up a workable integrated trading system can attract all large carbon emitters as well as innovators who devise ways to reduce emissions to participate in carbon trade. This would deepen the market and facilitate the emergence of less volatile carbon prices that equilibrate all demand and supply. For this, the system needs verified baselines and clear rules on eligible participants, size limits, and any geographical restrictions; for auctioning or directly allocating Emissions Permits; and—in transparent, highly regulated manner—for carbon credits or offsets, as follows:

- Estimate the current and prospective share of large emitters in total emissions and calibrate the total amount of emissions permits to align with quantity targets set out in NDCs—if necessary, along a path that takes into account baseline emission levels.
- Allow all large emitters and investors in financial products (Green Finance products and derivatives such as carbon options and futures) to participate in trading emission permits.
- Ensure liquidity of the permit market by providing relevant information to all potential market participants, including information used in implementing permit management.
- Allow carbon price movements within a broad, predictable range but trigger pre-determined interventions to avoid market meltdown if prices hit a lower or upper limit not conducive to achieving the NDC goals or to the smooth functioning of the market.
- Ensure accurate, credible monitoring, reporting and verification (MRV) of carbon emission reductions—including through the use of green technologies and mitigation measures—by government-appointed professional institutes. Couple this with a strict, credible enforcement mechanism that imposes substantial fines for excess emissions without permits—feasible since permit trading covers a small number of large emitters and financial institutions.
- Over time, aim for fully auctioning off all available permits to the highest bidder. Allow emitters to gain carbon credits for independently verified additional reductions in emissions below the permits they hold.
- To facilitate adjustment, use available fiscal space to subsidize struggling large emitters at a pre-announced declining rate to reach no subsidies within a few years.
- Gradually connect regional carbon markets and enable trading across regions to allow market signals rather than government subsidies to primarily drive enterprises' emission reductions—a much more effective and efficient mechanism, which facilitates self-targeting. In the longer run, aim for trading across national boundaries.

Shadow pricing for proposed *new investments* would immediately shift investment decisions, preventing large-scale lock-in of carbon-intensive production and consumption

[4] Deutsche Institut für Entwicklung (2018): "Mobilising Capital for Sustainable Infrastructure: The Cases of the AIIB and the NDB", and CPLC (2017) "Report of the high-level commission on carbon prices".

through outdated investment patterns in infrastructure, buildings, transport, and production equipment. It would also guide expectations firmly toward higher future carbon prices.

Eliminating subsidies, charging for emissions permits, and imposing a carbon tax would create considerable *recurrent fiscal space*, endowing governments with resources to (i) engineer an all-embracing change in production and consumption with compensation to enable gradual adjustment and to placate potential spoilers who lose out from price changes (phased out over a few years); (ii) income support for all except the top two-three deciles in the income distribution; (iii) incentivize renewables, low-carbon production and consumption patterns and the circular and sharing economy; (iv) facilitate rapid global diffusion of best-in-class technologies (including for carbon capture); and (v) enable attaining other SDGs.

In sum, an effective shift away from carbon-intensive production and consumption patterns can be fiscally neutral while avoiding the emergence of unsustainable social or economic tendencies. The budgetary resources generated from the intervention to decisively change incentives can be recycled to alleviate socioeconomic tensions that could hold back SDG attainment. Importantly, the fiscal space from these taxes will expand as the permit trading pillar stabilizes and subsidies to producers necessary for a stable transition are phased out.

A further consideration underpinning the sustainability of such change is that the proposed policy package eliminates a "headwind" for decarbonization—the strong micro-level price signals encouraging wasteful use—and replaces it with signals that act to reduce carbon intensity. In effect, using the fiscal room to directly strengthen decarbonization allows the measures to have a double effect. As an added bonus, this approach does not involve creating government debt that would generate debt service pressure on future budgets.

Implementing this policy package would encourage SDG-conform technology choices in *production*—via renewables-focused technologies (e.g., hydrogen and biomass) and revamped value chains in industry and services, power generation, infrastructure, transport, and construction—and in *consumption*—notably via the circular and sharing economy. These would shift the balance of technologies locked in for coming decades.

The resulting price signals would also help encourage accelerated *shedding of carbon-heavy facilities and processes*; and perhaps most importantly, provide a massive incentive for the private sector to develop carbon capture technology—thus enabling *negative carbon emission pathways* for development, an aspect almost certainly needed to avoid dramatic climate change.

The cumulative impact of such investment, production/consumption pattern changes, and enhanced technological progress focused on decarbonizing development hold the promise of placing the global economy on an SDG-conform path. No government instruction or legislative change can match this impact on its own. This would not necessarily reduce economic growth in the medium to long run—only its composition.

Support for owners and producers of outdated technology during the transition should take the form of technology transfer and investment credits to enable a rapid divestment of

carbon-heavy production and consumption technologies and patterns, rather than income subsidies that would act against phasing out unsustainable technologies.

Integrating the growing share of renewable power generation requires a revamping of the power grid to ensure the necessary flexibility and resilience. The electricity system increasingly needs to absorb intermittent and unpredictable power supply (Box 2) since high-carbon alternatives cannot meet rising demand or offset shortfalls in the long run. Complementary large savings in emissions could come from connecting country and regional power grids.

Box 2: Pathways toward a low-carbon, decentralized electricity framework[5]

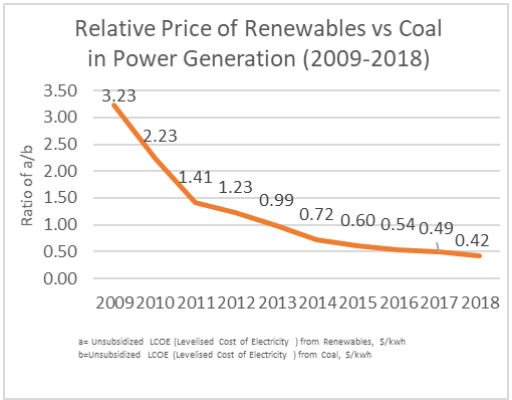
Battery energy storage currently costs between $320 to $410 per installed kilowatt-hour for a five-hour lithium-ion battery. This cost is expected to drop by a further 70% in ten years, ushering in battery storage at scale, which can (i) help avoid short-term blackouts or to stabilize the system in brownouts by absorbing power when prices are low, releasing it at times of peak use when they are high; and (ii) lower costs by deferring some investment in transmission and distribution systems.

The decentralizing electricity market opens room for distributed energy resources (DERs), enabled by distributed resource aggregators (DRAs) that coordinate supply from numerous independent generators to act as zero-emission "virtual power plants". DRAs can provide resilience, security and backup services to conventional players. They can also help rebalance power demand and supply by offsetting the intermittency of supply or reducing demand in peak periods by paying large users for restraint.

McKinsey estimates that enabling DRAs to fully participate in markets could unlock about 95 gigawatts of new potential flexible capacity for the U.S. grid by 2030. Since replicating DRAs in other countries requires careful regulatory changes but no large-scale investment, large global savings from enabling DRAs (especially with connected grids) can materialize relatively promptly.

Optimizing regulation and policies in wholesale markets—e.g., through common standards for metering, telemetry and control of distributed resources—can bolster efficiency in transmission and distribution. This will require regulation to create a level playing field for small-scale renewables generators to compete with traditional generating plants by changing legacy market-participation models and dispatch rules.

Importantly, raising relative fossil fuel prices would have a sizable knock-on effect on the economics of producing throw-away plastics by raising feedstock costs, thus curbing an important source of escalating plastic pollution.



A fact and a near-certainty also underscore the need to move on carbon prices early. First, the relative price of renewables compared with fossil fuels has been falling rapidly over the past decade and often renewables cost less now than fossil fuel-based alternatives. Second, as carbon prices

[5] Based on https://www.mckinsey.com/business-functions/sustainability/our-insights/sustainability-blog/decarbonizing-the-grid-stabilizing-the-future-of-renewables.

are nearly certain to gravitate toward a level that reflects all production costs and fully internalizes externalities within the decades-long horizon of financing energy and infrastructure investments, relative renewable energy prices are set to fall further. Thus, assets created by investments based on today's carbon prices are likely to turn non-competitive and hence nonprofitable well before the associated loans are repaid—curbing not only debtor countries' ability, but also their willingness to repay. This is a key argument for assuming full expected carbon prices when assessing the financial viability of proposed future projects; and for financial institutions to reconsider lending for such projects today to help avoid a future painful surge in nonperforming loans in their portfolio.

Summary and additional considerations

This note suggests strengthening quantity-focused efforts to curb climate change through a balanced package of complementary price, regulatory and other policy measures to revamp micro-level incentives. Governments need to tap the existing institutional framework built up to support the quantity-focused approach, but also pursue the price-based strategy in areas where the market works and put in place regulatory measures where it fails. For this, advocacy is needed to convince governments and the private sector about the truth of the arguments laid out in this position note.

As noted, the relative price of carbon is already on a clearly rising trajectory. But without prompt policy/regulatory action, market forces will remain in an "infinity pool" for many years, swimming against the tide when seeking to curtail carbon emissions. This could still deliver the right outcome, but decades later—and nature might be unforgiving in response to our current approach of "wait until it gets much worse, then garner sufficient support for global collective action to tackle climate change".

The world is nonlinear and dynamic: it will encounter threshold effects leading to tipping points (e.g., irreversible desertification, permanent loss of species, declining biocapacity to sustain life), and escalating feedback loops (e.g., massive release of CO_2 now captured in the permafrost areas of Siberia and Canada; the same stemming from forest fires; or invasive species taking over large areas now inhabited by ecosystems in equilibrium).

We do not know where the thresholds and tipping points are. As a result, at an unforeseen point, possibly in the not-too-distant future, the impact may be hugely larger than what we mistakenly think is warranted—based on linear extrapolation—by the incremental emission in a single year. And it may well be irreversible.

This is a key reason for calling into question the current approach of discounting future environmental costs at discount rates that steadily diminish their importance in our current decisions and essentially lead to ignoring any impact beyond two generations.

If that was not enough, unfortunately, climate change is an area where the "Logic of Collective Action"[6] meets the "political economy of time horizons". These enigmas cause

[6]Mancur Olson's idea (see https://en.wikipedia.org/wiki/The_Logic_of_Collective_Action).

serious further complications by blunting the ability to garner political support for global coordinated action. In particular:

- Small, highly organized lobby groups with members who gain large individual benefits from an outcome have overwhelming advantage in influencing political decisions that determine key outcomes. Hence, they often win over very large, individually less incentivized and hence less organized groups, even if the aggregate gains for the former group are dwarfed by the aggregate losses of the latter group.

- The time horizon issue is equally simple and important. Climate change evolves over decades, even centuries, while the time horizon of politicians who make decisions about policy actions to contain climate change is the time left until the next election—two years on average. Given this, politicians tend to rationally reject any policy package that has net losses in their own (short) time horizon, even if cumulative net benefits are massively positive over the longer horizon dictated by the issue at hand.

To facilitate overcoming these issues, an evidence-based consensus on facts relating to climate change needs to be reached among all countries. Effective institutions, enhanced transparency coupled with across-the-board acceptance of evidence-based dialogue and decisionmaking, and social pressure reflected in structural and consistent shifts in voting behavior—lacking so far—are needed. These would compel political decisionmakers to consider long-term costs and benefits, and to withstand organized lobbying from special interest groups. To prevent these groups from blocking necessary change, this note suggests paying them off in a form conducive for adjustment, at a declining rate.

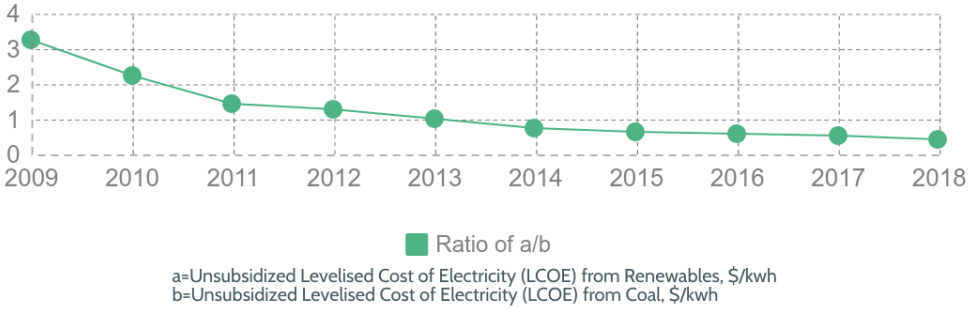
Against this backdrop, pricing and regulatory changes, coordinated across countries and involving a critical mass of actors is an essential, necessary component of new policies. This will align macro and micro-level signals; rectify market incentives for public and private stakeholders; precludes punishing first movers who might otherwise find themselves at a competitive disadvantage. In doing so, this package holds the promise of unleashing market forces to enable the overall package of policies to become effective in a timeframe that still fits within the available (fading) time window left before cumulative global GHG emissions trigger catastrophic climate change.

Finally, it is important to emphasize that UNDP and the UN in general, with a mandate to support SDG attainment, representing the joint long-term interest of all member states, and having significant convening power, are natural advocates of a policy package that holds the promise of enhancing the world's ability to contain climate change.

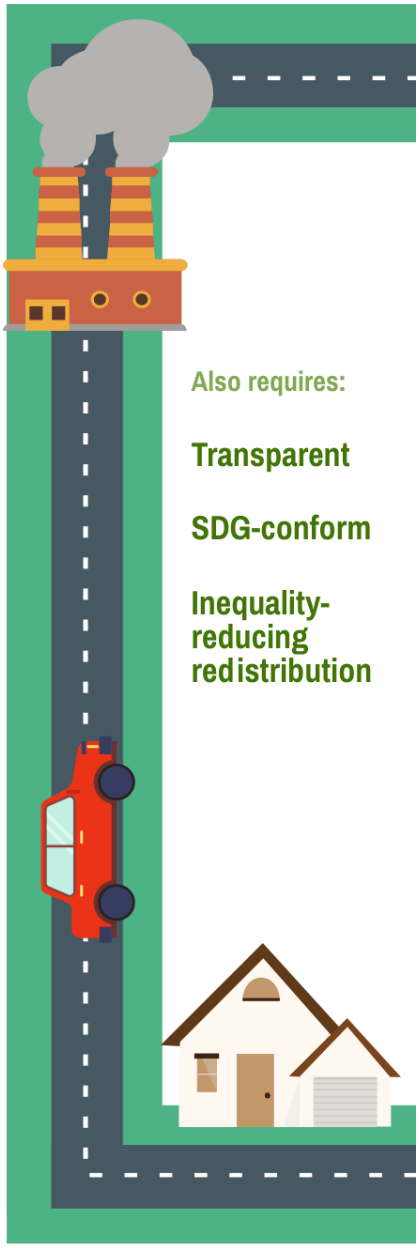
02 Auctioning emission permits for large emitters

Setting up a workable integrated trading system can attract all large carbon emitters as well as innovators who devise ways to reduce emissions to participate in carbon trade.

Figure:
Relative Price for Renewables vs Coal in Power Generation (2009-2018)



a=Unsubsidized Levelised Cost of Electricity (LCOE) from Renewables, $/kwh
b=Unsubsidized Levelised Cost of Electricity (LCOE) from Coal, $/kwh



Also requires:

Transparent

SDG-conform

Inequality-reducing redistribution

03 A broad-based carbon tax for small emitters

The resulting price signals would help provide a mass incentive for the private sector to develop carbon capture technology - thus enabling negative carbon emission pathways for development.

04 Shadow carbon pricing for new investments

This measure will immediately shift investment decisions, preventing large-scale lock-in of carbon-intensive production and consumption. It would more closely reflect the economic, social and environmental costs of relying on fossil fuels, guiding expectations firmly toward higher future carbon prices.

Eliminating subsidies, charging for emissions permits, and imposing a carbon tax would create considerable **recurrent fiscal space** to place the global economy on an SDG-conform path.

Fully pricing in all costs of fossil fuel use would help shift consumption, production and investment decisions, accelerate the shedding of obsolete high-carbon technology and incentivise innovation in low-carbon technologies, all needed to help avert catastrophic climate change.