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Achieving Global Carbon Neutrality Together with Economic Development

Abstract

This paper proposes a projection of macroeconomic and environmental conditions to 2030 in order to help clarify some of the likely major Economic and Environmental challenges facing Developing Economies in their efforts to achieve the Sustainable Development Goals. Using the United Nations Policy Model, the paper also assesses the dynamics and potential impact on Developing Economies of policy changes that could help the world to make substantial progress by 2040 in reaching the ambitious, but absolutely necessary, target of Zero Net Carbon Emissions by mid-century.

Key words: Global economy, economic development, climate change, macroeconomics, economic policy

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1. Introduction

In this paper we use the United Nations Global Policy Model (GPM) to make projections to **2030** in order to help clarify some of the likely major Economic and Environmental challenges facing Developing Economies in their efforts to achieve the Sustainable Development Goals (SDG). The paper also describes the dynamics and potential impact on Developing Economies of changes that could help the world to make substantial progress by **2040** in reaching the ambitious, but absolutely necessary, target of Zero Net Carbon Emissions by mid-century.

We start by projecting what we call a **Business as Before Scenario** of the trends in both Real Income Per Capita (RIPC) (measured in $2015 purchasing power parity terms) and CO_2 Emissions (measured in millions of tons) as a result of an assumed recovery over the period 2023-30 following the COVID-19 crisis and its immediate aftermath in 2020-22.

This projection of a Business as Before Scenario will provide a basis for more clearly understanding the scale of change required to reach the SDG targets, especially those for Economic Growth and Decent Work, and for a large reduction of CO_2 Emissions. The Business as Before Scenario is structured around the momentum imparted by established pre-COVID trends and the impact of the COVID crisis on trade, investment, employment, budget deficits and debt on the assumption that governments would strive to recoup budget losses and bring debt down towards pre-crisis levels. Importantly, this scenario incorporates no assumptions about new policy directions.

On the basis of the projections produced by the Business as Before Scenario, we can then identify and articulate changes in key economic variables that would generate substantially new and improved directions of change, for Real Income Per Capita, CO_2 Emissions and other development indicators.

As a consequence, this paper is structured as follows. We first produce a **Business as Before Scenario**, projecting initial outcomes for 2020-2022 and then generating longer projections for 2023-30 in order to highlight the scale of the development challenges that must be addressed. This scenario projects **continued increases** in CO_2 emissions despite a slowdown in global GDP growth. If the **Business as Before Scenario** were extended to 2040, the increase in emissions would continue unabated.

Our second scenario shoulders the challenge of achieving the objective of **Global Carbon Neutrality**. Thus, it is intended to substantially reduce global CO_2 Emissions by 2040 and put the Global Economy on track to reach the admittedly ambitious but absolutely necessary target of Net Zero Emissions by 2050. But this second scenario assumes **Market-Driven Decarbonization,** with taxes and other restrictive demand-side mechanisms implemented in order to cut the demand for fossil fuels (which are the main source of emissions) to a level at which production would scarcely remain profitable. Understandably, this scenario projects a highly adverse impact on GDP growth and income levels in Developing Economies that are net exporters of coal and oil. In a context of slow global economic growth, the outcomes of **Market-Driven Decarbonization** for developing regions are little better than those for the **Business as Before Scenario**.

The third and final scenario (which we label the **Alternative Development Scenario**) covers three elements that we believe are required to overcome the development problems associated with the first two scenarios.

i) **Concerted Decarbonization**, which avoids the pitfalls of Market-Driven Decarbonization through a programmed period of transition offering positive opportunities for Developing Economies that have to diversify away from current

reliance on coal and oil. This programme would seek an orderly reduction in fossil fuel extraction and distribution, based on stable producer prices, through the cooperation of major producer governments and corporations. The aim of this initiative is to match reductions in demand and supply through improvements in the efficiency of energy use and the substitution by alternative cleaner sources.

ii) **Regional Development**, which promotes closer economic cooperation among Developing Economies in five geographic regions (South America, Africa, South-East Asia, West and Central Asia, and South Asia). The purpose is to advance development-oriented 'De-Globalization' among such economies, i.e., reducing their counter-productive economic and financial dependency on Developed Economies.

iii) **The Containment of Financialization**, particularly with regard to constraining increases in Government Debt and avoiding the destabilizing build-up of External Financial Liabilities as the growth of Developing Economies accelerates.

We start our analysis with an examination of the income effects generated by our first Scenario, **The Business as Before Scenario**.

2. Business as Before Scenario

2.1 Projected Trends in Real Income Per Capita

This Scenario is highlighted first precisely in order to gauge the ensuing importance of any results generated by the introduction of changes of direction in our **Market-Driven Decarbonization Scenario** and our three-pronged **Alternative Development Scenario**. The results of the two latter scenarios will be tracked through both 2030 and 2040. Both of these latter scenarios require time to establish new directions and realize their full impact, especially with regard to environmental progress.

We start our analysis with the trends in **Real Income Per Capita** ($2015 pp) associated with the **Business as Before Scenario**. **Table B1** highlights global results for this variable for 1) the historical period of 2011-2019, 2) the projected outcomes for the period of the pandemic and immediate aftermath during 2020-22, and 3) the ensuing period of 2023-30.

At the **Global level**, Real Income Per Capita grew annually by 2.1 per cent between 2011 and 2019. But it is **projected** to fall by an average of -0.6 per cent per year in 2020-2022—before recovering to achieve an income growth rate of 1.6 per cent in the period 2023-30.

The focus of **Table B1** is on the Business as Before Scenario for 19 Major **Developing Economies**. Thereafter **Table B2** will examine the results from this Scenario for 9 **Developed Economies**.

Table B1 shows that The **People's Republic of China** is among the minority of Developing Economies that is expected to maintain positive economic growth during 2020-2022. Its Real Income Per Capita is projected, for example, to grow by 3.7 per cent. During 2023-30 China's growth of Real Income Per Capita is projected to average 4.6 per cent, through more reliance on its domestic market. Since China's exports are already very large, there will be limited opportunities for their growth in the future. Thus, this projected growth rate would be lower than China's historical average of 6.7 per cent during 2011-19.

Table B1.Real Income Per Capita ($2015)
Business as Before - Annual Growth Rate
19 Major Developing Economies (pp percentage p.a.)

Country	*2011-19*	*2020-22*	*2023-30*
World	2.1	-0.6	1.6
Argentina	-0.4	-3.2	0.5
Brazil	-0.5	-2.1	0.6
Chile	1.7	-1.9	1.2
Mexico	0.8	-4.0	0.2
Saudi Arabia	-0.6	-0.7	0.5
Iran (Islamic Rep. of)	-2.3	-2.5	-0.3
Pakistan	2.2	-1.5	0.8
India	5.1	-1.2	2.3
Bangladesh	5.1	1.4	3.0
China	6.7	3.7	4.6
Viet Nam	5.8	4.8	7.3
Philippines	4.7	-0.8	2.5
Indonesia	3.5	0.3	2.4
Egypt	1.8	-1.4	-0.1
Nigeria	-1.9	-2.1	1.0
Ethiopia	4.5	-0.5	2.5
Tanzania (United Rep. of)	4.3	0.8	3.0
Congo (Democratic Rep. of the)	2.8	-2.8	0.8
South Africa	0.2	-3.2	0.3

Viet Nam, being a much smaller economy with rising shares of markets in the United States, Europe and the Far East, is expected to exceed China's performance with an income growth rate of 4.8 per cent through the crisis in 2020-22 and 7.3 per cent in 2023-30. It has a much smaller economy than China but it is projected to secure a rising share of export markets in the United States, Europe and the Far East.

In contrast to China, **India** is expected to suffer a -1.2 per cent average annual contraction in Real Income Per Capita during 2020-22, after having recorded 5.1 per cent annual income growth in 2011-19. Moreover, India's projected, longer-term per capita income growth in 2023-30 would average only 2.3 per cent per year.

Both **South Africa** and **Brazil** are projected to do worse than India during 2023-30. **South Africa** already experienced a very slow 0.2 per cent growth of Real Income Per Capita during 2011-19, and during 2020-22 its income is expected to contract by an average of -3.2 per cent per annum. Moreover, its annual income growth over the recovery period of 2023-30 is projected to be a meagre 0.3 per cent.

Brazil's projected annual growth of Real Income Per Capita would be only 0.6 per cent over 2023-30 after having declined by -2.1 per cent annually during 2020-22. Even during the historical period of 2011-2019, its RIPC had declined yearly by -0.5 per cent.

Argentina, **Saudi Arabia**, Islamic Republic of **Iran** and **Nigeria** all experienced negative yearly growth rates of RIPC during 2011-19 and these rates are expected to worsen during 2020-22. For example, Argentina's annual growth rate of Real Income Per Capita would drop to -3.2 per cent and Islamic Republic of Iran's to -2.5 per cent during 2020-22. And all four economies are projected to 'recover' only modestly, if at all, during 2023-30: by 0.5 per cent for Argentina and Saudi Arabia, 1.0 per cent for Nigeria and -0.3 per cent for Islamic Republic of Iran.

Table B2 provides information on the historical trends in Real Income Per Capita ($2015 pp) for **Nine Developed Economies** for 2011-19 and projected trends for 2020-22 and 2023-30.

Averaging 1.8 per cent, the **United States** is close behind the global annual average of 2.1 per cent growth in Real Income Per Capita during 2011-2019. But its economy is assumed to contract by -1.4 per cent annually during 2020-22. Thereafter, it is projected to manage only a dismal income growth rate of 0.3 per cent during 2023-30.

This pattern is projected to be similar for the recovery of the growth of Real Income Per Capita in **France** and **Germany**. While France grew each year by only 0.9 per cent during 2011-2019, it is assumed to contract yearly by -2.0 per cent during 2020-22. Similarly, while Germany grew by 1.5 per cent during 2011-2019, it is assumed to contract yearly by -0.3 per cent during 2020-22. During the recovery period of 2023-30, France's Real Income Per Capita is expected to grow at the meagre yearly rate of 0.2 per cent and Germany's RIPC by 1.0 per cent.

Table B2.Real Income Per Capita ($2015)
Business as Before - Annual Growth Rate
Nine Developed Economies (Percentage p.a.)

	2011-19	*2020-22*	*2023-30*
World	2.1	-0.6	1.6
United States	1.8	-1.4	0.3
Germany	1.5	-0.3	1.0
Australia	1.1	-1.0	0.3
Canada	1.0	-1.3	0.4
France	0.9	-2.0	0.2
Japan	1.2	-0.1	1.3
United Kingdom	1.1	-1.5	1.1
Korea (Republic of)	2.5	1.8	3.2
Russian Federation	1.3	-0.4	1.1

Japan, the **United Kingdom** and the **Russian Federation** are also expected to recover only slowly during 2023-30: Japan with a 1.3 per cent average yearly increase of Real Income Per Capita, the Russian Federation and the United Kingdom with a 1.1 per cent increase. However, the United Kingdom is projected to suffer a sharp drop in per capita income averaging -1.5 per cent per year during 2020-22—a decline only exceeded among these nine major economies by France.

Average yearly growth rates during 2023-2030 of Real Income Per Capita documented above for Developing and Developed Economies under the 'Business as Before' assumptions will serve as an underlying point of comparison for projected growth rates under our two 'Policy-Change' Scenarios: 1) a 'mainstream' **Market-Driven Decarbonization Scenario** and 2) a more progressive **Alternative Development Scenario**, which advances **Concerted Decarbonization** along with enhanced **Economic Development** buttressed by improved **Regional Cooperation** among Developing Economies**.**

Before we proceed with a description of the above two **policy-oriented** Global Scenarios, we utilize our **Business as Before Scenario** to sketch out the projected increases by 2030 as well as 2040 in **CO_2 Emissions** across both Developed and Developing Economies—in the absence, we stress again, of major new initiatives to achieve Decarbonization.

2.2 Projected Trends in CO_2 Emissions

The projected economic trends already highlighted by our Global **Business as Before Scenario** do not bode well for the mitigation of future CO_2 Emissions. We focus here on the results of this Scenario with regard to the projections to both **2030** and **2040** of CO_2 Emissions—and compare them to those for **2019** (see **Table B3**).

Note again that this **Business as Before Scenario** makes no assumptions about major changes in Environmental Policies beyond the continuation of present trends of energy savings and increased supply and use of cleaner sources. Later in this report we will explicitly compare and contrast these projected 'Business as Before' results for CO_2 Emissions to those achieved by a **Market-Driven Decarbonization Scenario** and our **Alternative Development Scenario**. These latter are geared explicitly to achieving real progress *towards* Global Carbon Neutrality by **2030 as well as achieving a global rate of progress by 2040 that would make feasible reaching Zero Carbon Emissions by mid-century**.

As a sharp contrast, our **Business as Before Scenario** highlights the possibility that CO_2 Emissions (expressed in million tons) would not, in fact, be reduced at the global level, even by 2040. Instead, without changes of direction of our **GPM** model projects an increase from 36,670 million tons in 2019 to 41,930 by 2030 and then a further increase to 45,870 by 2040.

Note that our modelling of CO_2 relies on the evidence of annual country-by-country time-series data calculated by the United States Oak Ridge National Laboratory. The figures cover estimated emissions from the burning of fossil fuels (coal, oil and gas) and from the manufacture of cement, which releases CO_2 into the atmosphere.

Also, these results do not net out activities that reabsorb CO_2 from the atmosphere and thus could help to achieve some progress towards carbon neutrality. But in any case, the global emissions statistics would have to be reduced to a relatively low level before the atmospheric concentration of CO_2 could even stabilize.

2.2.1 Developing Economies

Among Developing Economies, **China** is projected to show the largest increase in CO_2 emissions: they would rise, for example, from 11,540 million tons in 2019 to 14,330 million in 2030—or by 2,790 million tons. With a lower income level and slower growth, **India** (the second largest Developing Economy) is projected to increase its CO_2 Emissions by 590 million tons, i.e., from 2,600 million in 2019 to 3,190 million in 2030.

Table B3 also projects forward to **2040** with regard to each Developing Economy's expected CO_2 emissions. For example, **China** is projected to emit 16,100 million tons by 2040—a stark increase of 1,770 million tons with regard to 2030. In comparison, **India** would emit a further increase of 510 million tons—to 3,700 million—from 2030 to 2040.

Viet Nam, which is projected to grow rapidly over the next two decades, would more than double its CO_2 emissions—from 310 million tons in 2019 to 760 million tons in 2040. With slower growth, **South Africa** is projected to increase its CO_2 emissions by 2040 to 560 million tons from 490 million tons in 2019. The Latin American economies of **Argentina**, **Brazil and Chile** are all projected to increase their CO_2 emissions by 2040. Notably, **Brazil** is predicted to increase its emissions from 480 million tons in 2019 to 550 million tons in 2040.

It is worth noting here that many lower-income Developing Economies in Africa and South Asia actually make little use of fossil fuels and are thus already closer to being 'carbon-neutral' than higher income economies. The Democratic Republic of the **Congo** is a prime example, as are **Ethiopia** and United Republic of **Tanzania** (as shown for 2040 in **Table B3**).

Table B3.CO_2 Emissions
Business as Before - Growth Scenario
19 Major Developing Economies (million tons)

	2019	*2030*	*2040*
World	36,670	41,530	45,870
Argentina	200	210	230
Brazil	480	520	550
Chile	90	110	120
Mexico	490	500	520
Saudi Arabia	610	670	710
Iran (Islamic Rep. of)	700	790	830
Pakistan	220	320	390
India	2,600	3,190	3,700
Bangladesh	110	150	180
China	11,540	14,330	16,100
Viet Nam	310	540	760
Philippines	150	190	240
Indonesia	630	710	800
Egypt	260	320	370
Nigeria	100	120	130
Ethiopia	20	30	40
Tanzania (United Rep. of)	10	20	30
Congo (Democratic Rep. of the)	0	0	10
South Africa	490	520	560

2.2.2 Developed Economies

The trends in CO_2 Emissions among **Developed Economies** are projected to be somewhat different from those for **Developing Economies**. **Table B4** provides information for the CO_2 trends in **nine** of them. It is noteworthy that five are projected to increase or maintain their current level of CO_2 emissions up to 2040 (**United States, Australia, Canada, the United Kingdom** and **the Republic of Korea**). Four (**Germany, France, Japan** and the **Russian Federation**) are projected to marginally decrease their CO_2 emissions. **France** and the **United Kingdom** are noteworthy because they already have a relatively low level of emissions.

Table B4.CO_2 Emissions