Greenhouse gas mitigation scenarios for major emitting countries

Analysis of current climate policies and mitigation commitments: 2022 update

Executive Summary | **October 2022**

NEW CLIMATE INSTITUTE

PBL Netherlands Environmental Assessment Agency

International Institute for Applied Systems Analysis
IIASA

National GHG emissions

Our findings suggest that emissions are on the way to reach pre-pandemic levels. Of the 25 countries analysed, emissions under current policies have increased from 36.3-36.8 $GtCO_2e$ in 2020 to 37.2-38.1 $GtCO_2e$ in 2021; this translates to a rebound of 2.5-3.5% since the COVID-19-induced emissions dip observed in 2020. Recent estimates of global CO_2 emissions suggest a rebound of between 4.2% and 6.5% in 2021 (Davis *et al.*, 2022; Jackson *et al.*, 2022). Our values are lower partly due to the fact we include other GHG emissions, which are less affected by the short-term dip associated with lower activity levels. The upper end of our 2021 estimates of emissions under current policies overlap with historical 2019 emission levels (38.1-38.2 $GtCO_2e$).

Emissions under current policies in the group of countries analysed are projected to reach 36.2-41.7 $GtCO_2e$ by 2030, which corresponds to a change between -4% and +11% compared to 2019, pre-pandemic levels. The aggregated emission levels in 2030 have not substantially change since our 2021 update report. In 2021, we projected current policies to reach 36.5-42.4 $GtCO_2e$ by 2030. This finding suggests that countries remain far off track to meet the collective goals of the Paris Agreement, which require emissions to be 43% below 2019 levels by 2030 (G7 Germany, 2022). Additionally, the Paris Agreement stated the aim of reaching a global peaking of emissions as soon as possible. This has not happened before 2020 and is not projected to happen before 2025, which is needed to keep the long-term goals of the Paris Agreement according with the latest scientific consensus (IPCC, 2022).

In 2015, most countries committed to the global goal of peaking global emissions and reaching net-zero emissions before the end of the century when they ratified the Paris Agreement (UNFCCC, 2015). Any choice of base year results in bias towards some countries. For example, Japan and Indonesia have unusually high emissions in 2015. In Japan it results from the coal dash following the Fukushima accident and in Indonesia from the high yearly emissions associated with peat fires. Using 2015 as a base year, thus favours these countries. However, choosing earlier years, such as 1990 or 2005, disproportionately affects developing countries. In this report, we present emissions projections using 2015 as a base year for reporting and comparability reasons considering the adoption of the Paris

Agreement and the common goal by developed and developing countries alike to reduce their own emissions.

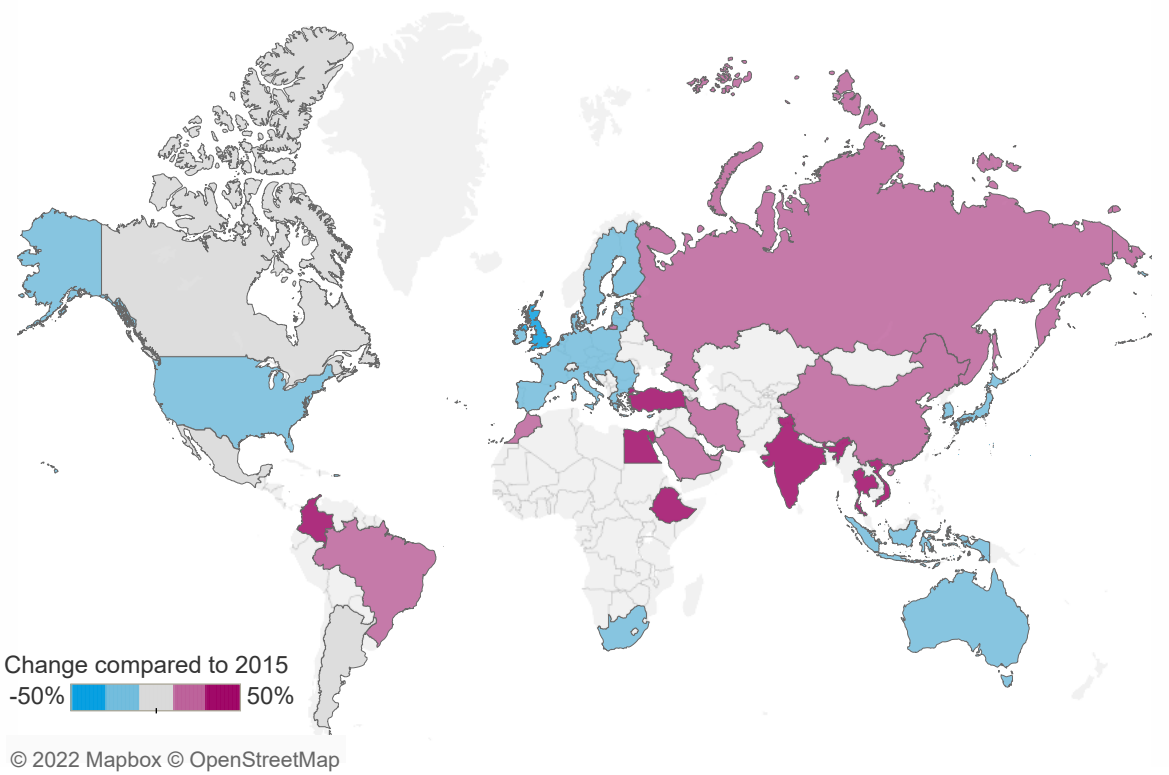


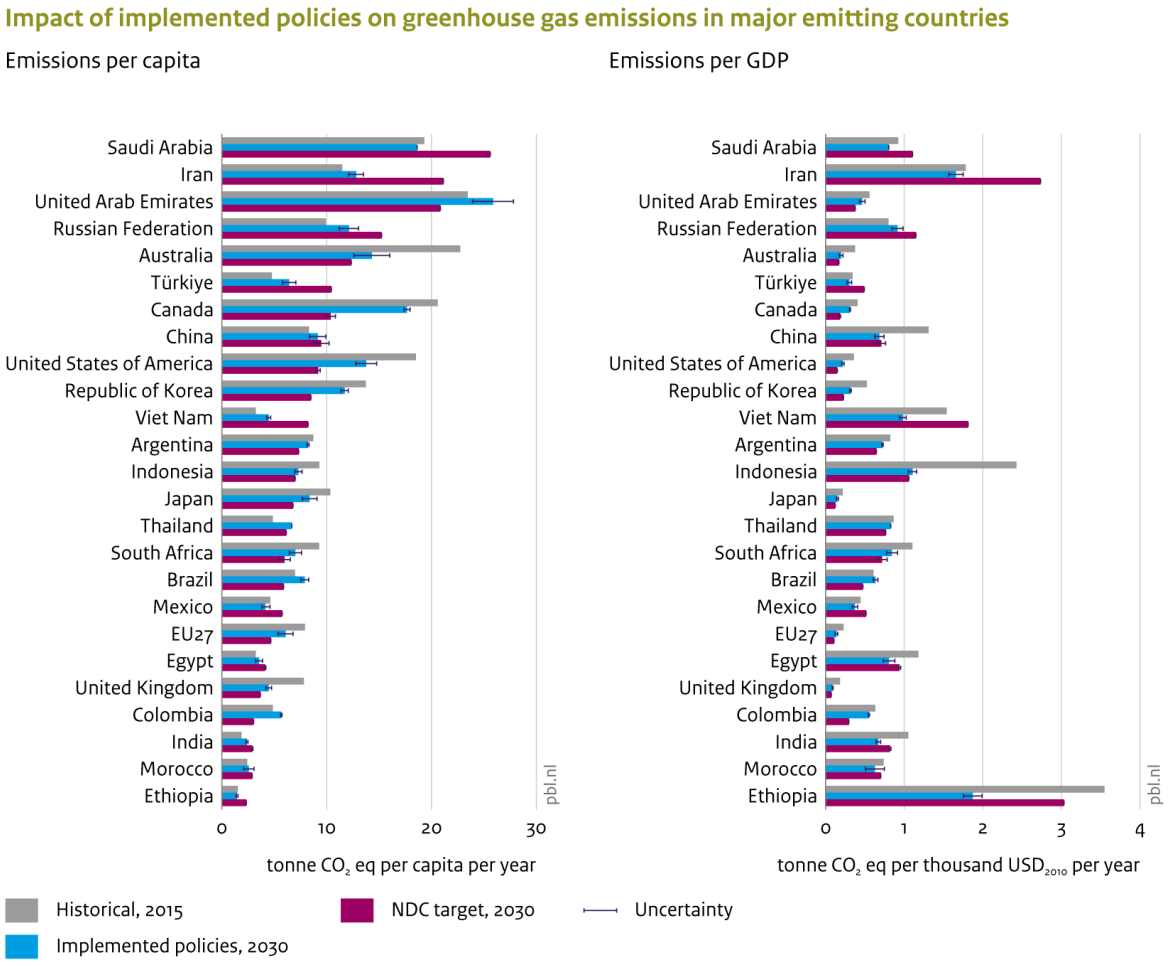
Figure 1: 2030 emissions under current policies compared to 2015 levels. The emissions coverage for GHG emissions is consistent with the scope of NDC targets (figure produced by authors).

Emissions under current policies are projected to remain above 2015 levels in most countries (16) analysed and range from a decrease of 40% to an increase of 70% between 2015 and 2030 (Figure 1). Of the 25 countries, the lower end of the 2030 economy wide GHG emission range is expected to be 4% below 2015 levels under current policies. Although the upper end of the emissions range still results in an increase of 11% in the same period. These key metrics remain mostly unchanged since our 2021 update report.

Nine countries have emissions projections below 2015 levels by 2030. Australia, the EU27, Japan and the UK all have projected in 2030 GHG emission reduction by more than 20% compared to 2015 values. These countries have multiple climate-relevant policies in place even though, in some cases, such as in Australia's, where their climate policy is largely driven by subnational commitments (Nascimento, Kuramochi and Höhne, 2022). Emissions in the United States are now expected to reach almost 20% below 2015 levels by 2030. This value will improve if the country implements the new Inflation Reduction Act to its full extent (Section 3.3). In Indonesia, emissions are roughly 10% lower than 2015 values in 2030, due to a peak in land-use-related emissions in 2015, economy-wide emissions in the country are still projected to increase between 2022 and 2030. In South Africa and the Republic of Korea, emissions are expected to be over 10% lower compared to 2015 levels. In the Republic of Korea, the Korean ETS drives a large share of the expected emissions reductions, while in South Africa, the expected reductions result from the planned decommissioning of the country's coal-fired electricity capacity. Emissions in Canada are marginally below 2015 levels by 2030. The continuation of Canada's policies to reduce emissions associated with fossil fuel exploration post-2025 could increase the level of emissions reductions in 2030. Together, these nine countries represent approximately one-third of global emissions in 2019 (Olivier and Peters, 2020; FAOSTAT, 2021).

The remaining 16 countries analysed have emissions in 2030 above 2015 values. In 2019, these countries were responsible for almost half of global emissions (Olivier and Peters, 2020; FAOSTAT, 2021). Considering the upwards emissions trend, these countries will probably represent an even higher share of emissions in 2030. Significant additional policies are required to curb their emissions. Emissions in Egypt, India, Türkiye and Viet Nam are projected to increase by approximately 50% between 2015 and 2030.

Emissions per capita also vary substantially across scenarios (Figure 2). In this section, we compare emissions under current policies to emissions associated with countries' unconditional NDC targets, except for Egypt, which only has a conditional target. Emissions per capita in Türkiye and Viet Nam are expected to more than double between 2015 and 2030 under the countries' NDC targets. While in Australia, Canada, United States, United Kingdom they are expected to fall by half in the same period. Average emissions per capita in both NDC and current policy scenarios are around 9 tCO_2e, and there is significant overlap between the distribution under both scenarios. Of the 25 NDC targets analysed the average per capita emissions in 2030 is expected to reach 8.8 tCO_2e per capita (range: 2.3 to 25.6 tCO_2e). Looking at current policies, this value is 8.9 tCO_2e (range: 1.4 to 25.9 tCO_2e). On average, this represents a reduction in comparison to historical 2015 values – 9.6 tCO_2e per capita (range: 1.5 to 23.5 tCO_2e). We observe a reduction in NDC target emissions since our last update but no substantial change in the current policies scenario in most countries.



Source: PBL FAIR/TIMER model; NewClimate Institute calculations; IIASA GLOBIOM/G4M model

Figure 2: GHG emissions intensity per capita and GDP in 2030 under current policies (adopted up until June 2022) and NDC scenarios and compared to 2015 levels (figure produced by authors). The NDC target figures refer to unconditional target, except for Egypt.

The variation in emissions intensity per GDP across scenarios is relevant in many countries (Figure 2). In both NDC and current policy scenarios, we project that emissions intensity of the economy will almost half in many countries: Australia, Indonesia, China, the Republic of Korea, the United States and the United Kingdom and the European Union. In several additional cases, NDC targets imply emissions intensity will be substantially lower than historical levels, such as in Colombia, Canada and Japan. Although in others NDC targets imply an extensive increase compared to historical levels, as is the case for Iran, the Russian Federation and Türkiye. The average emissions per GDP under the NDC scenario is expected to be approximately 0.8 tCO_2e per thousand USD_{2010} (range: 0.1 to 3.0). Under current policies, this value is 0.7 tCO_2e (range: 0.2 to 1.9 tCO_2e).

In our analyses of emissions per capita and per GDP indicators, the indicator range per country is driven by uncertainty in current policy emissions trajectories (Chapter 3). Both the minimum and maximum of the emissions ranges are based on the same population and economic growth forecasts.

Achievement of NDC targets

Few countries improved their NDCs since 2021 Glasgow call to update targets

During COP 26 in Glasgow, countries were invited to submit improved NDC targets because updated NDCs submitted remained insufficient to meet the collective goals of the Paris Agreement (UNFCCC, 2021; den Elzen *et al.*, 2022). However, out of the countries analysed, only Australia, Brazil, Egypt, India, Indonesia, the United Arab Emirates and the United Kingdom submitted new NDCs in 2022. In Egypt, India and Indonesia the updated NDC targets remain above current policy projections.

Brazil's NDC is an improvement in comparison to the target submitted in 2021 but still leads to higher emissions compared to the original 2016 NDC. This increase is a result from a revision in the emissions inventory and consequent change in emissions in the target base year. Egypt's NDC is the first to contain an emissions target. It presents emission reduction targets below BAU for difference sectors. However, these sectors represent only a fraction of the country's economy-wide emissions. The Egyptian target is also conditional on international support; Egypt did not submit an unconditional target. Both India and Indonesia submitted new targets in 2022. However, the impact of these targets is limited since they still result in emissions above our current policy scenario for the two countries. Australia and the United Arab Emirates are the only two countries analysed that submitted a NDC update targets in 2022 that result in emissions below their original 2016 target and below current policy projections. The United Kingdom NDC update adds information to the existing targets but does not lead to lower emissions compared the previous NDC. All targets are presented and discussed in detail in Chapter 3.

Out of the 25 countries analysed, eleven are on track and fourteen are off track to meet their current NDCs. Iran and Türkiye are yet to submit updated NDC targets.

Several countries analysed updated their NDCs between 2020 and 2022. Here, we compare these targets to the original NDCs submitted between 2014 and 2016 (Table 1). A country that was off-track to meet their original NDC target will be further off-track once it has set itself a more ambitious target, though full implementation of current policies and possible enhanced policies are expected to close this gap over time. Further action is still required in most countries analysed.

Eleven countries are on track to meet their current NDCs targets (Table 1). This number remains unchanged compared to our 2021 update report. However, there are some national differences. Brazil was on track to meet its targets but is now off track due to an increase in land use emission projections (section 3.3). Indonesia was on track to meet its NDC unconditional target but is now set to miss it due to an increase in land-use historical emissions (section 3.11). Mexico was close to meet its target and now is well on track due to revision in emission inventories (section 3.14). Egypt did not have a quantifiable target in our 2021 and is now on track to meet its NDC target (section 3.7).

Table 1 Progress towards meeting original (2015-2016) and latest unconditional NDC targets (as of September 2022). 'N/A' indicates that no target is available (table produced by authors).

	Updated NDC	On track to meet original NDC	On track to meet latest NDC
Argentina	Latest target leads to **lower** 2030 emissions	✓	✗
Australia	Latest target leads to **lower** 2030 emissions	✓	✗
Brazil	Latest target leads to **higher** 2030 emissions	✗	✗
Canada	Latest target leads to **lower** 2030 emissions	✗	✗
China	Latest target leads to **lower** 2030 emissions	✓	✓
Colombia	Latest target leads to **lower** 2030 emissions	✗	✗
Egypt *	Submitted emissions target for the first time	N/A	✓
Ethiopia **	Latest target leads to **lower** 2030 emissions	✗	✓
EU27	Latest target leads to **lower** 2030 emissions	✓	✗
India	Latest target leads to **lower** 2030 emissions	✓	✓
Indonesia	Latest target leads to **lower** 2030 emissions	✗	✗
Iran	N/A	✓	N/A
Japan	Latest target leads to **lower** 2030 emissions	✓	✗
Mexico ***	Latest target leads to **higher** 2030 emissions	✓	✓
Morocco	Latest target leads to **lower** 2030 emissions	✓	✓
Republic of Korea	Latest target leads to **lower** 2030 emissions	✗	✗
Russian Federation	Latest target leads to **same** 2030 emissions	✓	✓
Saudi Arabia	Latest target leads to **lower** 2030 emissions	✓	✓
South Africa	Latest target leads to **lower** 2030 emissions	✓	✗
Thailand	Latest target leads to **same** 2030 emissions	✗	✗
Turkey	N/A	✓	N/A
United Arab Emirates	Latest target leads to **lower** 2030 emissions	N/A	✗
United Kingdom	Latest target leads to **lower** 2030 emissions	N/A	✗
USA	Latest target leads to **lower** 2030 emissions	✗	✗
Viet Nam	Latest target leads to **lower** 2030 emissions	✓	✓

Submitted updated NDC
Did not submit updated NDC

* Here we consider progress towards Egypt's conditional target
** Ethiopia remains off-track to meet its conditional but on track to meets its unconditional target.
*** Mexico submitted a less ambitious target in 2020 but had to retract it as a result from a lawsuit. The current domestic target is the original NDC target.

Several of the countries on track to meet their targets have NDCs that result in 2030 emissions substantially higher than their current policies, which indicates that these countries can meet their targets without the adoption of any additional policies. The NDC targets that are substantially above the current policy scenario in 2030 belong to India (20%), Iran (40%), Mexico (30%), Russian Federation (20%), Türkiye (30%), Viet Nam (50%) and Ethiopia (40%).

Fourteen countries look set to miss their NDC targets: Argentina, Australia, Brazil, Canada, Colombia, the EU27, Indonesia, Japan, Republic of Korea, South Africa, Thailand, the UAE, the United Kingdom and the United States.

Brazil and Indonesia were on track to meet their targets in our 2021 report but are now off track. In both countries, we include new historical data related to land use, land-use change and forestry (LULUCF) emissions. In both countries historical emissions are substantially higher than estimated due to natural disturbances (such as peat fires) and an increase deforestation. The increase in historical LULUCF emissions has a substantial effect on these countries' ability to meet their own targets.

In some countries, missing the NDC target is a result of increased ambition. This is the case for Argentina, Australia, Japan, the EU27 and South Africa. These countries are on track to meet their previous targets but would miss their update NDCs since they lead to lower emissions in comparison to the previous one. The remaining countries are expected to miss both their previous and current NDC. They require considerably more stringent policies to meet their self-determined targets.

Iran and Türkiye have yet to submit updated NDCs. Both countries are on track to meet their original targets and could enhance and meet their NDCs without implementation of additional policies.

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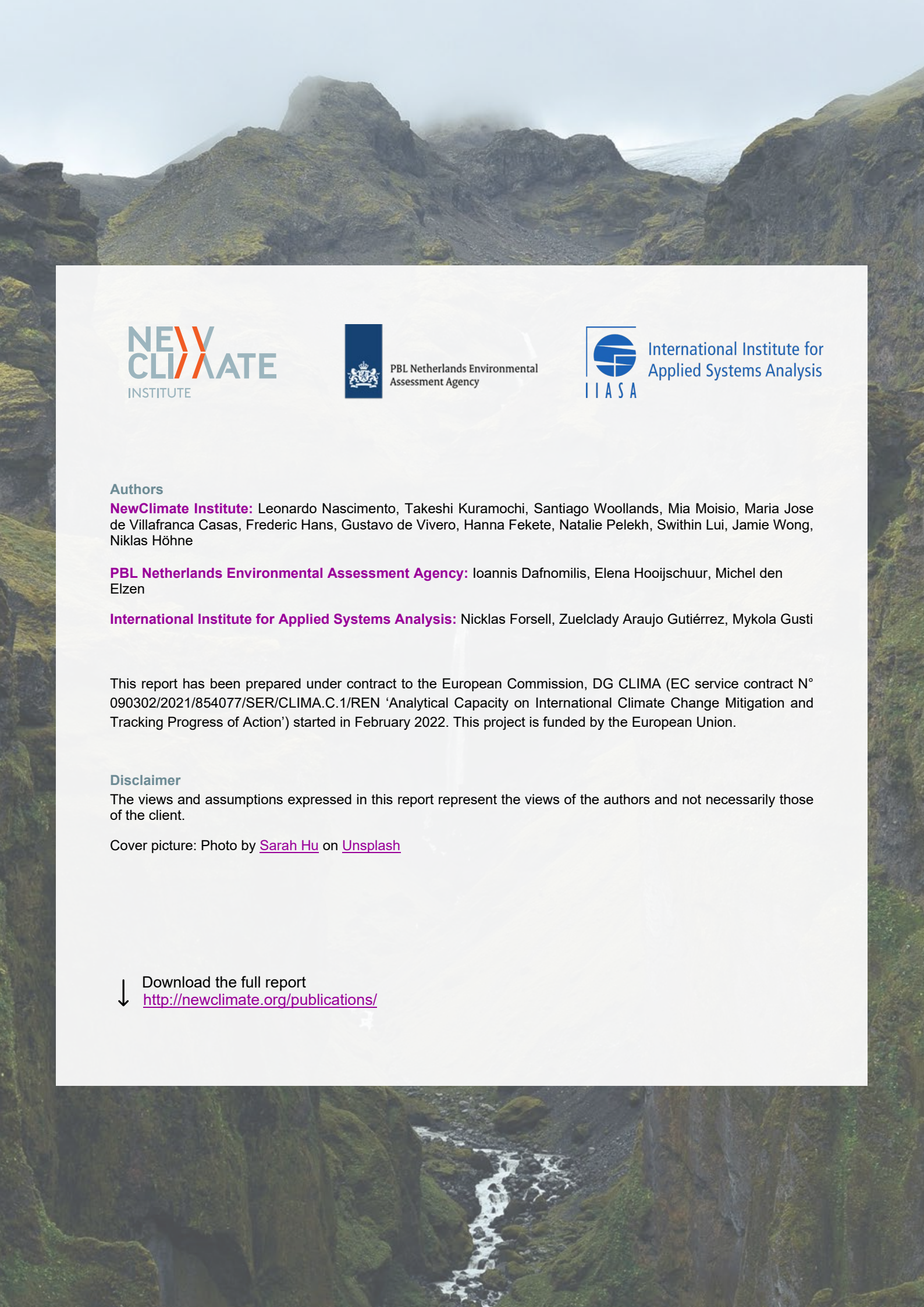

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