Climate Action Tracker

Scaling up climate action

Key opportunities for transitioning to a zero emissions society

EXECUTIVE SUMMARY

CAT Scaling Up Climate Action series

INDONESIA

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NEW CLIMATE INSTITUTE
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CLIMATE ANALYTICS

CAT Scaling Up Climate Action series

The Climate Action Tracker (CAT) strives to support enhancing climate action in the context of the Paris Agreement implementation. This analysis contributes to future revisions of mitigation targets, and aims at spurring an increase in climate mitigation actions, to close the gap between current emissions projections and required Paris-compatible pathways.

As part of this, we have been researching the potential for countries to scale up climate action in different focus areas. The analysis in this report is relevant to Parties considering revisions to their Nationally Determined Contributions (NDCs) to be submitted under the Paris Agreement by 2020, and also to their submission of long-term low greenhouse gas development plans, also due by 2020.

The result is our **Scaling Up Climate Action** country series, which identifies options for increased sectoral action that would move a country towards a pathway compatible with the Paris Agreement's long-term temperature limit and estimates the impact of those actions on emissions and other benefits.

The first round of our analysis covers South Africa, the European Union, Argentina, Indonesia, **Turkey** and **Australia**.

The consistent method and similar structure for all six reports allows for country-specific insights, while enabling a cross-country comparison to draw general research findings and lessons learnt on global potentials.

Executive summary

Introduction and objectives

Under the Paris Agreement, governments have committed to limiting temperature increase to well below 2°C above pre-industrial levels and pursuing efforts to limit it to 1.5°C. Current efforts are insufficient: aggregate mitigation targets for 2030, according to Climate Action Tracker (CAT) estimates, result in global warming of about 3.0°C. Implementation of the targets is falling short, with greenhouse gas (GHG) emissions under implemented policies leading to an estimated warming of around 3.3°C.

To stay below the globally agreed limit, the IPCC Special Report on 1.5°C finds that an increase in efforts is required to peak global GHG emissions as soon as possible and reduce CO_2 emissions to net-zero around 2050 and total GHG emissions shortly thereafter.

We no longer live in a world where climate change mitigation is a burden per se, but where it increasingly becomes the most feasible option when considering all socio-economic aspects. For cost-efficient global mitigation, it will be essential to make those mitigation actions accessible to, and overcome remaining barriers in, all countries.

This report, the fourth country assessment in the Climate Action Tracker's Scaling Up Climate Action Series, analyses three key areas where Indonesia could accelerate its climate action: electricity supply, passenger ground transport and forestry. The report illustrates GHG emissions reductions from such actions, along with other benefits for sustainable development.

Our analysis begins with an in-depth review of Indonesia's current policy framework and sectoral developments, comparing them with the policy packages and the sector indicators required under 1.5°C-compatible pathways.

We then focus on three areas we have identified that have a large potential to increase mitigation efforts: electricity supply, passenger road and train transport, and forestry. They were selected based on their share of GHG emissions and considering national and local circumstances. The CAT emphasises that other sectors must also take similarly ambitious actions to decrease economy-wide emissions in line with the Paris Agreement

Finally, we identify different options of accelerated climate action in each sector informed by insights from three categories of scenarios: (1) national research and country-specific studies (*national scenarios*), (2) practices implemented by regional or international frontrunners (*best-in-class scenarios)*, and (3) sectoral developments in line with the Paris Agreement's long-term temperature limit (*1.5°C Paris Agreement compatible scenarios)*.

	Scenario categories	Definitions
1	NATIONAL SCENARIOS	Scenarios based on national research and country-specific studies
2	BEST IN CLASS SCENARIOS	Scenarios based on practices implemented by regional or international frontrunners
3	1.5°C PARIS AGREEMENT COMPATIBLE SCENARIOS	Scenarios based on sectoral developments in line with the Paris Agreement's temperature limit.
4	CURRENT DEVELOPMENT SCENARIO	Baseline scenario used for comparison purposes. The scenario is based on the continuation of current trends and policies until 2050.

KEY FINDINGS

- Scaling up climate action in the electricity supply, passenger ground transport and forestry sectors, which together covered about 70% of Indonesia's emissions in 2014, would lead to curbing emissions growth and could achieve a 20% *reduction* in emissions below 2010 by 2030. This stands in stark contrast to the currently projected 58-68% emissions *increase* under Indonesia's Paris Agreement Nationally Determined Contribution (NDC). It would initiate Indonesia's transition towards zero emissions in line with the Paris Agreement and peak Indonesian GHG emissions excluding deforestation and land use shortly after 2030.

Electricity supply

- To bring Indonesia in line with the Paris Agreement and with full decarbonisation of the power sector by 2050 requires a share of decarbonised electricity generation of 50–54% by 2030, with no new coal plants and coal phased out by 2040. The most promising way to full decarbonisation is for Indonesia to prioritise developing renewables to make up a share of around 50% by 2030 and 100% by 2050. Such a pathway would deliver the greatest societal benefits and avoid large-scale early retirement of new coal-fired power plants.
- Decarbonising power is paramount to decarbonising other economic sectors. Electrifying Indonesian transport will only result in sufficiently large emission reductions when the domestic power supply is decarbonised.
- Ambitious climate policy in the Indonesian power sector can yield substantial employment benefits: development of solar PV will play a central role in a future low-carbon electricity system and our most ambitious renewables deployment scenario could create, on average, up to 290,000 additional direct jobs between 2020 and 2030.
- Job losses in the domestic coal supply chain (after 2025) are expected to be largely outweighed by additional new jobs in building and operating new renewables capacity. This shift will require preparation now to ensure a Just Transition.

Road and rail passenger transport

- As Indonesia's GDP grows, passenger transport demand is expected to grow substantially until 2030, by around 3% annually. Fuel economy standards, developing public transport and introducing electric mobility are key measures to start decreasing passenger transport emissions in the short term.
- Strong electrification of the passenger vehicle fleet, coupled with decarbonised electricity would enable decarbonisation of passenger transport and be in line with requirements of the Paris Agreement. Our most ambitious scenario assumes 100% electrification of the passenger vehicle fleet by 2050. Such an achievement would require going beyond, and sustaining, existing global best practices, e.g. the recent uptake of electric two-wheelers seen in China.
- These measures carry important co-benefits such as improving local air quality and reducing congestion in cities.
- Indonesia has a very ambitious biofuel blending policy. Biofuels could play a significant role in decarbonisation of the transport sector, although without additional measures related to governance and sustainability certification, palm oil biofuel production will continue to drive deforestation as oil palm plantations expand into Indonesia's primary forests.

Forestry

- Although ambitious interventions in all sectors are urgently needed to prevent fossil fuel lock-ins, the Indonesian forestry sector, with globally significant emissions peaking at 1.6 $GtCO_2e$ in 2015 (because of very high peat fires in that El Nino year), has the single largest potential for reducing domestic emissions.
- Indonesia can turn its forestry sector into a net sink of carbon emissions by 2030 if (1) it stops peat fires by 2020, (2) it drastically reduces or even phases out emissions from peat degradation via peat restoration by 2030 and (3) it ensures that emissions from deforestation are net-zero by rapidly reducing deforestation rates and reduce deforestation to almost zero by 2040, as well as mounting ambitious afforestation/reforestation programmes. This is more ambitious than Indonesia's NDC pledge under the Paris Agreement for the forestry sector.
- The 2015 peat fires in Indonesia have created political momentum to address this large source of emissions. But sub-national governments require more support to manage diverging interests among stakeholders, and land-swapping schemes for peatlands under concession require revisions to better meet all stakeholder needs. Its success would bring major co-benefits in avoided health impacts, environmental degradation and economic damage.

Sector transitions towards zero-carbon

Limiting global temperature increase to 1.5°C is highly relevant for Indonesia as, at 3% of global emissions (incl. LULUCF), it is among the world's largest greenhouse gas emitters and expected to be among the worst affected by climate change.

Recent research suggests that climate change has multiple adverse effects for Indonesia, including an increase in surface run-off, extreme low and high-river flows, severe droughts and at least 50 million people exposed to the effects of sea level rise. If it doesn't take sufficient domestic mitigation and adaptation measures, Indonesia will also suffer from more frequent forest and peat fires, which, besides emitting large amounts of greenhouse gases, are also an environmental and public health hazard.

Recent developments in Indonesia and projected trends cast doubt on whether Indonesia will achieve sufficient mitigation to meet the Paris Agreement long term temperature goal. If Indonesia continues on its current path without taking any further climate action, the country's GHG emissions are projected to double by 2030 from 2012 levels. This highlights the importance of decreasing the carbon intensity of key sectors to decouple CO_2 emissions from population and economic growth and reduce the country's dependence on carbon intensive fuels, in particular coal.

In recent years, measures to reduce GHG emissions have, in many cases, become more attractive globally to policymakers and private investors, both because of falling technology costs, as well as increased awareness of the negative impacts to be avoided and other positive benefits of mitigation measures such as air quality improvement and job creation from zero-carbon technology and infrastructure development.

In Indonesia, there is tremendous potential to scale up climate action, especially in the focus areas of this study: electricity supply, passenger transport, and forestry.

Increasing climate action now would initiate technically-feasible and socio-economically beneficial sectoral transitions towards a zero-emissions society while directly benefitting Indonesia's sustainable development agenda.

Our findings confirm that ambitious decarbonisation efforts in the Indonesian electricity supply, passenger transport and forestry sectors would significantly reduce greenhouse gas (GHG) emissions while simultaneously fostering co-benefits such as job-creation, reducing air pollution, reducing peat fires, conserving biodiversity, reducing traffic congestion in urban centres, promoting resource independency and increasing electrification of remote areas.

Electricity supply

To meet the Paris Agreement temperature goal, coal-based **electricity** generation is expected to halt its current expansion and then be reduced drastically. But in in the coming decade in Indonesia, power demand is expected to double, and additional capacity to meet such demand is planned to be predominantly based on coal-fired power stations from domestic coal production, completely at odds with the Paris Agreement.

Such plans are mainly due to recently-strengthened efforts to reduce fuel imports and become more energy independent. Other influencing factors are (1) the importance of revenues from coal mining in the state budget and for provinces, (2) the dominance of incumbents, and (3) the significant new funding for fossil fuel infrastructure that is being channelled to Indonesia by major Asian economies such as Japan, South Korea and China.

A swift energy transition in Indonesia is essential to be compatible with effort levels required to limit global warming to 1.5°C below pre-industrial levels. This will require a major trend shift. Additional power capacity needs to meet rapidly rising electricity demand represent both a challenge and an opportunity: by supporting the development of renewables (which are increasingly becoming cheaper than coal), Indonesia can develop more resilient grids and reduce air pollution.

Besides showing that the energy transition required to limit warming to 1.5°C will have significant benefits for access to clean and affordable energy and poverty eradication goals, the IPCC Special Report on 'Global Warming of 1.5°C' also re-emphasised that globally, coal needs to exit the power sector by 2050, a finding that has important implications for short and medium-term policy in Indonesia to avoid a high risk of stranded assets.

Indonesian research organisations' scenarios (referred to as the "national scenario" in this report) with the highest shares of renewables in the power supply foresee the potential for the share of renewable electricity to rise to 74% by 2050, and GHG emissions for electricity generation to drop by up to 66% below 2012 levels in 2050.

However, our analysis suggests that to be Paris Agreement-compatible and reach complete decarbonisation by 2050, the most promising option is to fully transition the electricity sector to 100% renewable sources. Indonesia is well-endowed with a range of renewable energy sources, while deployment of nuclear power or fossil fuels with CCS is highly unlikely, and not considered a realistic option to decarbonise electricity generation.

Other alternative low-carbon technologies are not expected to compete economically with renewable energy and storage where costs are falling and are expected to continue to fall. Renewable energy also presents large co-benefits related to economic development and health.

On the way to 100% renewable power in 2050, Indonesia should aim for 50% renewables in the fuel mix by 2030. This is a much higher share than the 20% by 2027 currently envisaged in the ten-year plan published in 2018 by Indonesia's state-owned transmission system operator, Perusahaan Listrik Negara (PLN), and the 23% by 2025 targeted by the government in the Electricity Supply Business Plan (RUPTL)[1]. Aiming for 50% renewables by 2030 would imply replacing the 27 GW of additional coal-based electricity generation planned in the next ten years with new variable renewables (especially solar PV and wind) as well as upgrading the grid

[1] In March 2019, the 2019 RUPTL was published. This was beyond the cut-off date for this report, but the Electricity Supply Business Plan shows similar levels of renewables deployment as that of the year before. Total coal capacity additions are similar as in previous plans, however the 2019 RUPTL frontloads coal capacity additions to the next years.

infrastructure. This implies a peaking of power sector emissions around 2025, representing a reduction of 20% below current policy projections by 2025.

To achieve such a transition, Indonesia would need to reduce its reliance on coal, and stop building new coal fired power generation to avoid the challenge of stranded assets, as coal would have to be phased out for power generation by 2040. This transition would have to be carefully managed to address the current importance of the sector for revenues at regional and local level.

Existing regulations, buoyed by fossil fuel interests, are too weak to stimulate the uptake of the vast renewable power potential in Indonesia. Increasing investor confidence by revising regulations on renewables' support would be a good first step. Recent changes to risk allocation in power purchasing agreements and to the feed-in-tariff scheme have had a negative impact on investors' ability to plan. The transition would imply fewer jobs in the coal industry, but this would be more than compensated by more jobs in renewables (see below).

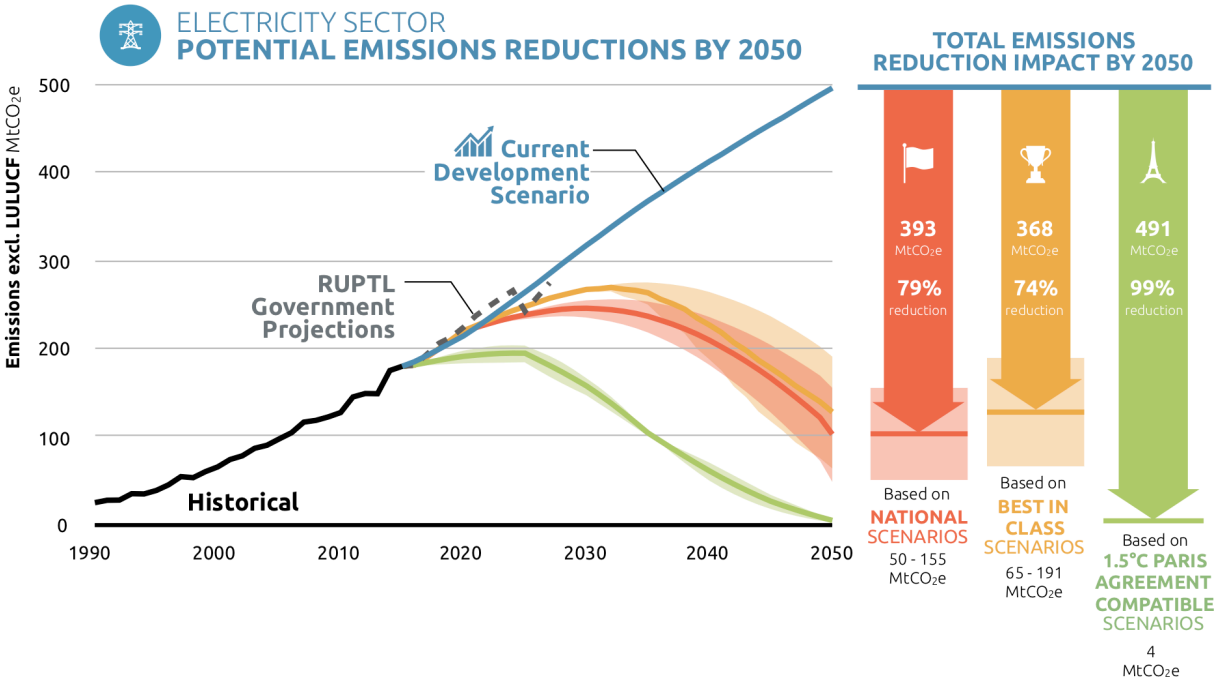


Figure 1: Overview of sectoral emission pathways in the Indonesian electricity sector under current policies and different levels of accelerated climate action. The projected electricity demand also considers accelerated climate action in the Indonesian passenger transport sector. All sectoral historical emissions and projections towards 2050 are analysed in the CAT PROSPECTS Indonesia scenario evaluation tool.

Passenger road and train transport

In a country with expected high economic and urbanisation growth, **passenger transport** is another sector key to achieving the Paris Agreement target. Growth in transport-related fossil energy demand will negatively impact emissions, but also comes with other challenges such as health impacts and congestion, especially in the country's growing cities.

There is significant potential for national and sub-national actors to accelerate climate action by successfully decarbonising key sub-sectors such as passenger transport. Road and train transport systems can be transitioned through the implementation of public mass transport (e.g. bus Mass Rapid Transport system in the Jakarta region or measures to limit the number of cars in city centres) and the electrification of all vehicles (mainly cars, buses and two-wheelers but also

trains such as the long distance high speed railway project being developed between Jakarta and Bandung).

Our analysis shows that short-term measures - such as fuel standards and development of public transport - are key to balancing the expected rapid growth in transport demand due to motorisation and economic/demographic growth. Indonesia also has a very ambitious 2025 biofuel blending policy, explaining the shape of the curve of the national scenario in the figure below.

Biofuels could play a significant role in decarbonisation of the transport sector, but palm oil biofuel production is causing adverse effects as it has been a driver of deforestation, with oil palm plantations expanding into primary forest in Indonesia. Additional measures related to governance and sustainability certification are required for the biofuel mandate to have a positive environmental and climate impact. If such measures are taken, biofuel blending growth could be extended until 2030 in most ambitious scenario.

Incentive programmes for hybrid vehicles and Indonesia's potential ban on fossil-fuel car sales by 2040 are a first step on the path toward achieving transport sector decarbonisation. To achieve the required level of emissions reductions in the long term, strong electrification of the passenger vehicle fleet is needed starting today. This means going beyond, and sustaining, existing global best-in-class examples (e.g. historical electric cars development in Norway or recent uptake of electric two-wheelers in China) which our assessment shows could achieve 65 to 80% emissions reduction in 2050 compared to the Current Development Scenario.

Electric vehicles also have the potential to provide flexibility to the power sector and therefore also help in the integration of additional variable renewable capacity. Electrification will also help to decrease the reliance on oil imports and achieve important benefits for sustainable development by reducing air and noise pollution as well as congestion impacts in Indonesia's growing cities.

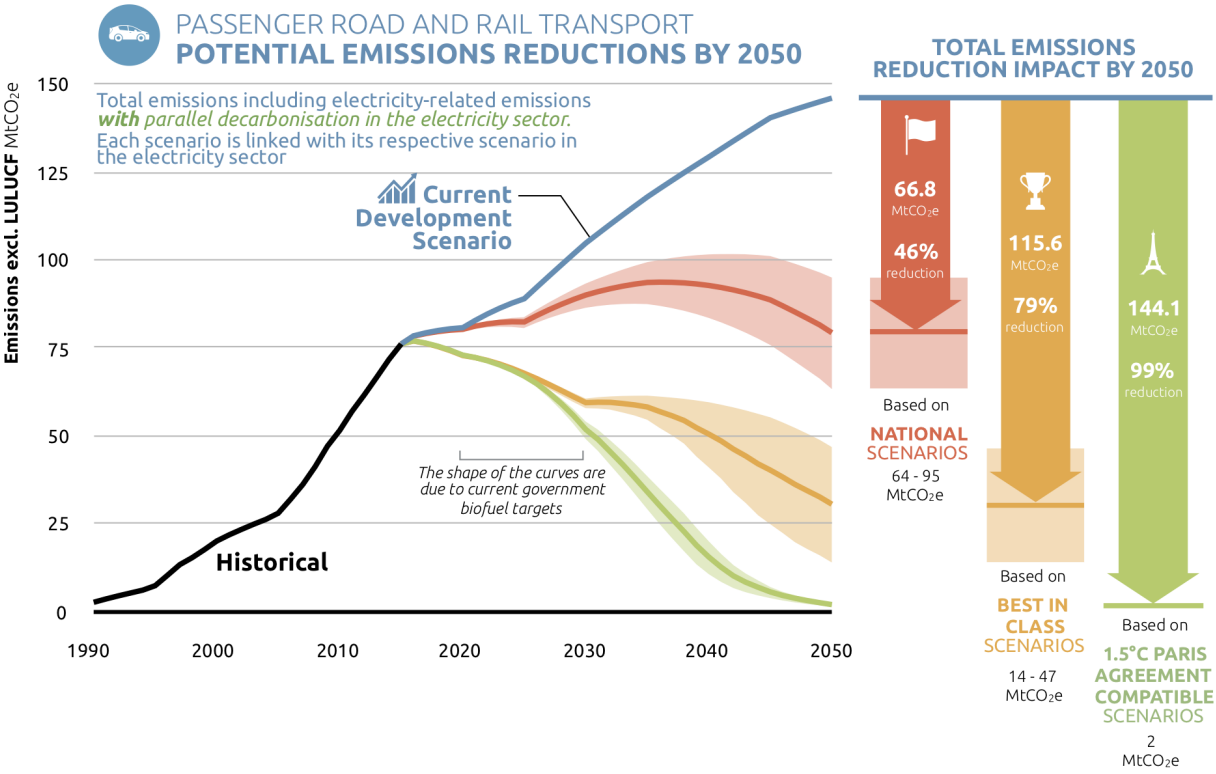


Figure 2: Overview of sectoral emission pathways under current policies and different levels of accelerated climate action in the passenger transport sector. All historical data and sectoral projections towards 2050 are from the CAT PROSPECTS Indonesia scenario evaluation tool. Values includes electricity related emissions.

Forestry

Indonesia is one of the world's largest emitters of Land Use, Land Use Change and Forestry (LULUCF) emissions, mainly as a result of deforestation for agricultural expansion on carbon-rich soils. Devastating peat fires also add to these emissions. Therefore, the sector probably has the largest potential for reducing domestic emissions, although interventions in all other sectors are urgent, to prevent fossil-fuel lock-ins, especially given that the rest of the economy is expected to see higher emissions over the coming decades than projected for the forestry sector.

To meet the future demand for palm oil, the Government of Indonesia has set a target to double the production of palm oil by 2020 (compared to 2012), to 40 million tonnes of crude palm oil, and this is expected to increase to eight times this level in 2050 under business-as-usual.

In 2018, President Widodo introduced a moratorium on new oil palm development across the country. Depending on the extent to which forest governance and existing regulations can be successfully executed and sustained, emissions from the forestry sector could therefore either be significantly underestimated or overestimated compared to the baseline considered in this study.

Other key levers to reduce emissions in this sector include stopping peat fires, rapidly reducing deforestation rates and restoring degraded peatlands, which can also reduce their susceptibility to the devastating peat fires that Indonesia has experienced in recent years.

Our Paris Agreement-compatible scenario for the Indonesian forestry sector is based on the 1.5°C pathway from the GLOBIOM model. Under this scenario, emissions from the forestry sector would decrease to zero by 2027 and turn into a net sink of CO_2 emissions before 2030. In the short term, scenarios developed by the Indonesian government follow even more ambitious pathways. If those scenarios were extended beyond 2020 and effectively implemented, Indonesia's forestry and peatland related emissions would be Paris-compatible.

Even in the longer term, the best-in-class scenario achieves equal or lower emissions than the Paris Agreement-compatible scenario, which provides strong evidence for feasibility of the Paris-compatible scenario.

To achieve the emission cuts in the Paris Agreement-compatible scenario, it is crucial that the moratorium on peatland deforestation remains and is strictly enforced. Deforestation should be reduced to almost zero by 2040, in combination with strong afforestation and reforestation programmes to still enable net deforestation emissions to be zero by 2030.

The remarkable achievements the Peatland Restoration Agency made in 2017—which saw a 60% reduction in deforestation and significant progress made on peatland restoration—should continue until emissions from deforested peatland are fully mitigated before 2030. Indonesia should extend the existing moratorium on new licenses for palm oil and mining concessions which, together with effective land swapping schemes, are seeing peatlands being excluded from future expansion of palm oil plantations. The momentum that increased significantly since the large 2015 peat fires in Indonesia should be used to halt emissions from peat fires by 2020, which would limit severe damages to the economy, public health and the environment.

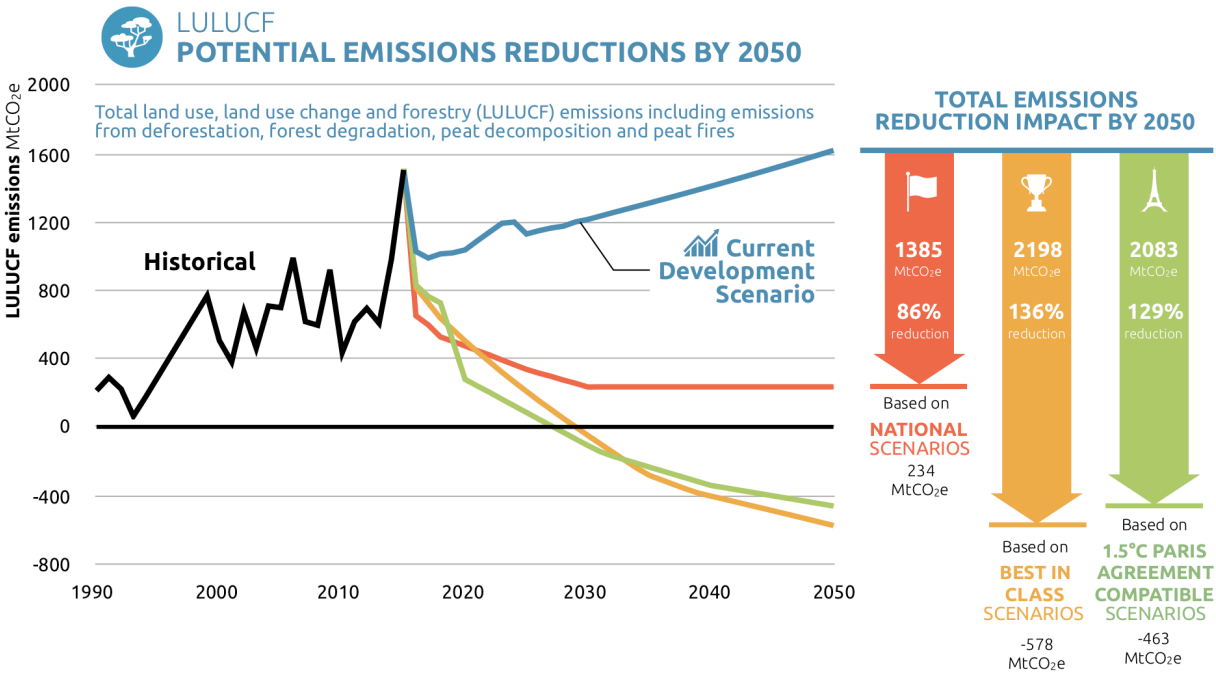


Figure 3: Overview of sectoral emission pathways under current development and different levels of accelerated climate action in the forestry sector, including emissions from deforestation, forest degradation, peat decomposition and peat fires. Historical data are from Indonesia's 1st Biannual Update Report (2015), and emission projections towards 2050 were done in a separate CAT forestry scenario evaluation tool

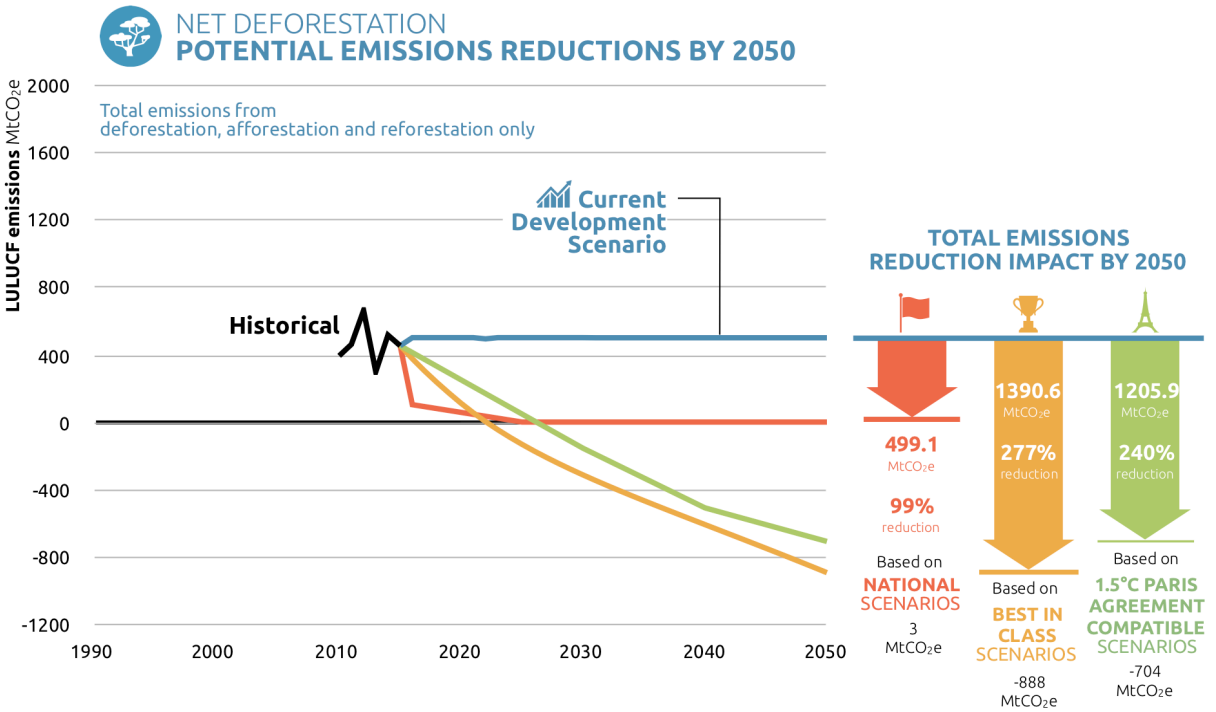
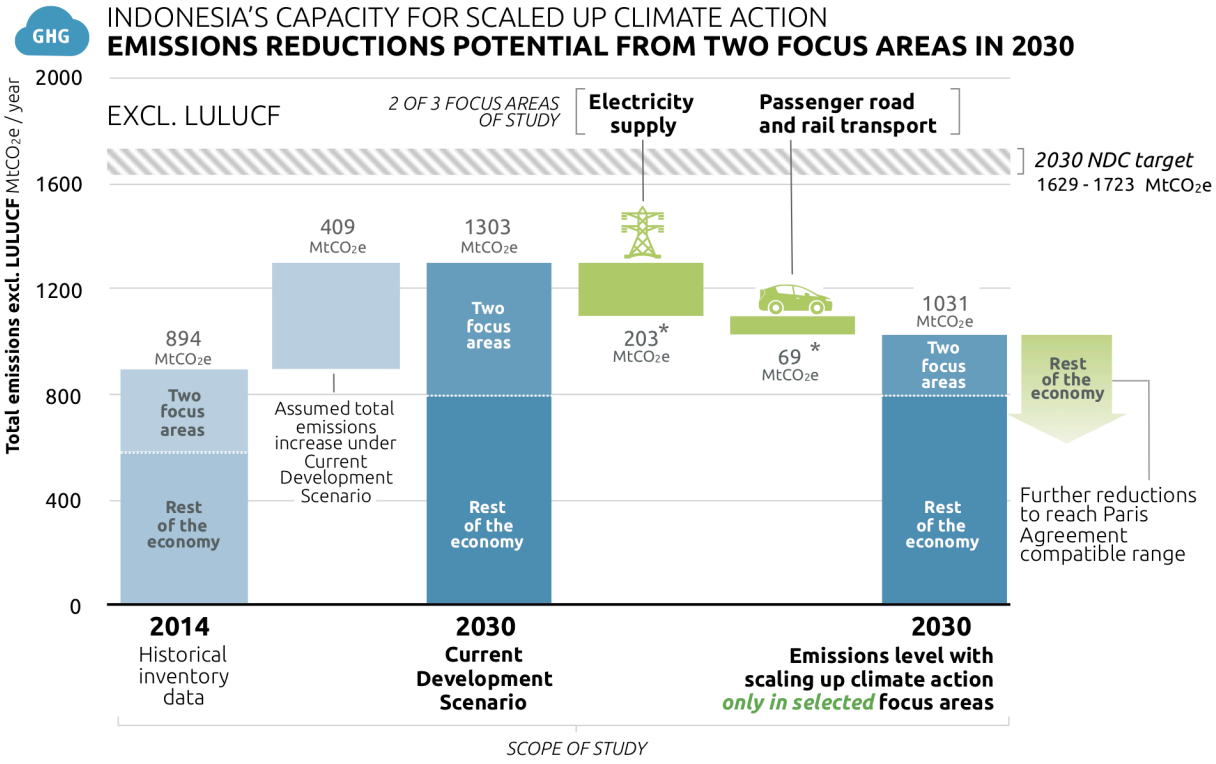


Figure 4: Overview of emission from deforestation, afforestation and reforestation only under current development and different levels of accelerated climate action Historical data are from Indonesia's 1st Biannual Update Report (2015), and emission projections towards 2050 were done in a separate CAT forestry scenario evaluation tool. Note that emissions in the upper graph are harmonized with emissions from Indonesia's GHG inventory, and that therefore emissions from deforestation are higher in this dataset compared to the data showed in the upper graph.

Accelerated climate action and Indonesia's emission reduction target

Under current developments, and without further action, Indonesia's GHG emissions are projected to double by 2030, mainly driven by population growth and addressing growing energy demand with increased use of carbon-intensive fuels. As highlighted above, Indonesia already has policies to support climate action in some sectors, but aligning with the Paris Agreement's 1.5°C limit will require more action in all sectors.

Scaling up climate action in the three key areas, electricity supply, passenger transport, and forestry (which cover about 70% of Indonesia's current emissions), could initiate the required transition and peak Indonesian greenhouse gas emissions shortly after 2030 (excl. LULUCF).



* Emissions reductions from electricity use in the passenger road and rail transport sector are allocated as emissions reduction in that sector

All emissions shown in this figure have been harmonised to fit with historical inventory data

Figure 5: Overview of emissions levels excluding LULUCF under different scenarios for two focus areas. All electricity-related emissions reductions from the transport sectors are allocated as emissions reductions in the end-use sector.

Taking into account LULUCF emissions, Indonesia could achieve a reduction of up to 20% below 2010 levels through actions in these focus areas alone by 2030. Such reduction would significantly overachieve currently projected 58-68% emissions increase in 2030 under Indonesia's conditional and unconditional Paris Agreement NDC targets.

Figure 6 summarises the various scenarios assessed in the study and highlights the key policy recommendations that would support the required level of climate action in the three sectors of focus.

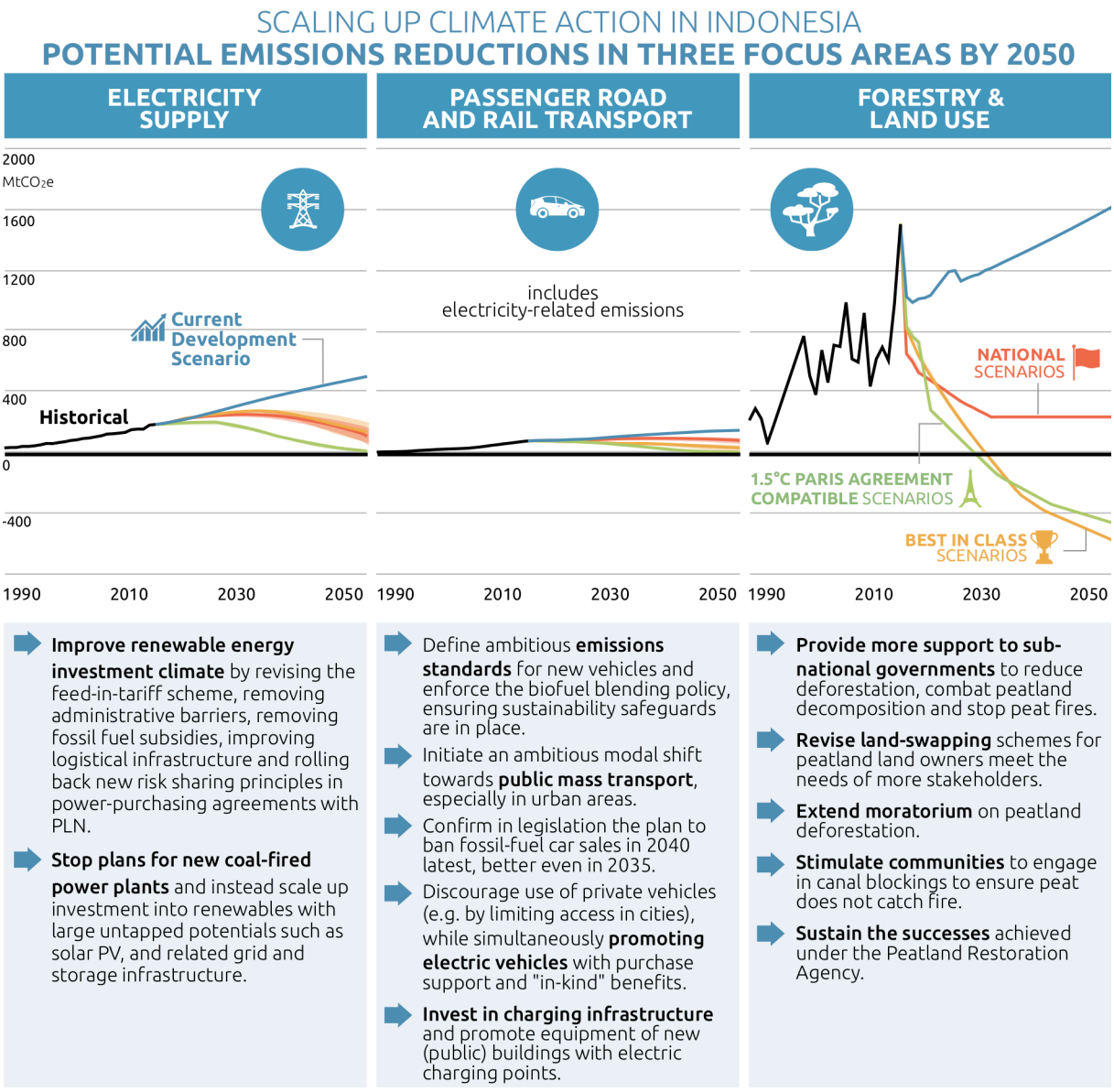


Figure 6: Overview of actions to manage the transition to a Paris-compatible pathway in Indonesia's three key sectors.

The status of sectoral transitions: opportunities for accelerating climate action

The transitions towards zero-emissions in the Indonesia electricity supply, urban passenger transport, and forestry sectors have all shown slow progress or have barely begun. Given the status of the policy activities in the three focus sectors, more accelerated and stringent climate action is required to initiate meaningful sectoral transitions. Given the existing significant political barriers to be dealt with, this represents a real challenge for the country.

Table 1 is an overview of this study's evaluation of the current state of policy activity for the three sectors compared with sector-specific benchmarks. These benchmarks represent the most important short-term steps for limiting global warming to 1.5°C identified by the Climate Action Tracker (Kuramochi et al., 2018). The full results of this analysis for all sectors are detailed in Chapter 2 of the report.

*Table 1: Summary table for sectoral policy activity and gap analysis in Indonesia for electricity supply, passenger transport and forestry sector. 1.5°C consistent benchmarks relate to most important short-term steps for limiting global warming to 1.5°C identified by the Climate Action Tracker **(Kuramochi et al., 2018)**. Percentages in the first column indicate the share of national GHG emissions in 2012, calculated based on the Biannual Update Report of 2015.*

Sector	1.5 °C-consistent benchmark	Overall evaluation based on policy activity and gap analysis	Policy rating
Electricity supply sector (12% of GHG emissions)	*Sustain the global average growth of renewables and other zero and low-carbon power until 2025 to reach 100% by 2050*	• Renewable power generation in Indonesia is expected to increase four-fold by 2025 compared to 2016. Given electricity demand will double over this same period, renewables will account for less than a quarter of the power mix in 2025 (up from 11% 2015). This is not in line with a transition pathway to 100% low-carbon by 2050. • There is significant untapped potential for renewable electricity generation, especially based on the large solar resources, and in most regions the costs of rooftop PV have dropped below the national average generation cost. • Policy stability for solar PV is critical for realising this potential. Although many regulatory changes have been made in the past years, administrative barriers still prevail.	
	No new coal plants, reduce emissions from coal power by at least 30% by 2025	• 27 GW of new coal-fired power capacity is expected to come online in the coming decade. The 2018 revision of the RUPTL sees the share of coal-fired power increase to 58% by 2027 instead of the 52% reported one year earlier[2]. • Indonesian power sector CO_2 emissions are projected to increase from 220 $MtCO_2$ in 2018 to 366 $MtCO_2$ in 2027 (+66%), primarily due to the growth in coal-fired power generation—87% of these emissions are expected to come from coal.	
Passenger transport (8% of GHG emissions)	*Last fossil fuel car (or personal vehicle) sold before 2035*	• A Low Carbon Emission Vehicle (LCEV) programme is under development where hybrid vehicles will be incentivised financially. Indonesia is considering a ban on fossil-fuel car sales from 2040 onwards. • *A strong biofuel mandate supports decarbonising internal combustion engines, though sustainability concerns around deforestation first need to be urgently addressed.* • Two-wheelers are the most popular form of personal transport across Indonesia. A transition to zero-carbon two-wheelers is therefore crucial, and current plans for electrification (less than 3% in 2030) are not sufficient to meet the benchmark. • Indonesia is developing a large long distance highspeed railway system between Jakarta and Bandung and a metro infrastructure in Jakarta, helping to cope with expected increase in overall travel demand.	

2 In March 2019, the 2019 RUPTL was published. This was beyond the cut-off date for this report, but the Electricity Supply Business Plan shows similar levels of renewables deployment as that of the year before. Total coal capacity additions are similar as in previous plans, however the 2019 RUPTL frontloads coal capacity additions to the next years.

Forestry (53% of GHG emissions)	*Reduce emissions from forestry and other land use to 95% below 2010 by 2030, stop net deforestation by 2025*	• In 2015, Indonesia lost more than 700,000 hectares of forest, (from the very high peat fires in that El Nino year). The net-zero deforestation target is unlikely to be met by 2025 under current conditions. • 2017 saw a 60% reduction in deforestation, in part due to the moratorium on peatland drainage. Significant progress was made on peatland restoration, as a part of the Peatland Restoration Agency's initiative of restoring 2.4 million hectares of peatland by 2025. • There is significant momentum in Indonesia to address peat fires, although sub-national governments require more support for sustainable development. Land-swapping schemes for peatlands under concession require revisions to better meet all stakeholders' needs.	Ambitious Plan

Co-benefits of upscaled climate action: employment

Accelerated climate action in Indonesia can generate significant socio-economic co-benefits. Various studies have demonstrated the significant positive impacts of a low-carbon economy on local air pollution reduction (through expansion of non-biomass renewables), economic growth (through local development of innovative, zero-carbon technologies such as solar panels and electric vehicles infrastructures) and energy security for isolated islands.

Our assessment indicates that, with the right policies to support the required transition in some sectors, increasing the renewable energy share in the electricity sector would also yield substantial employment benefits for Indonesia. In all the CAT 'Scaling Up Climate Action' scenarios, the total number of direct jobs in the electricity sector from 2020 to 2030 is higher than the estimated total jobs in the current development scenario.

We find that the most ambitious scenario in terms of emissions reductions also yields the highest employment benefits over time, with an average potential of up to more than 290,000 additional direct jobs compared to current developments over the period 2020 to 2030.

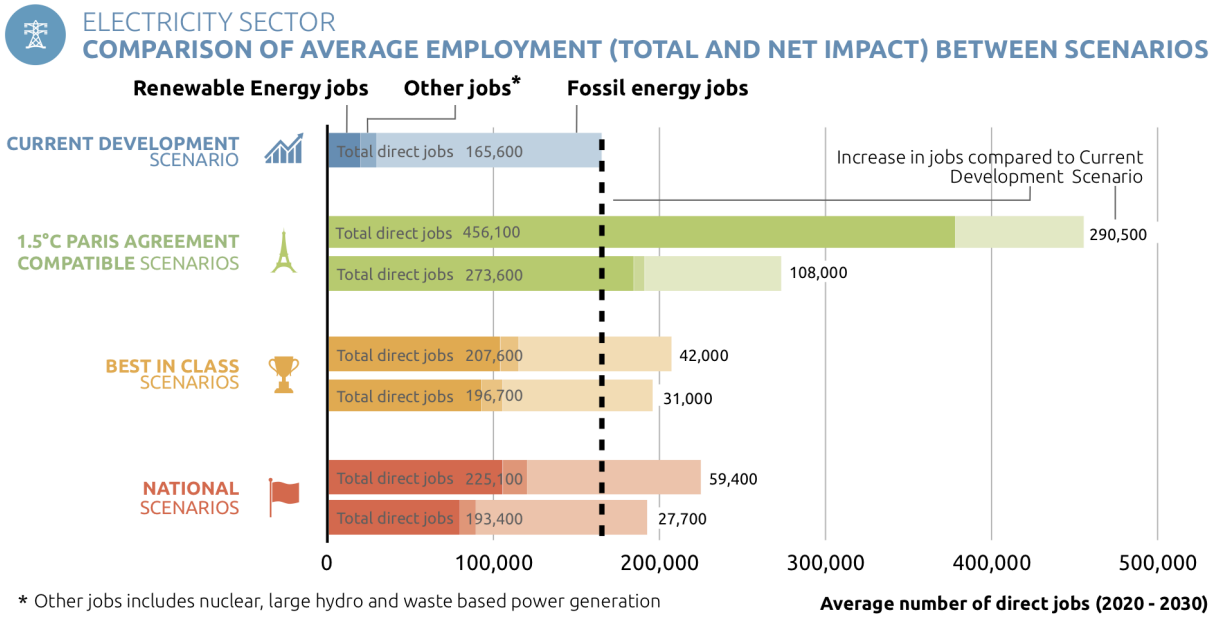


Figure 7: Average direct employment (FTE) impact between 2020 and 2030 in Indonesia per technology for different electricity generation scenarios. Shown is the estimated total direct jobs in the electricity sector averaged over the period 2020 to 2030, in the scenarios analysed in this study. The respective net direct employment impact compared to the reference scenario is also shown for each analysed scenario.

In terms of technologies, solar development is playing a central role in the future low-carbon electricity system of the most ambitious scenario, potentially representing an average of more than 360,000 jobs over the period 2020 to 2030.

By contrast, the scenario assumes that coal capacity will remain capped at its current level until 2025 and will reduce rapidly afterwards. This is key to remaining within the objective set by the Paris Agreement and avoiding high risks of stranded coal assets. While such rapid development could negatively impact local coal mining jobs, we also find the loss will be largely outweighed by additional new jobs in the building and operation of renewables in the long term.

This would give the domestic coal supply sector around five years to adapt and implement a "just transition" towards renewables. The potential impact on coal export-related jobs (e.g. if the rest of the South-East Asia region also moved towards a coal-phase out) has not been included in the analysis.

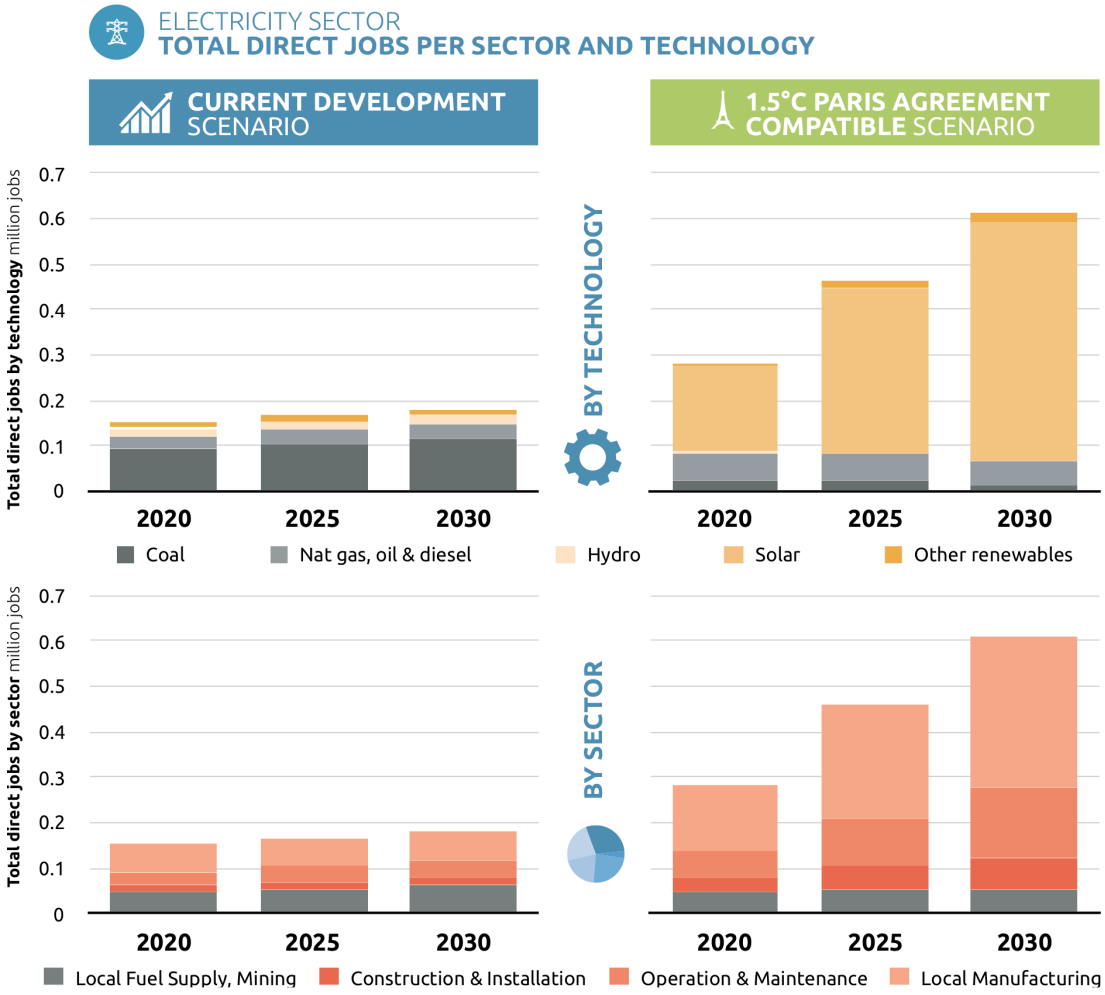


Figure 8: Total direct jobs per generation technology and total direct jobs per employment sector for the Current Development scenario (graphs on left) and the 1.5°C Paris Agreement compatible scenario (graphs on right) for the electricity supply sector. Note: 'other renewables' comprises of wind, biofuels, geothermal, marine and waste.

In the most ambitious scenario, more than half the jobs will be related to the construction and the installation of new power generation, mainly around the large amount of additional renewable capacity to be installed in the decade to come. In this scenario, it is also expected that many additional long-term and high-skilled jobs related to operation and maintenance of renewable plants will be generated.

Our analysis does not include the expected positive impacts on local and high skilled jobs in the development of electricity transport and distribution needs in the most ambitious scenarios.