

Meeting Paris climate targets will require a substantial reallocation of global investment

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A new analysis by an international team of scientists led by IIASA shows that low carbon investments will need to increase markedly if the world is to achieve the Paris Agreement aim of keeping global warming well below 2°C.

The authors find that a fundamental transformation of the global energy system can be achieved with a comparatively modest increase in overall investments. However, a radical shift of investments away from fossil fuels and toward renewables and energy efficiency is needed, including dedicated investments into measures to achieve the United Nations' Sustainable Development Goals (SDGs).

As part of the Paris Agreement in 2015, many countries defined Nationally Determined Contributions (NDCs) designed to reduce their greenhouse gas emissions. The study confirms that current incentives like the NDCs will not provide sufficient impetus for the "pronounced change" in investment portfolios that are needed to transform the energy system.

To keep global temperature rise to 1.5-2°C,

investments in low carbon energy and energy efficiency will likely need to overtake investments in fossil fuels as early as 2025 and then grow far higher. The low carbon and [energy efficiency](#) "investment gaps" calculated by the researchers are striking. To meet countries' NDCs, an additional US\$130 billion of investment will be needed by 2030, while to achieve the 2°C target the gap is US\$320 billion and for 1.5°C it is US\$480 billion. These investment figures represent more than a quarter of total energy investments foreseen in the baseline scenario, and up to half in some economies such as China and India.

The researchers point out that energy system transformation investments to reduce greenhouse gases are an order of magnitude greater than those required to meet other SDGs, such as for energy access, clean water, air pollution, food security, and education.

"We know that limiting global temperatures to well below 2°C demands that renewables and efficiency scale up rapidly, but few studies have calculated the energy investment needs for a fundamental system transformation, at least not with an eye toward 1.5°C and using multiple scientific modelling frameworks running side-by-side," says IIASA researcher and lead author of the study David McCollum.

The six scenario modelling tools used by the researchers, so-called integrated assessment models, are often employed to evaluate the costs, potential, and consequences of different energy, climate, and human development futures over the medium-to-long term. In this case the researchers collaborated within the framework of the Horizon 2020 project "Linking Climate and Development Policies—Leveraging International Networks and Knowledge Sharing (CD-LINKS)". The project brings together leading international research organisations to explore national and global transformation strategies for climate change and

their linkages to a range of sustainable development with the goals of the Paris Agreement as well as objectives.

"This is the first scientific study to conduct a systematic and detailed analysis of the energy investment needs for futures including the very ambitious target of 1.5°C. We find that a 1.5C investment strategy will be quite different from one to reach 2°C. Particularly investments into energy transmission and storage as well as for renewables and efficiency would need to be scaled up more rapidly for reaching 1.5°C. On the other hand both targets (1.5°C and 2°C) will mean that upstream investments into coal extraction and unabated fossil power generation without carbon capture and storage will need to scale down rapidly to avoid further lock-in of the system into fossil fuel infrastructure," says IIASA Energy Program Director Keywan Riahi.

Outputs of this analysis provided crucial scientific underpinning for a methodology developed by and for the banking industry to improve their understanding of climate change, how it could impact business and how to better manage climate-related risks. The researchers are hopeful that their findings will be of use to national and global policy analysts and policymakers, as well as those in the private sector, working in the areas of energy, climate change and sustainability over the next several years.

"It's important for professionals in the finance sector to be aware how much more investment in low carbon solutions is needed if the world is to meet the Paris targets. The NDC pledges are a step in the right direction, though much deeper changes in the energy investment portfolio are clearly necessary," says Elmar Kriegler, vice chair of the research domain "Sustainable Solutions" at the Potsdam Institute for Climate Impact Research (PIK) and one of the coauthors of the paper.

Many of the world's largest economies have already agreed to place low carbon investments high on their priority lists. For example, as part of the recent G20 Hamburg Climate and Energy Action Plan for Growth, countries agreed "to create an enabling environment that is conducive to making public and private investments consistent

with the national [sustainable development](#) priorities and economic growth", thus reiterating an earlier agreement to mobilize US\$100 billion per year for mitigation actions in developing countries.

"Our work demonstrates that support on the order of US\$100 billion would go a considerable way toward closing, maybe even completely cover, the low-carbon investment gap for developing countries; however, considerably up-scaled capital flows will be needed globally to meet the Paris Agreement targets. On top of that, developing countries will likely need support to cover the [investment](#) needs of other SDG targets, specifically [energy](#) access, clean water, air pollution, education and food security. Our study shows that [climate change](#) mitigation can have significant implications for the investments in these areas, on the order of tens to hundreds of billions," says McCollum.

More information: David L. McCollum et al, Energy investment needs for fulfilling the Paris Agreement and achieving the Sustainable Development Goals, *Nature Energy* (2018). [DOI: 10.1038/s41560-018-0179-z](https://doi.org/10.1038/s41560-018-0179-z)

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