



Towards a low carbon economy

Triodos Bank's vision paper on
energy and climate, September 2019

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Production

Triodos Bank's vision paper on energy and climate

Published

September 2019

Text

Triodos Bank

Concept & Art Direction

Michael Nash Associates, London, United Kingdom

Design and layout

Grafisch ontwerp PI&Q, Zeist, The Netherlands

This document can be downloaded from
www.triodos.com

Executive summary

We're running out of time

To limit global warming to a maximum of 1.5°C, the world must radically reduce its CO₂ emissions starting right now. The warmer climate already affects natural and human systems around the world, such as more temperature extremes, rising sea levels, more heavy rainfall and more frequent and intense droughts. This results in desertification, land degradation, scarcity of clean water, loss of biodiversity, acidification of oceans, declining food security, more inequality – to mention a few. And they all require action.

The severity of the changes in our systems will depend on how much the world will heat up. To put it simply, increased global warming will affect this planet more. An increase of 1.5°C will already have an enormous impact on our planet and the effects will significantly be worse with an increase of 2.0°C.

Current NDCs won't do

It's important to keep in mind that the emission reductions resulting from the current Nationally Determined Contributions (NDCs) will be insufficient to put the world on an effective pathway to keep the global temperature increase to below 2.0°C, let alone to respect 1.5°C. Currently, the NDCs suggest a global warming of (more than) 3.0°C by 2100, with warming continuing afterwards (UNEP, 2019).

The Paris Agreement appeals to the world community to take action to limit global temperature rise to preferably 1.5°C. Triodos Bank supports this goal. A rapid decline of global greenhouse gas emissions is therefore required to safeguard this target. This calls for a comprehensive transition towards a more sustainable society, starting as soon as possible.

Global energy trends

Globally, energy is the largest polluting sector with over 70% of all global greenhouse gas emissions (PBL, 2017). Therefore, energy is an important key to reduce the level of greenhouse gas emissions in line with a 1.5°C scenario.

Growing population leads to a higher demand for energy in the future, as does higher global income. Higher household income links to increased energy consumption, such as energy intensive diets, housing and transport. More prosperous countries and economies will have more energy intensive needs and push up the demand for energy.

Emerging markets are an increasingly important factor on the global energy market. It is expected that between 2012 and 2030 the strongest growth in power demand will come from non-OECD countries, due to population growth, economic development and current electricity deficit. Globally 1.2 billion people lack sufficient access to energy, and several hundred million more are subject to frequent power outages.

Declines in equipment costs, along with innovative business and financing models, are transforming access to energy in some of the world's least developed nations. The number of small off-grid home systems – for light, phone charging and basic appliances – has grown rapidly.

Countries such as Pakistan and Nigeria with large populations and unreliable grid power supply are among the largest markets for off-grid small-scale solar in the developing world, as are Bangladesh, Myanmar, Ghana and Dominican Republic and West and East Africa.

Nine key elements of the energy transition

We realise that the effects of climate change that are already 'in the pipeline' will require climate adaptation. However, as we are running out of time and carbon budget, Triodos Bank will put all its efforts in the energy sector on climate mitigation. For developed countries, we have identified nine key elements, which are all needed to bring the Paris goals within reach (see table 1).

Taking the lead – the role of finance

Banks do not exist simply for themselves. They fulfil many important functions in society. One of these functions is financing entrepreneurs and institutions committed to tackling major social and ecological issues.

According to the 2018 report of the High-level Advisory Group on Sustainable Finance, an investment of EUR 11.2 trillion is required to meet the European 2030 energy policy and targets set in the Paris Agreement. In financing the energy transition, the bulk of the financing comes from banks (50-90%) who are the most appropriate financing parties and play a crucial role.

Change policy

Triodos Bank calls for policy changes to ensure a sustainable finance future. It already made this plea in its publication 'New Pathways – Building Blocks for a Sustainable Finance Future for Europe' (2017), a collaborative effort from the Global Alliance for Banking on Values, Finance Watch and Mission 2020. The report states that banks are indispensable in tackling climate change and other major issues in society. Climate change risks and management thereof, should become an active topic in board rooms.

Focus on project finance

Triodos Bank calls for all stakeholders to focus on climate mitigation and more specifically on asset and project finance and infrastructure, because this is where the biggest financing need exists in terms of volume. More specifically, we see financing opportunities for:

- Saving energy and energy efficiency
- Production of renewable energy
- Infrastructure investments in grid, off-grid systems, smart grid and storage

Table 1: Key elements of the energy transition in developed countries

Energy use	Energy supply	Energy system	Energy markets
Energy saving and energy efficiency	Sustainable supply of green electricity (wind, solar, hydro etc.)	Optimisation of electrification	Decentralised market and energy democracy
	Green hydrogen and green molecules	Flexibility of the power system	Proper regulation and guidance of energy markets
	Careful use of biomass and carbon capture, utilisation and storage (CCUS)		
	Phasing out fossil fuel		

Seek non-mainstream opportunities

The finance sector should also play an active role in tackling the obstacles for realising non-mainstream projects. Instead of waiting to see a bankable project land on its desk, the sector should seek opportunities for co-creation and joint business development with entrepreneurs. Banks and investors should pioneer with new business models and develop new financial instruments, such as off balance, energy-efficiency (ESCOs) and green lease solutions.

Make projects investable

How can we increase the number of investable projects? We see four prerequisites:

- Provide consistent and proper regulatory framework and guidance of energy markets.
- Remove bottlenecks in (financial) regulation that hampers the energy transition.
- Allow for and support experimenting with (new forms of) financing of new business models.
- Develop a fundamentally new economic model that internalises externalities, like costs stemming from unsustainable production and consumption.

Develop tools for true pricing

To stay within ecological limits, we feel that tools must be developed that internalise externalities – costs stemming from unsustainable production and consumption. A concrete example of true pricing, and in our view a must, is the introduction of a carbon pricing mechanism, preferably globally or on a European scale. The other side of the coin is attaching a positive financial value to social and environmental externalities.

Investment needs in emerging markets

Even bigger investments will be needed for non-OECD countries, due to population growth, economic development and the current state of energy deficit. We see (new) businesses emerging with different financing needs:

- Companies such as D.Light (over-the-counter solar lanterns), SimGas (bio digesters) and Envirofit

(clean cooking stoves). Financing need: early stage equity and working capital financing.

- Pay as you go (PAYG) solar companies such as M-KOPA and Fenix. Financing need: early stage equity and working capital financing.
- Companies such as Husk (mini-grid solutions) and small projects. Financing need: early stage equity and working capital financing, as well as project financing (debt and equity).
- Mini-grid and on-grid projects. Financing need: project financing (project financing).

The way forward - how Triodos Bank contributes

From the start, energy and climate has been an important theme for Triodos Bank. Nowadays, renewable energy is Triodos Bank group's largest portfolio, with a total exposure of EUR 2.25 billion - 14.5% of the total group's funds entrusted.

Triodos Bank's focus in relation to energy and climate has mainly been on offering project finance for mostly medium-sized renewable energy generation projects, based on proven technologies. This will continue to be an important focus, as the energy transition requires massive deployment of green assets.

However, to address the challenges in our energy system in order to mitigate climate change, doing that will not be enough. While differentiating our activities in developed countries and emerging markets, we see four elements as the way forward:

- Financing the energy transition, Triodos Bank will move from financing renewable energy generation 'only' to financing the energy transition. We will do so around the nine key elements.
- Financing a more decentralised and distributed energy system; there are several developments in the energy transition market in developed countries. In the energy transition, we believe all efforts are needed to reach the Paris Agreement goals: financing centralised as well as distributed power; mainstream as well as non-mainstream projects.

- Financing more non-mainstream projects: the composition of mainstream in the total portfolio is around 95%. In three years' time, we will allocate more time, budget, access to expertise, systems, processes and people with the necessary competencies to the non-mainstream and more distributed projects. We aim to increase this part in the portfolio to 10-20% to build impact and to remain a frontrunner in the sector.
- Applying a systemic view & providing impact reporting: when financing the massive deployment of mainstream technologies, we apply an integral, inclusive and systemic view of the energy transition.

The Climate Emergency: everybody should act now

In 2015, the world community adopted the Paris Agreement, but the results so far are a source of great concern. Up to 2019, global emissions are still rising, trillions of dollars are still available for fossil investments, and governments and business leaders are overall too hesitant to pursue the effective transition pathways we need.

That said, we should be aware that the risks of uncontrolled climate change are huge. A global temperature rise of more than 2.0°C will have a severe impact on societies, economies and the financial sector. The cost of inaction is high (at least 20% of global GDP) and probably beyond imagination. This legacy should not be passed on to future generations.

Everybody should act now: citizens, societal organisations, business, finance and governments.

Triodos Bank stands behind the most ambitious scenario of the Paris Agreement, limiting global temperature rise to 1.5°C. Key elements of effective government policies and business strategies are the following:

- We call for an ambitious and rigorous policy to phase out the fossil industry by rising CO₂ pricing and ending (implicit) fossil subsidies, that

nowadays are globally 35 times higher than public funds for sustainable energy. A process of phasing out and controlled dismantling of fossil capacity should be a priority in government policies and business/finance strategies. Enterprises should embrace and use the concept of true pricing in order to steer their investment to sustainable products and operations.

- We promote strengthening of regulation on CO₂ reduction, leading to energy efficiency (housing, transport etc) and reduction of livestock.
- We underline the importance of citizen involvement in the energy transformation by supporting (and financing) community energy initiatives.
- We call for robust and ambitious government policies in R&D (availability of new technology for industry, housing and transport), eco-design, regulation of the eco-efficiency of products and (local) policies to kick off large scale isolation and sustainable heat systems in the housing sector.

Triodos Bank operates based on the principle that the future should be the concern of all. Today's climate emergency can only be addressed when we all accept the responsibility to act and do so together.

Dare to act. Now.

Preface

The world has witnessed increasingly positive action to combat climate change - from school children to central banks, government and businesses. Many have picked up on these developments and shared their desire for urgent change.

But despite popular protest, declarations from business leaders and government plans, global emissions are still rising. The effects of climate change are already tangible. Moreover, the IPCC (2018) has recommended that the world community should quickly adopt ambitious transition policies and low carbon business plans in order to maintain the global temperature rise within the limit of 1.5°C.

Since its inception about 40 years ago, Triodos Bank strives to finance projects with a positive impact on society and the environment. We have built an extensive track record financing renewable energy projects, from the first wind turbine in 1987 to the offshore wind farms we finance today.

However, climate change developments are accelerating. This has prompted us to review our position on renewable energy and climate change, resulting in this vision paper. We saw three compelling reasons to write this paper.

Most importantly, we are running out of time. Without strong action from all global stakeholders, the Paris goals will be out of reach, and future generations will be forced to cope with the adverse effects of uncontrolled climate change. That's why, according to Triodos Bank and many sustainable allies, we're now in a state of climate emergency. We call for immediate action from all sectors of society, including the financial industry.

Secondly, the transformation of the energy system away from its fossil base has taken off, resulting in maturing businesses and financing. We welcome this development and aim to be a frontrunner in this transformation, through participation in the public debate on necessary steps and programmes, and through our financing decisions. We want to transform our financing business from 'just' renewable energy projects to financing the entire energy transition, and encourage others to do the same.

Thirdly, we aim to inform, stimulate and encourage our co-workers, Triodos Bank customers, the communities we are part of in all countries we operate in and the international networks of sustainable colleagues and friends by sharing our insights. Together we have an obligation to make a difference. We invite all our partners to act. We have no time left to lose.

Peter Blom
Chief Executive Officer
Triodos Bank

1. We're running out of time

To limit global warming to a maximum of 1.5°C, the world must radically reduce its carbon dioxide (CO₂) emissions right now. The following chapter provides the facts about climate change, the consequences and the CO₂ reduction pathway that is needed to stay within the limit of 1.5°C.

1.1 Facts about climate change

Temperatures are rising

Since the start of measuring temperatures in 1880, the three warmest summers were in 2016, 2017 and 2018. The coldest summers were in 1881, 1882 and 1886, while the coldest winters were in 1885, 1885 and 1893 (GISTEMP Team, 2019). The global mean surface temperature has increased by approximately 1.0°C since pre-industrial levels. It is likely to increase further to 1.5°C between 2030 and 2052 if it continues to rise at the current rate. It is estimated that every 10 years, global warming is increasing by 0.2°C because of past and ongoing emissions (IPCC, 2018).

CO₂ emissions and temperature rise run parallel

Global warming is a direct effect of the increase of greenhouse gases (GHG) in our atmosphere, like carbon dioxide, methane and nitrous oxide. These greenhouse gases absorb heat radiation in the atmosphere and radiate this heat in all directions, including back to the earth. The most influential greenhouse gas is CO₂. Between 1750 and 2018, the CO₂ concentration increased from 280 parts per million (ppm) to 410 ppm, which is higher than any time in the last 800,000 years (IPPC, 2014; Harvey, 2019).

The speed of this increase of CO₂ concentration - 130 ppm in almost 270 years - is immensely rapid. By comparison, during the last part of the most recent glacial period, the CO₂ concentration in the atmosphere increased from 190 to more than 260 ppm over a 6,000-year period (Eric Monnin, et al, 2001). Figures 1.1 and 1.2 clearly show that CO₂ emissions and a rise in temperature run parallel.

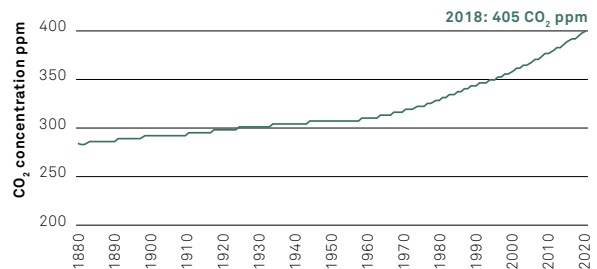


Figure 1.1: CO₂ concentration since 1880, Ethridge et, al. (1996), MacFarling Meure et al. (2006), Scripps CO₂ Programme (2019)

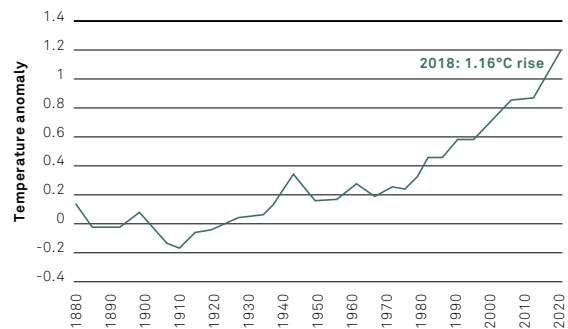


Figure 1.2: Temperature anomalies compared to average temperature of 1880-1910, GISTEMP Team (2019)

Human cause of climate change

Contrary to what some people would like to believe, the increase of CO₂ concentration in the atmosphere is caused by human activity. According to William Ruddiman (2003), global warming started with deforestation to create fields for agriculture around 7,000 years ago. When forests structurally disappear more than they grow back, CO₂ levels in the atmosphere increase. Reconstructions show that 7,000 years ago, CO₂ concentration in the atmosphere started to increase from 260 ppm to 280 ppm just before the Industrial Revolution.

After the introduction of the steam engine during the Industrial Revolution, CO₂ concentration increased

even faster due to burning fossil fuels. The invention of the steam engine was followed by many more technological innovations from computers to cars, and plastics to pesticides.

What followed was an explosion in world population and an increase in comfort and wealth for many people. To support a growing population and further technological development, more energy was needed, and so even more fossil fuels was extracted. This led to the current concentration of CO₂ in our atmosphere (Mommers, 2019).

A closer look at emissions

It is important to note that all the emissions in the past have contributed to a higher concentration of greenhouse gases in the atmosphere. Even if current emissions stop immediately, it will still take time for the global concentration to decrease significantly and the global temperature rise to be contained (IPCC, 2014).

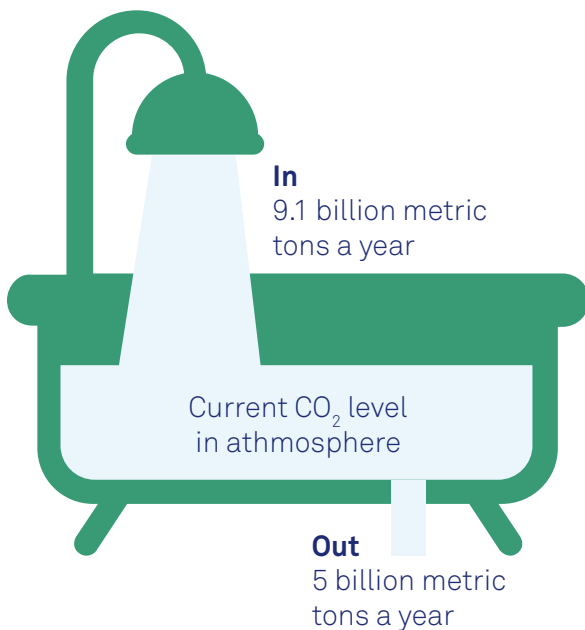


Figure 1.3: The Carbon Bathtub, Nigel Holmes (National Geographic) (2009)

If we continue to pour CO₂ into the atmosphere faster than nature drains it out, the planet will continue to warm. Climate change cannot be switched off instantly by reducing emissions soon.

A decrease in the next decade is highly unlikely due to the vast volume of past emissions of greenhouse gases in the atmosphere. A fast reduction is therefore necessary to avoid a further increase in the global temperature. The metaphor of the bathtub explains this mechanism (see figure 1.3).

Figure 1.4 reveals the major share of fossil energy production and consumption in the composition of global GHG emissions. Specific sectors (like agriculture, industry and forestry) also attribute to climate change, emitting other gases.

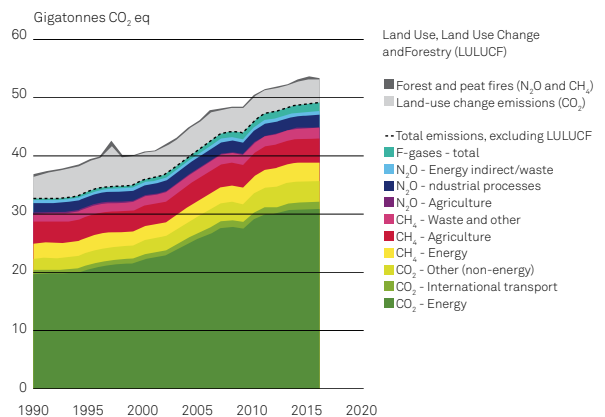


Figure 1.4: Global greenhouse gas emissions, per type of gas and source, including LULUCF, PBL (2018)

Figure 1.5 shows that the origin of global emissions has changed over time, mainly due to the growth of economies such as China or India, which still heavily depend on fossil fuels.

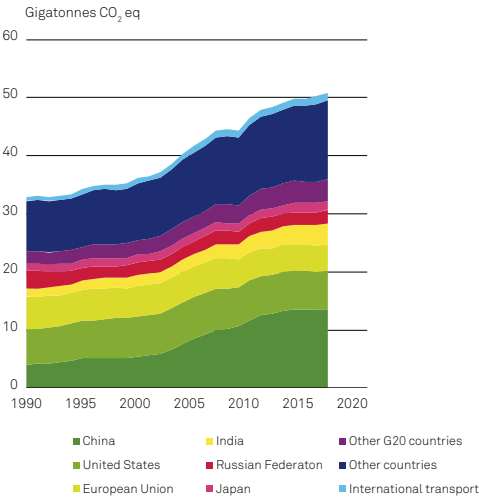


Figure 1.5: Global greenhouse gas emissions, per country and region, PBL (2018)

Figure 1.6 allocates global GHG emissions to economic sectors (final users), including the share of different sectors in the consumption of electricity and heat-production.

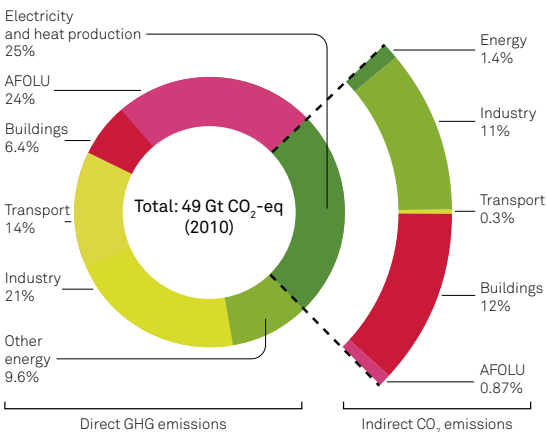


Figure 1.6: Greenhouse Gas Emissions by Economic Sectors, IPCC (2014)

Figure 1.7 shows the historical composition of cumulative global emissions since 1870. As previously mentioned, nowadays China and India are large contributors to global emissions. Historically, Europe and the United States had the largest share of global emissions since 1870 and thereby contributed most to present day rise of global temperature.

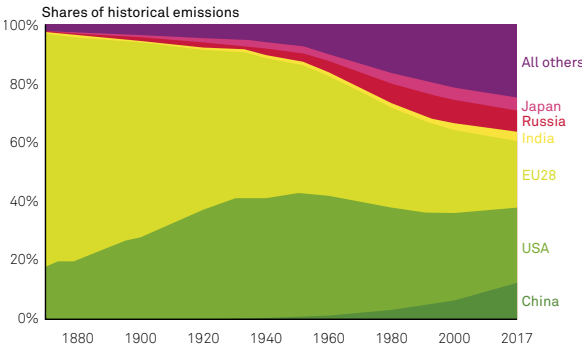


Figure 1.7: Cumulative emissions from fossil fuel and industry were distributed (1870-2017), Global Carbon project (2018)

1.2 Consequences of rising temperatures

Changing climate

A warmer climate affects natural and human systems around the world. Examples are more extremes of temperature, rising sea levels, more heavy rainfall and more frequent and intense

droughts (IPCC, 2018). The severity of the changes in our systems will depend on how much the world will heat up. Increased global warming will affect the planet more. An increase of 1.5°C would already have a serious effect on our planet and the effects would be significantly worse with an increase of 2.0°C. In a 2.0°C scenario there is a bigger chance of more heat-related morbidity and mortality, more people

Table 1.1: Different impact of 1.5 or 2.0°C global warming (IPCC, 2018; World Resources Institute, 2019)

	1.5°C	2.0°C
Extreme heat Global population exposed to severe heat at least once every five years	14%	37%
Sea-ice-free Arctic Number of ice-free summers	At least 1 every 100 years	At least 1 every 10 years
Sea level rise Amount of sea level rise by 2100	0.40 meters	0.46 meters
Species loss: vertebrates Vertebrates that lose at least half of their range	4%	8%
Species loss: plants Plants that lose at least half of their range	8%	16%
Species loss: insects Insects that lose at least half of their range	6%	18%
Ecosystems Amount of Earth's land area where ecosystems will shift to a new biome	7%	13%
Permafrost Amount of Arctic permafrost that will thaw	4.8 million km ²	6.6 million km ²
Crop yields Reduction in maize harvests in tropics	3%	7%
Coral reefs Further decline in coral reefs	70-90%	99%
Fisheries Decline in marine fisheries	1.5 million tonnes	3 million tonnes

losing their homes because of flooding, more poverty and disadvantages for some populations, and more food shortages (IPCC, 2018). The 2018 IPCC report shows that a 0.5°C of warming makes a big difference. Table 1.1 shows the impact on climate with a scenario for global warming of 1.5°C and of 2.0°C.

Declining food security

As already stated, rising temperatures can lead to more food shortages, especially when climate change and intensive use of land come together. The latest IPCC report, published in August 2019, states that land can be used to reduce climate change. Also, to be able to feed the world, land must remain productive because the population is growing. However, our land is currently under increasing human pressure through deforestation and intensive farming practices.

Climate change has also adversely impacted food security and terrestrial ecosystems, resulting in desertification and land degradation in many regions around the world. At 2.0°C global warming, very high risks related to food security are projected. Having said that, activities that combat desertification can actually contribute to climate change mitigation by increasing the soil's ability to absorb carbon. The IPCC therefore calls for sustainable land management, more plant-based diets and eliminating clearing and burning forests (IPCC, 2019).

In June 2019, Triodos Bank published its vision on food and agriculture systems in its paper *Towards ecologically and socially resilient food and agriculture systems*. In this vision paper, Triodos Bank calls for a radical systemic transition from the current production-focused systems towards one that is ecologically and socially resilient and based on balanced ecosystems, a healthy society and inclusive prosperity. The vision paper can be found on the Triodos Bank website.

More inequality

Since the Industrial Revolution most emissions have originated from western countries, while developing countries are expected to be mainly affected by climate change. These countries are also likely to be least capable to design, finance and carry out adaptation policies. In 2016, the University of Notre Dame (Indiana, US) published an index revealing which nations were more or less likely to be affected by climate change based on the vulnerability of each country to climate change as well as the readiness to adapt (see figure 1.8).

The index shows the vulnerability of countries outside the northern hemisphere (except Australia and New Zealand). Populations in Africa will be severely impacted, while having limited resources to address the challenges they will face in the future. The social, economic and geopolitical fallout of this scenario is worth avoiding at all costs.

In conclusion, the assessment highlights clear benefits to people and natural ecosystems if global warming is limited to 1.5°C compared to 2°C. This requires an ambitious sustainable transition to ensure a more sustainable and equitable society (IPCC, 2018).

1.3 The big gap

The 2018 Emissions Gap Report (UNEP, 2018), released in the run up to the Katowice Climate Change Conference (COP 24) in December 2018, presents the latest assessment of current national mitigation efforts and the ambitions countries have presented in their Nationally Determined Contributions (NDCs), which form the foundation of the Paris Agreement. According to this report, *'current commitments expressed in the NDCs are inadequate to bridge the emissions gap in 2030. (...) [If] the NDC ambitions are not increased before 2030, exceeding the 1.5°C goal can no longer be avoided. Now more than ever, unprecedented and urgent action is required by all nations. (...) in fact, global CO₂ emissions increased in 2017 after three years of stagnation. (...) Global greenhouse gas emissions show no signs of peaking. (...) Total annual greenhouse gases emissions, including from land use change, reached a record high of 53.4 GtCO₂e in 2017,*

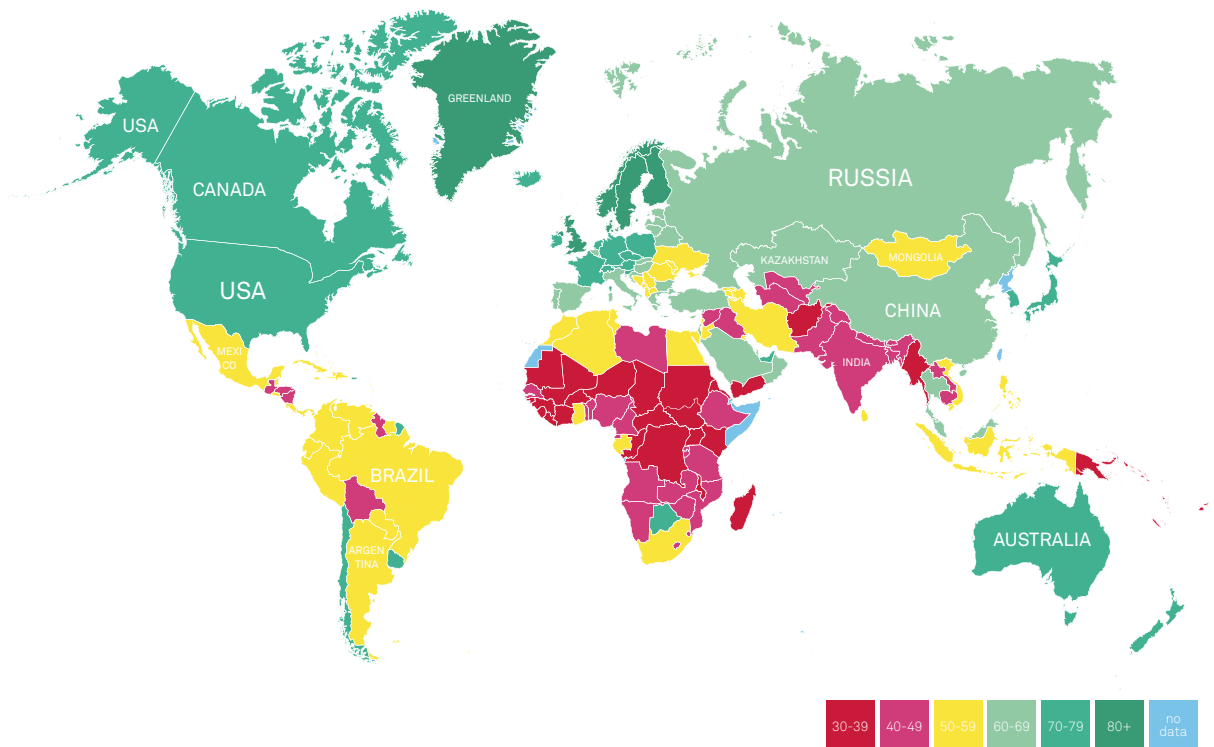


Figure 1.8: Nations affected by climate change, University of Notre Dame (2016)

an increase of 0.7 GtCO₂e compared with 2016. In contrast, global GHG emissions in 2030 need to be approximately 25% and 55% lower than in 2017 to put the world on a least-cost pathway to limiting global warming to 2°C and 1.5°C respectively.’ Figure 1.9 shows the main conclusions of the 2018 Emissions Gap Report.

The ‘current policy trajectory’ is based on estimates of the 2020 emissions considering projected economic trends and current policy approaches including policies at least through 2015. The (un) conditional NDC scenarios are based on the submissions by countries that have ratified the Paris Agreement which represent their national efforts to reach the Paris Agreement’s long-term temperature goal of limiting warming to well below 2.0°C. New or updated NDCs are to be submitted in 2020 and every five years thereafter.

So, up to 2018, total global greenhouse gas emissions have increased, albeit at a slower rate than global GDP. This is thanks to lower coal

consumption and increased renewable power generation, in particular wind and solar power. Although these are promising results in one way, there is no substantial reduction expected soon, unless we all take the effects of uncontrolled climate change on the living conditions of future generations very seriously.

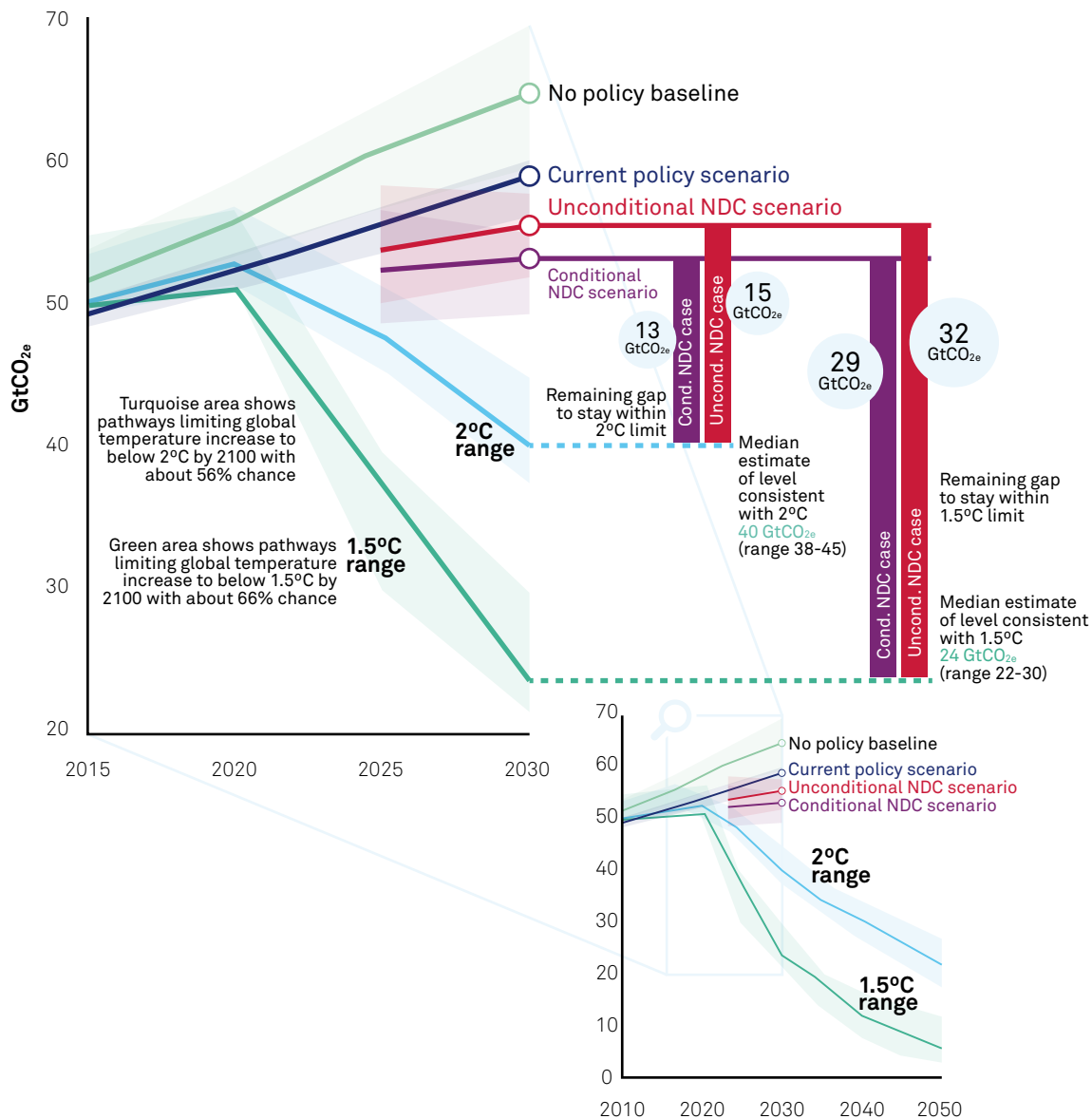


Figure 1.9: Global greenhouse gas emissions under different scenarios and the emissions gap in 2030, UNEP (2018)

1.4 Tools for a holistic approach

SDGs

It is important to keep in mind that climate change is one of many environmental (and social) problems the world community faces today. Scarcity of clean water, loss of biodiversity, acidification of oceans – to mention but a few – all require action. The causes and solutions of these problems are interconnected.

Therefore, a holistic view and comprehensive approach, as proposed by the UN Sustainable Development Goals (2015) is crucial to truly make progress. Sometimes trade-offs exist between strategies to meet the Sustainable Development Goals (SDGs). For example: use of biomass in power generation to reduce carbon emissions may contribute to loss of biodiversity. Though challenging, it's crucial to apply the SDGs in its holistic way, so that the problems facing the world community are not approached in isolation.



Figure 1.10: UN Sustainable Development Goals

Planetary boundaries

To relate the issue of climate change to other environmental challenges, 'Planetary boundaries' (Rockström et al. 2009 and Steffen et al. 2015) can help to understand the state of the global ecology. This is a concept of nine Earth System processes which have boundaries. The concept aims to define a 'safe operating space for humanity' and is based on scientific evidence that, since the Industrial Revolution, human actions have become the main driver of global environmental change.

Scientists assert that once human activity has passed certain thresholds or tipping points, defined as 'planetary boundaries', there is a risk of 'irreversible and abrupt environmental change'. The nine Earth System process boundaries mark the safe zone for the planet provided they are not crossed. Two of these, climate change and biosphere integrity, are considered to be core boundaries. Significantly altering either of these core boundaries would 'drive the Earth System into a new state'. Three out of the nine planetary boundaries have already been crossed.

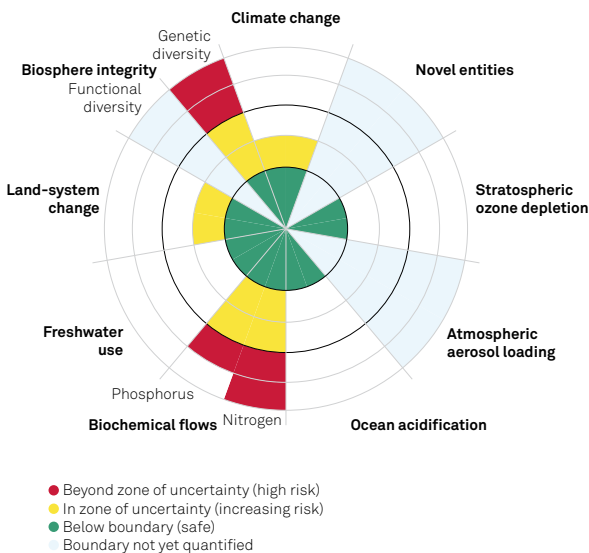


Figure 1.11: Planetary Boundaries, Steffen et al. (2015)

Doughnut economy

In her book *Doughnut Economics* (2017), the UK economist Kate Raworth combines the framework of planetary boundaries with social/basic needs and societal qualities, introducing the doughnut as a metaphor. She defines the space for human activity and sets the agenda for global action. For Triodos Bank, this agenda is vital. Our goal is to contribute to a sustainable and inclusive society and economy, which respects the ecological limits and meets the social needs as outlined by the SDGs.

The carbon budget approach

The speed of (radical) action required can best be understood following the carbon budget approach as presented by the IPCC in its *Global Warming of 1.5°C* report, published in 2018. By the end of 2017, CO₂ emissions since the pre-industrial period are estimated to have been 2,200 (± 320) GtCO₂. Current emissions amount to 42 (± 3) GtCO₂ per year. The remaining carbon budget is 580 GtCO₂ for a 50% probability of limiting warming to 1.5°C, and 420 GtCO₂ for a 66% probability. There are of course uncertainties, such as in the climate response to CO₂ and non-CO₂ emissions, the level of historic warming, potential additional GHG release from permafrost thawing and from wetlands and the level of future non-CO₂ mitigation e.g. related to meat consumption.

The IPCC recommends that the world community limits global temperature rise to within 1.5°C. In figure 1.12, the four mitigation scenarios of IPCC are presented, which eventually limit temperature increase to 1.5°C.

Breakdown of contributions to global net CO₂ emissions in four illustrative model pathways

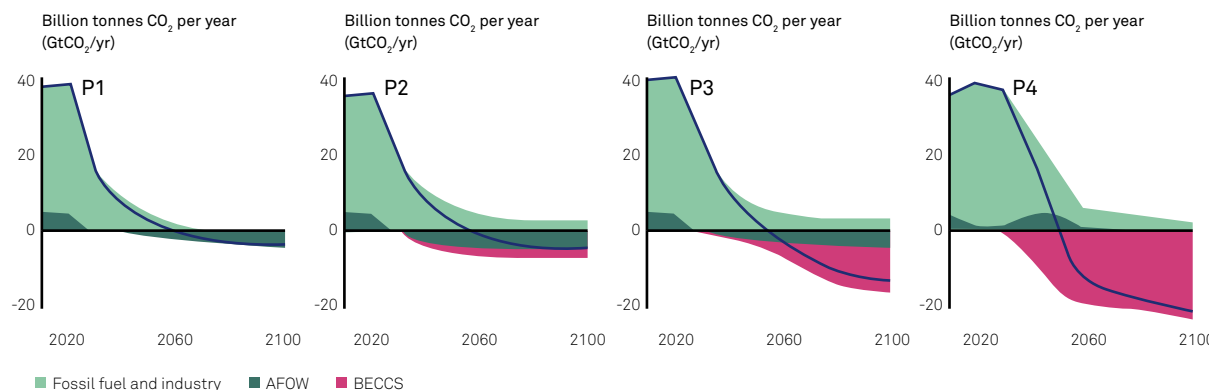


Figure 1.12: Four illustrative model pathways, IPCC (2018)

Table 1.2: Indicators of the four illustrative model pathways, IPCC (2018)

Global Indicators percentages relative to 2010	P1 No or limited overshoot		P2 No or limited overshoot		P3 No or limited overshoot		P4 Higher overshoot	
	2030	2050	2030	2050	2030	2050	2030	2050
CO ₂ emission change	-58%	-93%	-47%	-95%	-41%	-91%	4%	-97%
Final energy demand	-15%	-32%	-5%	2%	17%	21%	39%	44%
Renewable share in electricity	60%	77%	58%	81%	48%	63%	25%	70%
Primary energy from:								
coal	-78%	-97%	-61%	-77%	-75%	-73%	-59%	-97%
oil	-37%	-87%	-13%	-50%	-3%	-81%	86%	-32%
gas	-25%	-74%	-20%	-53%	33%	21%	37%	-48%
nuclear	59%	150%	83%	98%	98%	501%	106%	468%
biomass	-11%	-16%	0%	49%	36%	121%	-1%	418%
non-biomass renewables	430%	833%	470%	1327%	315%	878%	110%	1137%
Agricultural CH emissions	-24%	-33%	-48%	-69%	1%	-23%	14%	2%
Agricultural N ₂ O emissions	5%	6%	-26%	-26%	15%	0%	3%	39%
Cum. CCS until 2100 (GtCO ₂)	0		348		687		1218	
of which BECCS (GtCO ₂)	0		151		414		1191	
Million km ² of crops in 2050	0,2		0,9		2,8		7,2	

Table 1.2 provides the global indicators for the four scenarios.

P1 is a scenario in which social, business and technological innovations result in lower energy demand up to 2050 while living standards rise, especially in the global south.

P2 is a scenario with a broad focus on sustainability as well as shifts towards sustainable and healthy consumption patterns, low-carbon technology innovation, and well-managed land systems.

P3 is a middle-of-the-road scenario which follows historical patterns. Emissions reductions are mainly achieved by changing the way in which energy and products are produced.

P4 is a resource and energy-intensive scenario, making strong use of carbon dioxide removal (CDR) and bioenergy with carbon capture and storage (BECCS).

These scenarios lead to an important conclusion: Given the present annual global emission levels, the transformation to a zero-emission or low carbon economy and society must be accelerated in order to avoid presumably costly and uncertain large-scale deployment of CDR techniques. This should also be achieved in the 2030s as scenario P1 indicates. It is a huge challenge and a real reduction of global emissions must start right now as Christiana Figueres argues (Mission 2020).

As already outlined, the emission reductions resulting from the current nationally determined contributions (NDCs) will be insufficient to put the world on an effective pathway to keep the global temperature increase below 2°C, let alone to respect 1.5°C. Currently, the NDCs indicate a global warming of (more than) 3°C by 2100, with warming continuing afterwards (UNEP, 2019).

As part of the Paris Agreement, all countries should submit (new) NDCs national plans for emission-reduction strategies by the end of 2019. For Triodos Bank, it's clear that society, politics, business and the financial industry should adopt an ambitious transition scenario to a 100% sustainable economy and energy production to comply with limiting global warming to 1.5°C.

Triodos Bank supports the scenario P1 from the IPCC illustrative model pathways (2018). This scenario fully embraces the sustainable transition combining emphasis on energy saving, maximum use of renewable electricity and avoids unsustainable investments in carbon capture and storage (CCS). It also avoids jeopardizing biodiversity and land-use by relying on large scale biomass production. This requires a radical transformation of the use of land, energy and materials.

Since energy is the largest polluting sector globally with over 70% of all global greenhouse gas emissions, the following chapter will take a deep dive into the future of the energy system.

1.5 Our position

The need for change is no longer a question. The Paris Agreement appeals to the world community to take action to limit global temperature rise, preferably to 1.5°C. Triodos Bank supports this goal. Therefore, a rapid decline of global greenhouse gas emissions is required to safeguard this target. This calls for a comprehensive transition towards a more sustainable society, as soon as possible.

2. Energy transition - a deep dive

Globally, energy is the largest polluting sector with over 70% of all global greenhouse gas emissions (PBL, 2017). Therefore, energy is an important key to reduce the level of greenhouse gas emissions in line with a 1.5°C scenario. This chapter will take a deep dive into the future of the energy system.

2.1 Global energy trends and scenarios

There are many energy scenarios available to build an impression of future developments in the global energy markets. Although these scenarios differ in many ways and have different outcomes, the key elements of most scenarios are:

- Global population growth (to 10 billion by 2050)
- Global GDP growth (estimated roughly doubling present global output (\$76 trillion) between now and 2050)
- Growth in demand for energy (wide variety)
- Rising levels of energy efficiency (innovation and electrification)
- Growing/changing supply of energy

Increasing population leads to a higher demand for energy in the future, as does higher global income. Higher household income combines with increased energy consumption, such as energy intensive diets, housing and transport. More prosperous countries and economies will be more energy intensive and push up the demand for energy.

So, if global demand will increase substantially - something likely to happen - what are the implications for the development of the supply of energy? Without increasing levels of energy efficiency, the energy supply will grow at the same rate and exacerbates the ambition to reach a low carbon energy system within the next decades.

However, if energy efficiency levels were to rise substantially, higher demand could be met with a lower marginal supply growth. This will facilitate the transition to a sustainable energy system. Figure 2.1 shows the impact that an ambitious energy-saving policy and investments can and should have in efforts to reduce demand.

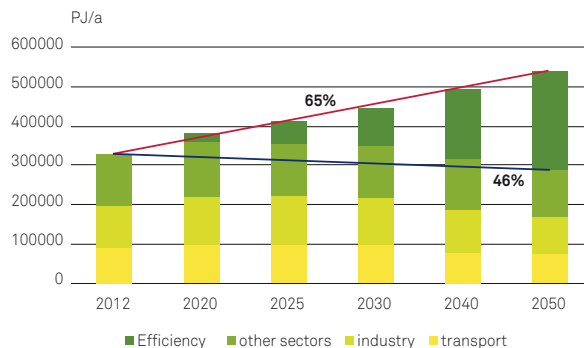


Figure 2.1: Impact of ambitious energy saving policy, Greenpeace et al (2015)

Next to innovation - like new production techniques, insulation of buildings or the eco-efficient design of consumer products - energy efficiency depends significantly on the speed of the electrification process. This is much more efficient than fossil-based energy production. This assumption is critical for the outcome of a scenario and influences the future energy mix.

The more energy sources are electricity based, the more the rise of global demand for energy is offset by increasing levels of energy production efficiency. The speed of electrification depends on a variety of factors, such as investment in renewable sources, development of smart grid (data) technology, storage facilities, electric transport and heat innovation. A smart mix of green electrons and green molecules like green hydrogen or other gases can contribute to a cost-efficient pathway to an energy system with a greater share of sustainable electricity production. Production of renewable energy is expected to grow substantially in all scenarios. Expectations and ambitions differ from shares of 40% in 2040 to 100% in 2050 of the total energy supply.

2.2 Two diverging scenarios

Two diverging scenarios are presented here to understand the key elements of a successful transition. The first scenario by the International Energy Agency is a business as usual scenario, including announced policies and targets. The outcome of this scenario is hardly or not at all reconcilable with the Paris Agreement targets. The second scenario by Greenpeace can be considered as direction indicator of the future global energy system respecting the planetary boundaries.

World Energy Outlook 2018

In the World Energy Outlook 2018, global demand for primary energy is projected to grow by more than a quarter by 2040, accompanied by rising incomes, population growth of 1.7 billion people and increasing urbanisation (IEA, 2018).

Developing countries contribute to growing energy demand, led by India. In 2040, developing countries will be responsible for 40% of global energy demand, while Europe and North America will account for 20% of the global energy demand. In 2000, this was the opposite. This growing energy demand is expected to be met by a changing energy mix. The main elements are:

- Rapid deployment and falling costs of clean energy technologies, the growing electrification of energy, the shift to a more services-oriented economy plus a cleaner energy mix in China, and the resilience of shale gas and tight oil in the United States.
- Renewable energy will contribute to 40% of electricity production, and solar power will become the largest source of low carbon power by 2040. In Europe, wind will be the leading source of electricity after 2030.
- A 45% rise in the share of natural gas by 2040. Coal strikes out, as consumption flatlines. Oil demand continues to grow modestly.
- Electrification will make up to 40% of (growing) demand in 2040. Digital technology improves efficiency and facilitates flexible operation of power systems.

- Energy related global CO₂ emissions show a slow upward trend to 2040.

According to the World Energy Outlook 2018, this outlook is not 'Paris-proof'. In an additional Sustainable Development Scenario, the World Energy Outlook 2018 projects a larger impact of the growth of renewables, increased efficiency, carbon capture and storage. Among other measures, CO₂ pricing and phasing out fossil subsidies are part of this scenario. The World Energy Outlook 2017 estimated that the Sustainable Development Scenario implies major investment to cumulate to USD 69 trillion in renewables, efficiency and sustainable technology up to 2040 (IEA, 2017).

Energy [R]evolution

In 2015, Greenpeace International, in collaboration with scientists, released the Energy [R]evolution scenario (Greenpeace et al., 2015). The key elements are:

- 100% renewable energy by 2050 (64% by 2030) is possible thanks to rapidly falling prices of capital equipment.
- Phasing out of lignite/brown coal (2035), coal (2045) and oil and gas (2050).
- Oil for heating will be replaced by solar collectors, geothermal energy and heat from renewable hydrogen. Gas will be the last fossil fuel in use – it will be replaced by hydrogen generated by renewable electricity by 2050.
- Transport is the most challenging sector and requires a technical revolution and more R&D – particularly in aviation and shipping. Planes and ships could be powered by biofuels, hydrogen and synthetic fuels produced using electricity. So, electricity demand will go up, but it will be generated with renewable energy.
- Energy efficiency and electrification: in most business as usual scenarios the total global energy demand is expected to increase by 65% by 2050. In the Energy (R)evolution scenario, the demand by 2050 decreases by 12-15% compared to 2015 levels, thanks to radical improvement in efficiency and electrification. This requires a very fast pace of energy saving.

- Around USD 64.6 trillion investment is needed for this transformation.

In the Energy [R]evolution scenario much is expected of politics, business and finance. CO₂ pricing, phasing out of fossil subsidies (today still roughly twice the fiscal support for renewable energy), public transport, strong policy on e-saving and efficiency – to mention a few – are part of an ambitious, steady and predictable government policy to change market conditions and behaviour. This is even more urgent since the rate of annual energy saving that is assumed in this scenario might be out of reach.

2.3 Energy transition vital for decoupling

The development of global emissions correlates with a range of factors. The so-called ‘Kaya Identity’, developed by Japanese energy economist Yoichi Kaya, states that the total emission level of the greenhouse gas carbon dioxide can be seen as the product of four factors: human population, GDP per capita, energy intensity (per unit of GDP), and carbon intensity (emissions per unit of energy consumed). This equation looks like this:

$$F = P * (G/P) * (E/G) * (F/E)$$

F = global CO₂ (greenhouse gas) emissions (human sources)

P = global population

G = world GDP

E = global energy consumption

This equation offers clues as to where government policies, business and financial institutions can make a difference. For example, investment in energy efficiency or financing low carbon business can contribute to decarbonization of economy and society.

Some progress has been made in the past, as in many countries the link between GDP (and population) growth and the increase in CO₂ emissions (and CO₂ equivalents) has weakened or even decoupled. Simultaneously though, fast economic growth in developing and especially middle-income countries (like China, India and Indonesia) has led to increasing emissions. Figure 2.2 shows in more detail the decoupling of growth and emissions. Not only has the amount of energy per unit of GDP decreased over time, but in recent years the production of energy has become less CO₂ intensive as well, which has contributed to the decoupling. Efficiency of production and use of energy and renewable energy are vital to a radical decoupling of GDP growth and GHG emissions.

Change in global CO₂ emissions and their drivers, GDP and energy, based on Kaya decomposition

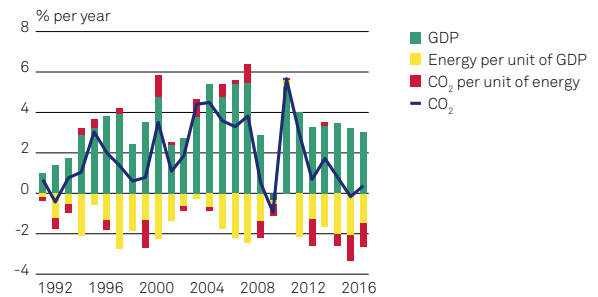


Figure 2.2: Change in global CO₂ emissions and their drivers, GDP and energy, based on Kaya decomposition, PBL (2017)

Although (a more radical) decoupling of growth and emissions is vital for a successful transition, this is not a license for continuation of the old economic strategy of economic growth as we know it. Apart from the possible adverse effects on other planetary boundaries, the required prosperous reduction of greenhouse gas emissions might conflict with continuous global economic growth. In the shorter-term, economic growth will partially offset the gains of decoupling and emissions still rise as seen in previous years. Moreover, economic growth, at least

in the short term, is not compatible with the required reduction of greenhouse gasses. This is especially true for the rich countries in the world.

2.4 The role of emerging markets

Emerging markets are an increasingly important factor on the global energy market. It is expected that between 2012 and 2030 the strongest growth in power demand will come from non-OECD countries, due to population growth, economic development and current electricity deficit. Figure 2.3 shows the growth in power demand and is comparable with the World Energy Outlook 2018. Figure 2.4 shows that globally 1.2 billion people lack sufficient access to energy, and several hundred million more are subject to frequent power outages.

Utility scale renewable energy (RE) projects play a critical role in increasing the clean generation base to replace fossil fuels, to support economic development and decrease the global energy deficit. However, large-scale centralised projects do not necessarily improve access to energy for those who do not have access to energy yet.

Therefore, as well as utility scale RE projects, it is important to provide reliable access to clean, affordable energy. A lack of access to modern energy technology limits income generation, blunts efforts to escape poverty, affects the health of women and children, and contributes to global deforestation and climate change. The IEA (2017), in their report on Energy Access Outlook 2017, summarise the issue very well:

- In 2015, 193 Member States of the United Nations agreed upon a specific target for ensuring access to affordable, reliable and modern energy for all by 2030 called SDG 7.1 – universal access to electricity and clean cooking. Achieving SDG 7.1 would require bringing electricity to the remaining 1.1 billion who are still without electricity and reaching the 2.8 billion currently without access to clean cooking facilities.

- Achieving modern energy for all by 2030 is possible and brings big benefits for minimal expenditure.
- To provide universal electricity for all, decentralised systems, led by solar PV in off-grid and mini-grid systems, will be the least-cost solution for three-quarters of the additional connections needed. But grid extension will still have a role to play, especially in urban areas. Achieving clean cooking for all relies on the use of LPG, natural gas and electricity in urban areas and a range of technologies in rural areas, including increasing the use of improved and advanced biomass and solar cooking stoves.

Declines in equipment costs, along with innovative business and financing models, are transforming access to energy in some of the world's least developed nations. The number of small off-grid home systems – for light, phone charging and basic appliances – has grown rapidly. Countries such as Pakistan and Nigeria with large populations and unreliable grid power supply are among the largest markets for off-grid small-scale solar in the developing world, as are Bangladesh, Myanmar, Ghana and Dominican Republic and West and East Africa.

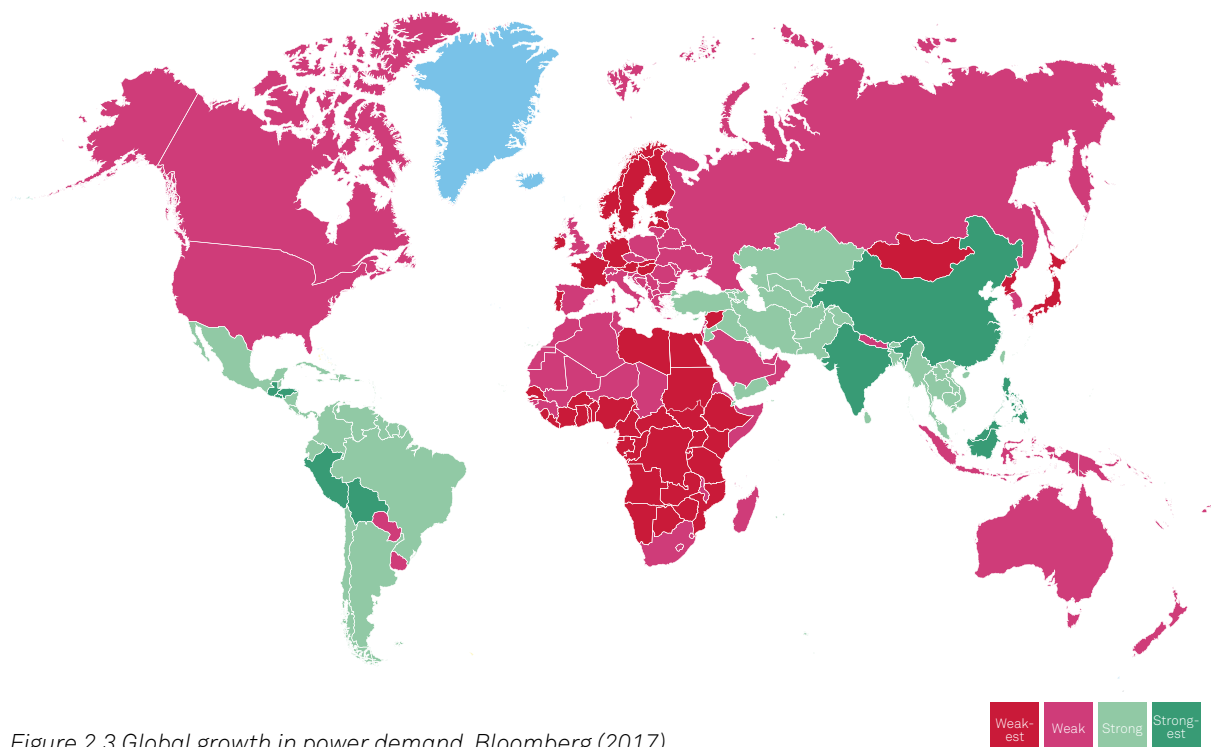


Figure 2.3 Global growth in power demand, Bloomberg (2017)

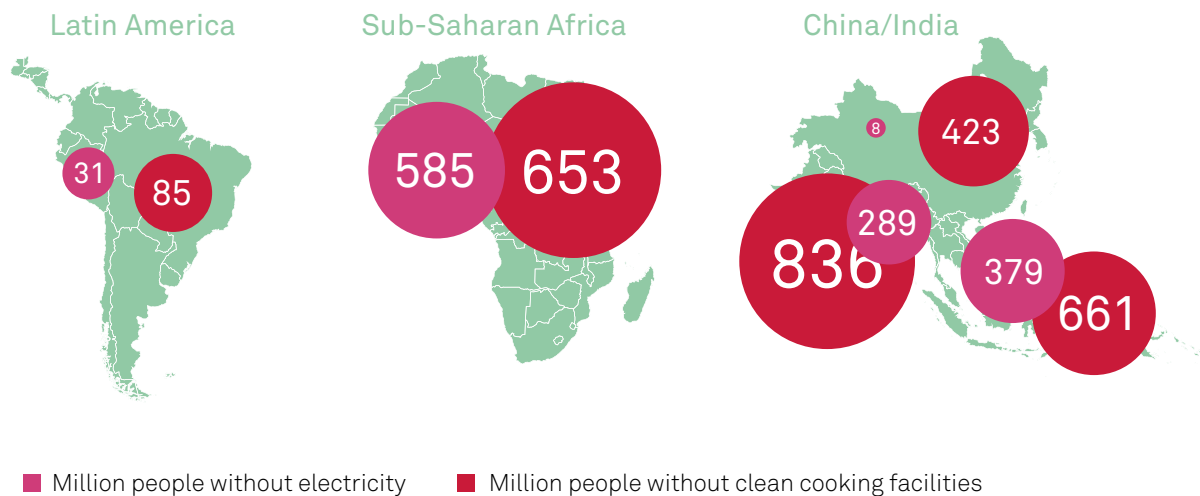


Figure 2.4: Global energy poverty, IEA (2011)

2.5 Climate adaption versus mitigation

We realise that the effects of climate change that are already 'in the pipeline' will require climate adaptation, such as adaptation in agriculture, water management, land use, construction, etc. We need resilient economies to allow for such adaptation. If done properly, adaptation can also contribute to building sustainable and resilient economies. However, we are running out of time and carbon budget. Triodos Bank puts all its efforts in the energy sector on climate mitigation, to reduce emissions as much as possible as soon as possible and to stabilise heat-trapping greenhouse gases in the atmosphere. The longer we wait, the more expensive climate mitigation becomes. For this we foresee an energy transition along nine key elements.

2.6 Nine key elements of the energy transition

Based on the scenarios and data presented above, Triodos Bank has formulated nine key elements for a viable transition strategy.

The Paris Agreement suggests different climate policies and strategies for developed versus developing countries. The aim in developed countries is to transform the existing energy system to a sustainable one. In developing countries, the aim is to meet the rapid growth in demand with a growing and sustainable energy supply and to offer better and affordable access to energy, both on grid, utility based and off grid. We have identified the following elements, which developed countries need to get the Paris goals within reach (see table 2.1).

Energy saving and energy efficiency

A (radical) improvement in the level of energy efficiency is needed. Energy saving in the built environment, both for households, small and medium-sized enterprises (SMEs) and commercial, public and social properties is indispensable in the energy transition. Big industry and large consumers, like the steel industry and other manufacturing industries, will need to innovate their processes - for example with geothermal heat systems, green hydrogen or biofuels alongside electrification - to reduce emissions and dependency on cheap fossil energy.

Table 2.1: Key elements of the energy transition in developed countries

Energy use	Energy supply	Energy system	Energy markets
Energy saving and energy efficiency	Sustainable supply of green electricity (wind, solar, hydro etc.)	Optimisation of electrification	Decentralised market and energy democracy
	Green hydrogen and green molecules	Flexibility of the power system	Proper regulation and guidance of energy markets
	Careful use of biomass and carbon capture, utilisation and storage (CCUS)		Proper regulation and guidance of energy markets
	Phasing out fossil fuel		

Accelerating the decoupling of GDP growth and (fossil) energy demand should be an essential part of the strategy to have a greater chance of keeping the Paris ambition within reach. This requires robust and ambitious government policies, for example in CO₂ pricing, R&D (availability of new technology for industry, housing and transport), regulation of the eco-efficiency of products and (local) policies to kick off large-scale insulation of housing.

Sustainable supply of green electricity

In the developed world, fast transformation of the energy supply by means of acceleration of mainstream renewable energy production - wind, solar and hydro - is vital to effectively reduce global greenhouse gas emissions.

Green hydrogen and green molecules

The future flexible power system will be inextricably linked to the overall sustainable energy system, a smart mix of green electrons and green molecules. Green hydrogen and other green gases are energy carriers. The application range varies from industrial high temperature processes to transport and storage, for example strategic reserves. Green gases are important for the roll out of renewable energy production.

Phasing out of fossil production

New investments in fossil energy production should end as soon as possible and a process of phasing out and controlled dismantling of fossil capacity should be priority in government policies and in business and finance strategies. Gas may be needed for a certain period during the transition to facilitate the priority phasing-out of lignite and coal first. However, this should not prohibit the full transformation to a fossil free energy production.

Careful use of biomass and CCUS

In a sustainable, circular economy that respects planetary boundaries, heavy use of biomass is hard

and seems impossible without limiting food production and jeopardizing biodiversity. Focus should be on local-for-local sourcing of the biomass input. Burning of biomass for power production or application in mobility should be avoided. Carbon capture, utilisation and storage (CCUS) might be options in the future.

CCUS should be viewed with caution as these techniques could serve as barrier to a genuine sustainable transition of our economies. In the medium-term however, CCUS might be unavoidable to safeguard the Paris Agreement limits. In any case, policies and investments should focus on effective sustainable techniques and practices across society.

Optimisation of electrification

Electrification of energy supply offers great benefits, provided it is sustainably generated, because it will boost energy efficiency. Households are expected to increasingly shift from gas to sustainably and mostly solar PV generated electricity. Industrial processes will be transformed and should make use of green power supply. Also, mobility is shifting towards electrification, as electric vehicles will play a central role in sustainable transport, possibly including heavy transport, largely depending on new storage technology. These developments will substantially add to e-demand.

Flexibility of the power system

Flexibility will be key for functioning of the overall power system. A flexible supply of power from renewable sources like wind and solar-PV requires a new flexible design of the power system to maintain high levels of supply stability and security. Demand side response, smart grid technology, storage, storage innovation, zero-emission adjustable power capacity and new (local) energy system designs are vital elements here. Electric vehicles form a key part of these flexible solutions. Increased electrification will also require additional investments in national and transnational grids.

Decentralised market and energy democracy

Transformation to a renewable energy future changes the role of existing players in the energy market. The transition marks the transfer of the dominance of large-scale industrialised power supply to the rise of a differentiated energy market with small and large capacity. A fast roll-out of renewable energy implies the arrival of local and regional multi-source energy systems with new and various combinations of production and consumption. This includes extensive use of small self-generation capacity, local energy exchange systems and new forms of cooperation and business.

These systems will co-exist next to large renewable production units - such as offshore wind - to meet demand. More citizen involvement is both needed and expected. Finance can play a fertile role in supporting and financing new networks of change agents and their business and cooperative projects, to get things done, to learn and to scale-up the transformation.

Proper regulation and guidance of energy markets

The realisation of an ambitious, stable, predictable and effective government policy is easier said than done. The sustainable transformation required will be a Herculean task and political leadership is crucial to guide the process, within the time frame set by the Paris Agreement.

Four elements are exceptionally important: (i) effective CO₂ pricing, well above the actual levels of the ETS but at least EUR 40 per ton of CO₂ (ii) timely and effective investment in e-grids which should be mostly publicly owned (iii) effective local governance to kickstart sustainable projects in housing, transport and small-scale energy production and (iv) a much faster pace of breakthrough and penetration of new technologies.

3: Taking the lead – the role of finance

Banks do not exist simply for themselves. They fulfil many important functions in society. One of these functions is financing entrepreneurs and institutions committed to tackling major social and ecological issues. The time is right to start making this shift. This chapter is a guide to how.

3.1 Banks and society

Triodos Bank calls for policy changes to ensure a sustainable finance future. It already made this plea in its publication 'New Pathways – Building Blocks for a Sustainable Finance Future for Europe' (2017), a collaborative effort from the Global Alliance for Banking on Values, Finance Watch and Mission 2020. The report states that banks are indispensable in tackling climate change and other major issues in society.

Triodos Bank envisions a new economic model – built on generating benefits instead of financial value alone. An economic model based on fair social foundations and limited by ecological ceilings. Aimed at financing an economy that is distributive and regenerative by design.

Also, Triodos Bank applauds entrepreneurs developing projects no longer based on (individual) ownership, but based on sharing, pay-as-you-use and circular models. We see entrepreneurs developing off balance solutions for energy saving and energy efficiency, investments that the majority of private house owners, entrepreneurs and industry otherwise would not do, because it is not their core business.

Finally, climate change risks and management, should become an active topic in board rooms. Risk management should not be limited to the management of financial, market and operational risks, but also include climate change risk. We believe this is a must have, as recently indicated by several supervisory banks worldwide.

3.2 Focus on project finance

As the previous chapters have clearly shown, tackling climate change is the biggest issue facing us today and will require vast amounts of money. According to the 2018 report of the High-level Advisory Group on Sustainable Finance, an investment of EUR 11.2 trillion is required to meet the European 2030 energy policy and targets set by the Paris Agreement. In financing the energy transition, the bulk of the financing comes from banks (50-90%) who are the most appropriate financing parties and play a crucial role. But we also need investment funds, asset managers and institutional capital like pension funds and insurance companies, governmental financial institutions like EIB and EIF, and country specific development banks like Invest-NL to get the energy transition financed.

In the energy value and supply chain, there are different possible levels for (financial) intervention, see figure 3.1.

Triodos Bank calls for all stakeholders to focus on climate mitigation (see paragraph 2.5) and more specifically on asset and project finance and infrastructure, because this is where the biggest financing need exists in terms of volume. More specifically, we see financing opportunities for:

- Saving energy and energy efficiency
- Production of renewable energy
- Infrastructure investments in grid, off grid systems, smart grid and storage

In our view, it is not primarily about the availability and volume of financing as there is enough capital available. The real challenge is to organise the bankability, investability and financeability of energy transition projects.

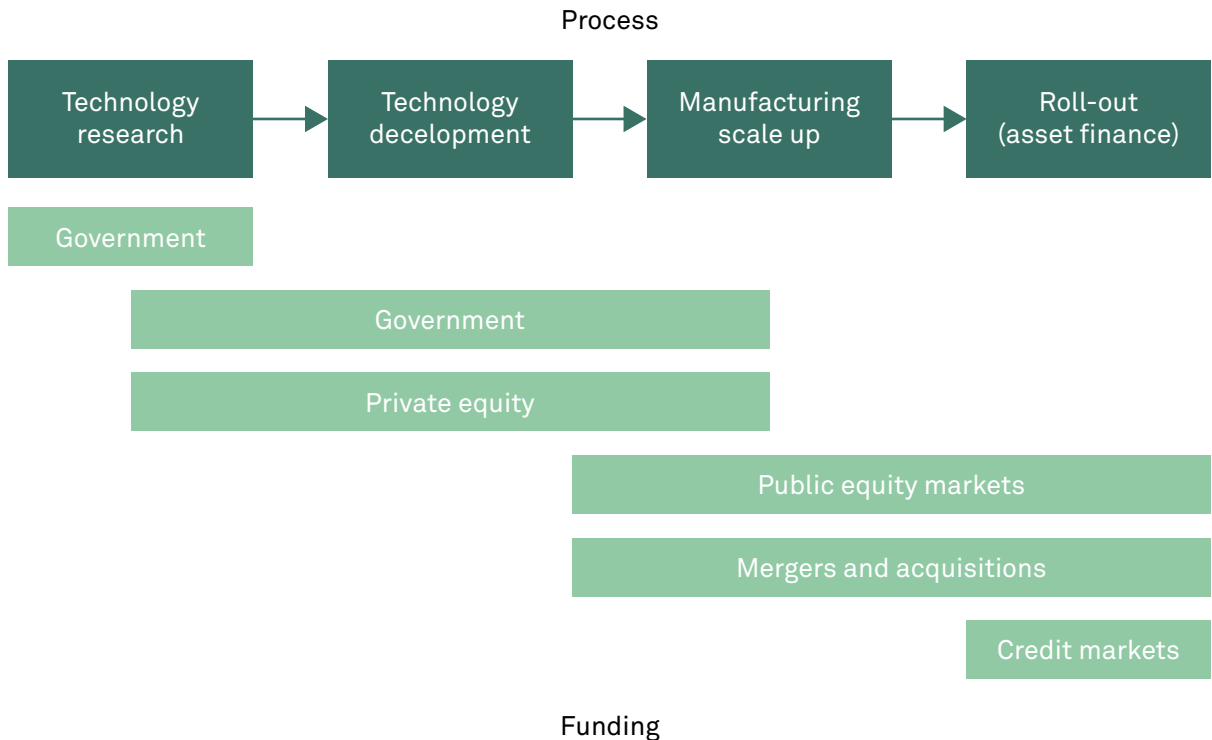


Figure 3.1: Investment categories, Frankfurt School, UN Environment and BNEF (2015)

3.3 Make projects investable

In Triodos Bank's view, financing the energy transition is not about securing a supply required capital. There is enough money, capital and in-principle interest available on the financial and capital markets to invest in the energy transition. There is mostly a need to create more bankable energy transition projects. The questions are: how can we increase the number of bankable projects so that the energy transition can scale up and compete best with energy produced by fossil fuels? What economic model do we need for this? What does it mean for new business models?

We talk about complex projects and projects with a (perceived) higher risk, due to new technology like geothermal or new and yet imperfect markets. We talk about projects that need tailor-made and newly

developed financing solutions, because the ownership structure is new, like cooperatives with thousands of owners. And we talk about small projects that may not be profitable on a stand-alone basis but may become profitable and hence bankable when bundled in a portfolio.

This is not easy – it requires a lot of work by financiers who need to develop expertise in how to make projects investable. In order for this to work, we see four prerequisites:

- Provide consistent and proper regulatory framework and guidance of energy markets. This point is explained in paragraph 2.6 as one of the key elements of the energy transition.
- Remove bottlenecks in (financial) regulation that hampers the energy transition. There are many legal, technical and financial obstacles hampering the transition, such as standardised lease contracts for solar PV projects on roofs. All these

topics should be dealt with and solved.

- Allow for and support experimenting with (new forms of) financing of new business models. Two things are important in this. First to have an open view and allow room for experimenting, especially by governmental bodies and local authorities. Second, to provide for (first loss) guarantees, forms of blended finance and innovation and development finance.
- Develop a fundamentally new economic model that internalises externalities, such as costs stemming from unsustainable production and consumption.

3.4 Develop tools for true pricing

To stay within ecological limits, we feel that tools must be developed that internalise externalities; costs stemming from unsustainable production and consumption. True pricing is the monetary valuation of social and environmental externalities. Internalisation helps to make these hidden costs for society visible and identifies where positive impact can be made. Moreover, this increased transparency can stimulate market forces.

A concrete example of true pricing, and in our view a must, is the introduction of a carbon pricing mechanism, preferably globally or on a European scale. A recent report by the Dutch Central Bank (2018), shows that a broadening or increase of the tax that corporations pay on their greenhouse gas emissions does not have to exert a major impact on the Dutch economy as a whole. Profound effects may, however, occur in a number of specific industry sectors. These effects may be partly cushioned by using the carbon tax revenues to give a financial impetus to the transition to cleaner technologies.

The other side of the coin is attaching a positive financial value to social and environmental externalities. In this way, the integrated value (I) can be established by summing the financial (F), social (S) and environmental (E) values in an integrated way. This can be labelled a true value methodology (Schoenmaker, 2019).

Another example of measuring and pricing externalities is the total value methodology that incorporates the social and environmental dimension in the net present value calculation of an investment, including a negative value for unsustainable practices.

Furthermore, for the success of the energy transition, Triodos Bank considers it vitally important that the fiduciary duty of investors towards their clients is reviewed to incorporate negative value of unsustainable factors.

3.5 Seek non-mainstream opportunities

Mainstream projects, where senior debt is levered up to 90% of the capital expenditures (Capex), tend to grow bigger and bigger. Offshore and onshore wind are increasingly being financed - both equity and debt - by institutional investors such as pension funds and insurance companies. International banks are becoming active in this market too, such as German (KfW), Japanese and Chinese banks. On the public side, large corporations and utilities are active, like Eneco, RWE, Engie and Mitsubishi.

Despite the role of these institutional and large corporate parties, banks continue to play their role in the mainstream sectors. Banks are usually the ones to structure these projects and finance them through construction, after which the operational phase is often refinanced by the institutional parties (see table 3.2).

Table 3.2: Financing structures of mainstream, non-mainstream and clean tech projects

	Mainstream	Non-mainstream	Clean Tech
	• Proven technology • Large-scale roll-out • Offshore wind • Onshore wind	• New(er) technology • Smaller projects • New, imperfect markets • Innovative legal forms, social structures	• Non-proven technology, investments • R&D • Seed Capital • Venture Capital • Growth Capital
Debt/ Bank financing	Project financing +/- 60-90%	Project financing +/- 50-80%	• Very limited role for banks
Equity/ Mezzanine	Project financing +/- 10-40%	Project financing +/- 20-50%	• Venture capital • Launching customers

However, given the importance and the challenge of financing non-mainstream projects in the energy transition, the financial sector should not focus on financing mainstream projects alone. The finance sector should also play an active role in tackling the obstacles for realising non-mainstream projects. It should be part of the real economy and actively cooperate with all stakeholders involved.

So instead of waiting to see a bankable project land on its desk, the sector should seek opportunities for co-creation and joint business development with entrepreneurs. Banks and investors should pioneer with new business models and develop new financial instruments, such as off balance, energy efficiency, energy service companies (ESCOs) and green lease solutions. To solve the challenge of 'small-scale', the financial sector needs to realise that portfolios of small projects could soon become more significant than single large projects.

Also, it should focus on making their financing leaner and more efficient, standardise its documentation and the required collateral etc. This also requires a significant additional effort from Triodos Bank.

Closely cooperate with other parties

Clearly, the challenge in financing is biggest in the non-mainstream projects, and banks and investors cannot solve the bottlenecks alone (see figure 3.3). To realise these non-mainstream projects, we need joint effort, commitment and coordination between all players involved to overcome external, internal and pre-financing hurdles. We need rigorous but fair and inclusive governmental targets and policies, supported by strict legal enforcement and support mechanisms, to make these projects investable.

For example, the RE market is developing very rapidly and an increasing number of stakeholders are entering this market. The finance sector should closely cooperate with these stakeholders in an inclusive manner. It should cultivate a more diverse ecology of values-based, sustainable financial partners at city, regional, national and European level, with a broad spectrum of risk appetites and sector specialties. Such an ecosystem consists of financial institutions with different business models, different investment horizons and risk appetites. This includes crowdfunding, regulated by a consistent framework and including citizens, businesses and public authorities, with a role for public money and public support instruments.

What are mainstream projects?

Wind onshore and offshore and bigger ground-mounted solar PV projects are regarded as mainstream. In mainstream finance the focus is on massive deployment of green assets. Innovation takes place through this massive deployment, like wind turbine development and an increase in the efficiency of solar PV modules. The scale of mainstream projects shows an upward trend: projects get increasingly bigger. Market and system failures have no significant influence on the financing of these projects. An adequate and robust regulatory framework is in place. Projects and entrepreneurs and developers are solvent and liquid and show good entrepreneurship. Portfolios of (the biggest) mainstream projects are fit for investment by institutional investors. Hence, investments can be financed in a regular manner.

What are non-mainstream projects?

Financing of non-mainstream projects has its specific challenges and obstacles for investors. These can be caused by the immaturity of a new technology, for example (deep) geothermal and the immaturity of the market. This may result in high up-front costs or risks and uncertainties like e-efficiency, ESCO, smart grids; a lack of scale, since small projects have high handling costs and need standardisation and bundling; and new legal forms of ownership structures like cooperatives, PPP and crowdfunding structures. Also, non-mainstream projects may involve innovation: technologically, structurally like bundling or standardisation, financially and socially.

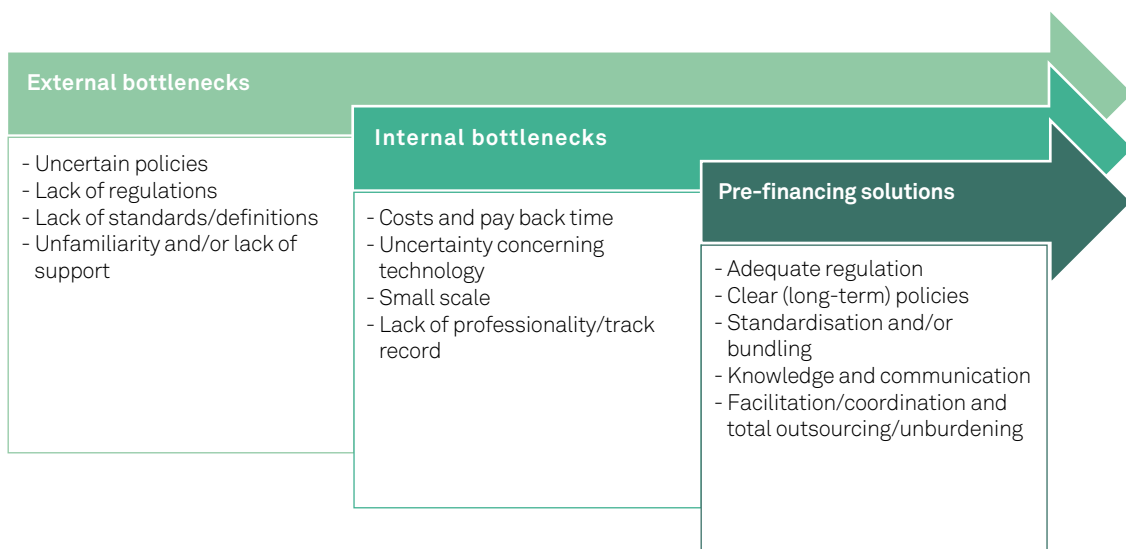


Figure 3.3: Focus points when investing in non-mainstream projects, PBL (2017)

3.6 Investment needs to 2030 in developed countries

A large volume of financing and investments will be needed to finance the energy transition, both in energy efficiency projects and in renewable energy generation. According to the 2018 report from the High-level Advisory Group on Sustainable Finance, an investment of EUR 11.2 trillion is required to meet the targets set in the European 2030 energy policy and the Paris Agreement.

According to a report by PBL Netherlands Environmental Assessment Agency on investments and financing for the energy transition (PBL, 2017), the required investments in the Netherlands alone, in the 80% and 95% reduction scenarios, would add up to approximately EUR 300 billion or EUR 350 billion respectively over the period 2020–2040. The share of non-mainstream projects in this total amount is approximately 55%.

3.7 Investment needs in emerging markets

Chapter 2 outlined that even bigger investments will be needed for non-OECD countries, due to population growth, economic development and the current state of energy deficit. These very significant amounts of funds – both equity and senior debt – for medium and large, utility-scale projects to increase the production of energy from renewable sources outgrow those in the developed world. Over the past decade many of these projects have become bankable.

Every renewable energy project entails certain risks. However, a project in an emerging market can bring more and different types of risk, such as grid constraints and the risk of curtailment. Some of these risks are connected to the political situation; governments often keep electricity tariffs low for political reasons, which leads to utility companies having to face losses. Via explicit or implicit guarantees, governments make up for these losses

Climate and energy investment needs to 2030 (European Commission, 2017)

Currently, the EU is not on track to deliver the €11.2 trillion required to meet its 2030 energy policy targets. The latest estimates put the annual investment gap at around €177 billion between 2021 and 2030, totalling €1.77 trillion.

The biggest gaps relate to investment in energy efficiency in buildings (74%) and transport (17%). Geographically, the biggest gaps are in central and eastern Europe. Investment needs for climate adaptation and resilience are generally not available. This is largely because most member states have not set out their climate adaptation requirements, and where they have, the quality of current national/regional adaptation plans vary considerably.

Closing the investment gap will bring significant benefits, including clean energy and reduced greenhouse gas emissions; it will also create new jobs in Europe, reduce energy poverty and improve air quality. Given the scale of the gap, unlocking energy efficiency investment in buildings must be the top priority. One key solution is for EUROSTAT to issue guidance to national statistical authorities on classifying energy performance contracts as services or as buy-and-leaseback contracts. This would enable governments to contract and finance energy efficiency investment programmes to the private sector off balance sheet. Along with reforms of state aid, this would be a significant step forward in boosting investment where it is most needed.

at utility level on a regular basis, as the electricity supply is regarded of crucial importance for the country.

Government institutions and multilateral institutions often invest in grid infrastructure and work with member countries to improve the infrastructure, sector policies and reforms.

Political risks like transferability, convertibility, war, expropriation or breach of contract can be insured in certain cases. Some of these risks can be absorbed by working with so-called A/B loan structures with multilateral institutions, who benefit from a preferred creditor status in member countries. Also, maintaining certain country limits and a well-spread portfolio where energy sectors in target countries are not correlated, helps to create an acceptable risk profile.

First and foremost, important risk mitigants need to be well structured project and finance documents, where risks are properly addressed. A base case financial model should be robust enough to handle potential setbacks, in terms of financial ratios, reserve accounts etc.

In addition, when the feed-in tariff or negotiated power purchase agreement tariff is competitive enough – fuelled by the ever-decreasing costs per MW of renewable energy – projects structured in accordance with international project finance standards in emerging markets can be as sound as projects in the developed world. And the impact is perhaps even greater.

Besides financing utility scale projects, financing access to energy projects is as important, if not more important. These need to go hand in hand. In many cases, off-grid solutions provide the most economically viable solution for energy access to households in emerging markets, especially in rural areas. Figure 3.4 states that if someone lives more than three kilometres away from an existing grid line, off-grid is a better solution for that person, not taking into account the unreliable grids that usually are in place.

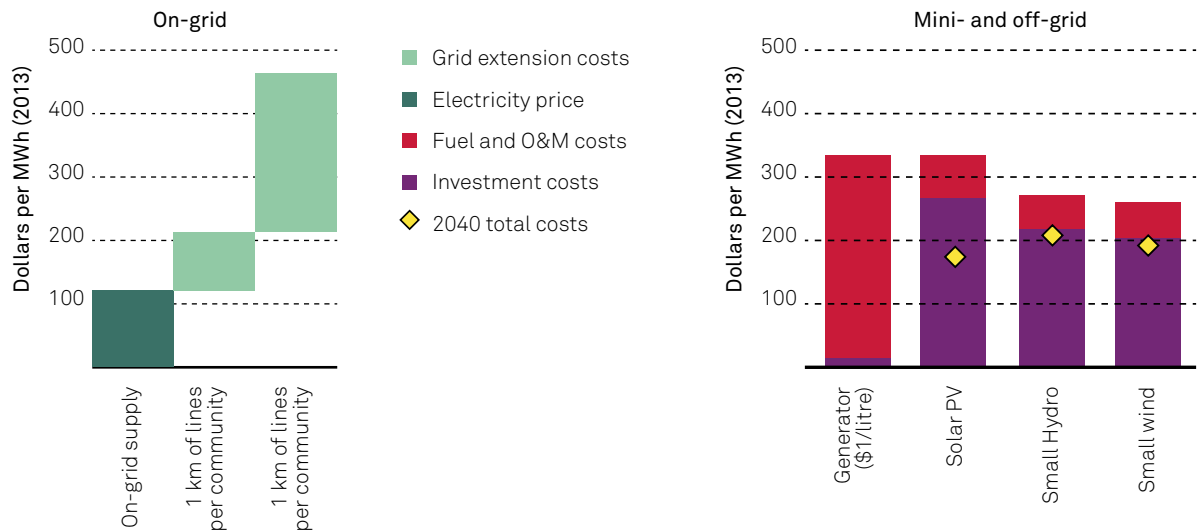


Figure 3.4: Indicated levelized costs of electricity for on-grid, mini-grid and off-grid technologies in sub-Saharan Africa, 2012, IEA (2014)

The type of energy access solutions that people, communities and businesses need varies.

The question of which is best, is closely related to their income levels. In general, people will aspire to move up the energy ladder; they want to be able to use electricity for more applications as their income goes up. The energy ladder has several definitions, but can be segmented as follows (taking a World Bank approach (2015)):

- Tier 0 - no access
- Tier 1 - basic access to task lighting, clean cooking and phone charging, solutions include solar lanterns, clean cooking stoves and bio digesters
- Tier 2 - also access to general lighting, television, fan, solutions including solar home systems
- Tier 3 - also access to medium power appliances such as refrigerators, rice cookers, solutions including generators and mini grids
- Tier 4 and 5 - also access to high power appliances, solutions include big generators, mini grids and grid access

For each of the energy access solutions above, we see (new) businesses emerging with different financing needs:

- Tier 1: Companies such as D.Light (over-the-counter solar lanterns), SimGas (bio digesters) and Envirofit (clean cooking stoves). Financing need: early stage equity and working capital financing.
- Tier 2: Pay as you go (PAYG) solar companies such as M-KOPA and Fenix. Financing need: early stage equity and working capital financing.
- Tier 3: Companies such as Husk (mini-grid solutions) and small projects. Financing need: early stage equity and working capital financing, as well as project financing (debt and equity).
- Tier 4 and 5: mini-grid and on-grid projects. Financing need: project financing (project financing).

4. The way forward - how Triodos Bank contributes

So far, we have described the need to combat climate change and the challenges to realise the energy transition. This chapter describes our concrete actions to both 'change finance' and 'finance change' from a global perspective within energy & climate.

4.1 Triodos Bank's current energy & climate activities

From the start, energy and climate has been an important theme for Triodos Bank. In fact, after the Chernobyl disaster in 1986, Triodos Bank's earliest clients called the bank to ask what it would do about it, whether it would offer the opportunity to invest in the alternative energy sector. The investment in the first Dutch wind farms go back to that period and Triodos Bank has since built an extensive network & expertise and three decades of experience.

Largest portfolio

Nowadays, renewable energy is Triodos Bank's largest portfolio, with a total exposure of EUR 2.25 billion - 14.5% of the total group's funds entrusted. This portfolio is built up and managed by co-workers of Triodos Bank branches and subsidiaries in Belgium, France, Spain, the Netherlands, and the UK, as well as Triodos Investment Management. Triodos Groenfonds, Triodos Renewables Europe Fund, Hivos-Triodos Fund and funds at Impact Equities and Bonds to various extents invest in energy and climate projects and companies, in the Netherlands, Europe and emerging markets.

Current projects

This section describes the current activities of the Triodos Bank branches and Triodos Bank non-listed investment funds focusing on projects, excluding the investments in listed companies of the Impact Equities and Bonds funds.

In the first decade, loans and investments predominantly focused on electricity generation by wind farms in the Netherlands. In the second and

third decades, activities expanded to other branches of Triodos Bank in Europe and Triodos Renewables Europe Fund. Moreover, exposure to the solar PV sector has increased significantly, driven both by the exponential drop in costs of producing electricity by solar PV systems and the excellent opportunities of solar PV in distributed energy systems.

From 2015, Triodos Investment Management actively engaged in renewable electricity generation in emerging markets. This led to an increase in the share of hydropower in the portfolio. Next to electricity generation, Triodos Bank is also increasing its contribution to sustainable heat projects by investing in heat & cold storage projects. Energy efficiency and energy storage projects ('other') are emerging in our portfolio.

Figure 4.1 gives an overview of the portfolio exposure by (sub)sector, as per end of 2018. 95% of the overall portfolio is exposed to renewable energy generation; 2% to heat & cold storage and 3% to 'other'. The composition differs per country, depending on the needs and opportunities in the market.

Impact

In terms of impact, by the end of 2018, Triodos Bank and its energy and climate investment funds were financing 513 projects in the renewable energy sector (2017: 472) with a total generation capacity of 3,800 MW (2017: 3,100 MW). In 2018, these projects produced the equivalent of the electricity needs for 2.5 million European households (2017: 1.4) and contributed to the avoidance of over 2.9 million tonnes of CO₂ emissions (2017: 2.4 million).

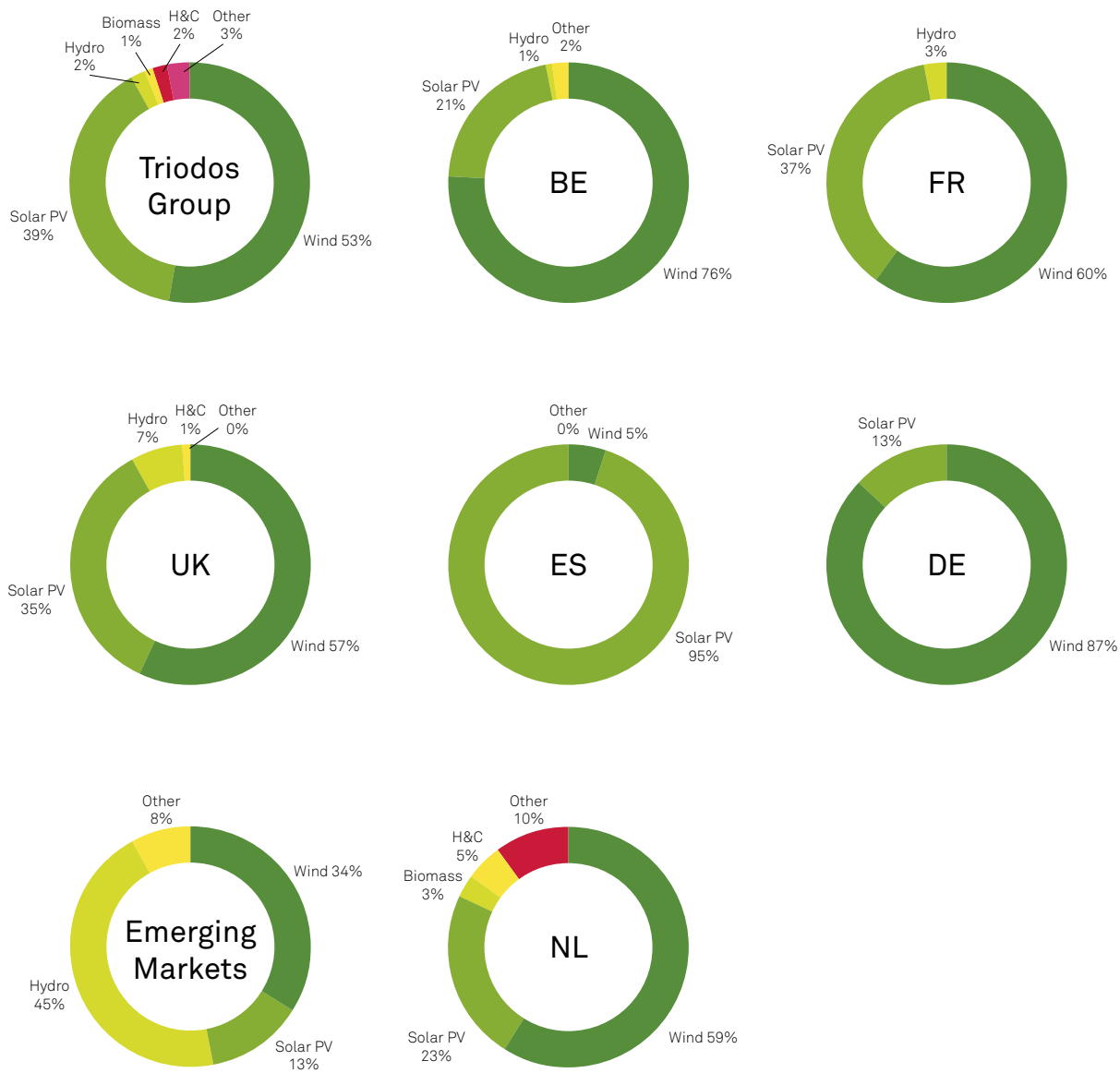


Figure 4.1: Composition of Triodos Bank's renewable energy portfolio per geography as per end of 2018

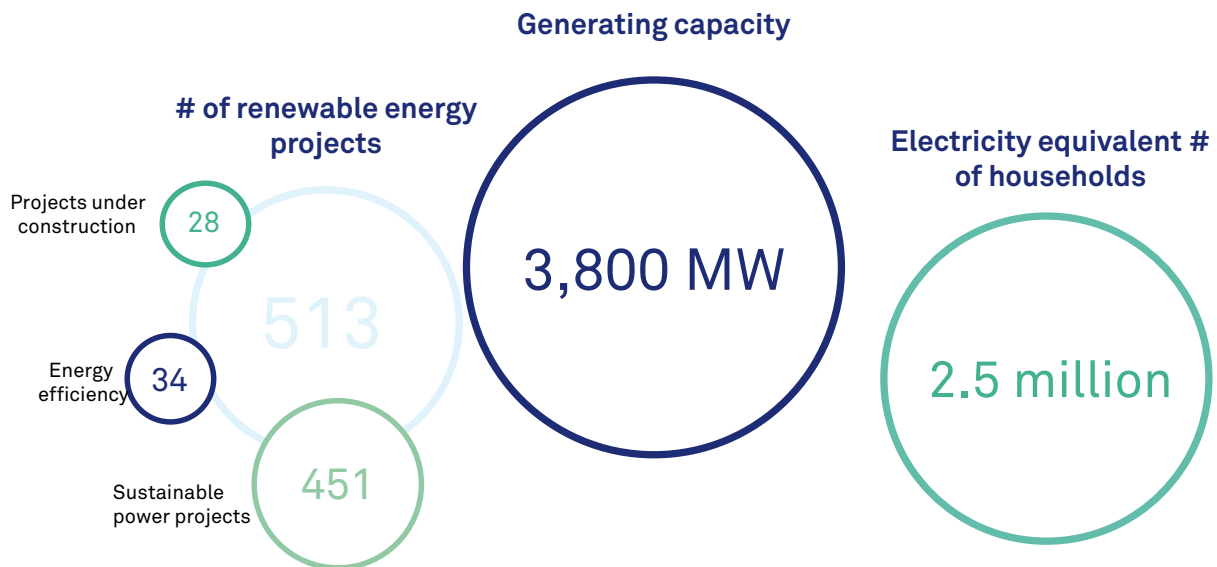


Figure 4.2: Impact of Triodos Bank's renewables portfolio as per end of December 2018

Triodos Bank provides flexibility and funds projects of all different sizes, including smaller or community level ones that many other banks and debt funds are not prepared to look at. For the fourth year in a row, Triodos Bank was named most active global lead arranger in financing renewable energy projects by number of deals. In 2018, Triodos Bank invested in 78 deals totalling USD 806 million (2017: 68 deals, totalling USD 698 million), which leads the clean energy pipeline annual Global League tables.

4.2 Changes we will make

Triodos Bank's focus in relation to energy and climate has mainly been on offering project finance for mostly medium sized renewable energy generation projects, based on proven technologies. This will continue to be an important focus, as the energy transition requires massive deployment of green assets.

However, this will not be enough to address the challenges in our energy system to mitigate climate change. While differentiating our activities in developed countries and emerging markets, we see four elements as the way forward:

Financing the energy transition

Triodos Bank will move from financing renewable energy generation 'only' to financing the energy transition. We will do so around the nine key elements discussed in chapter 2. We will work along this transition theme throughout the entire organisation and synthesise our efforts from bank to investment management.

Financing a more decentralised and distributed energy system

In the energy transition market in developed countries, there are several developments (see figure 4.3 below). We identify two opposing developments along the horizontal axis of centralised and decentralised:

- Centralised power projects, based on proven technology, become larger and larger by volume at relatively low cost
- Distributed, decentralised energy projects move increasingly into the hands of regional and local cooperative structures like local governments and local industries and into the hands of citizens and citizens' cooperatives. These decentralised projects may be small in volume, but their numbers are growing fast.

There are developments along the vertical axis of innovation: non-mainstream projects become mainstream and mainstream projects add elements

of non-mainstream by including innovation in terms of technology, scale, market and social ownership structure.

In the energy transition, we believe all efforts are needed to reach the Paris Agreement goals by financing centralised as well as distributed power and mainstream as well as non-mainstream projects. Triodos Bank wants to continue financing centralised mainstream projects. We believe by doing so, we contribute to incremental innovation due to the massive deployment of green assets. Look at the first windmill Triodos Bank financed compared to the offshore wind turbines installed today. This sector is our bread and butter and we have the right competences, a good reputation and network.

Financing more non-mainstream projects

Currently, most focus, time and effort (80-90%) is spent on mainstream projects, getting these scaled

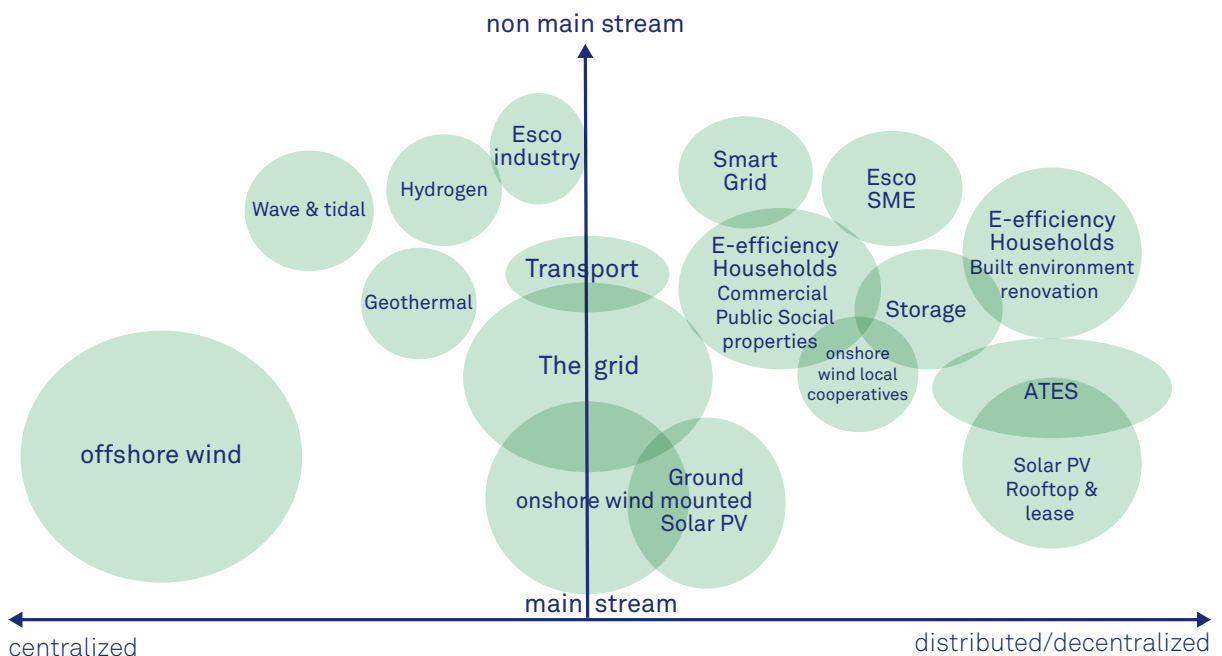


Figure 4.3: Renewable energy projects

up, developing an offshore strategy and helping organisations to become more efficient. The composition of mainstream in the total portfolio is around 95%. We will continue to finance mainstream projects, but given the transition we are in, we will increasingly finance non-mainstream projects.

In three years' time, we will allocate more time, budget, access to expertise, systems, processes and people with the necessary competencies to the non-mainstream and more distributed projects. We aim to increase this part in the portfolio to 10-20% to build impact and to remain a frontrunner in the sector.

In emerging markets, we see the landscape as presented in figure 4.4. In these markets, we want to radically expand our existing activities, both in providing financing for mainstream, grid connected utility-based projects and for Tier 1-3 and 4-5 access to energy projects.

Applying a systemic view & providing impact reporting

When financing the massive deployment of mainstream technologies, we apply an integral, inclusive and systemic view of the energy transition.

Compared to previous statements focusing on energy generation, Triodos Bank stresses the importance of the goal to support energy efficiency as the first step. Triodos Bank has also added the goal of financing of and investing in the (increase of the) flexibility of the energy system. This is important, because further electrification is key to a sustainable energy system and the grid must be well balanced. Finally, we added 'energy democracy': awareness and involvement of the general public as new challenges and focus areas, because we are strongly convinced that societal support is key for the energy transition.

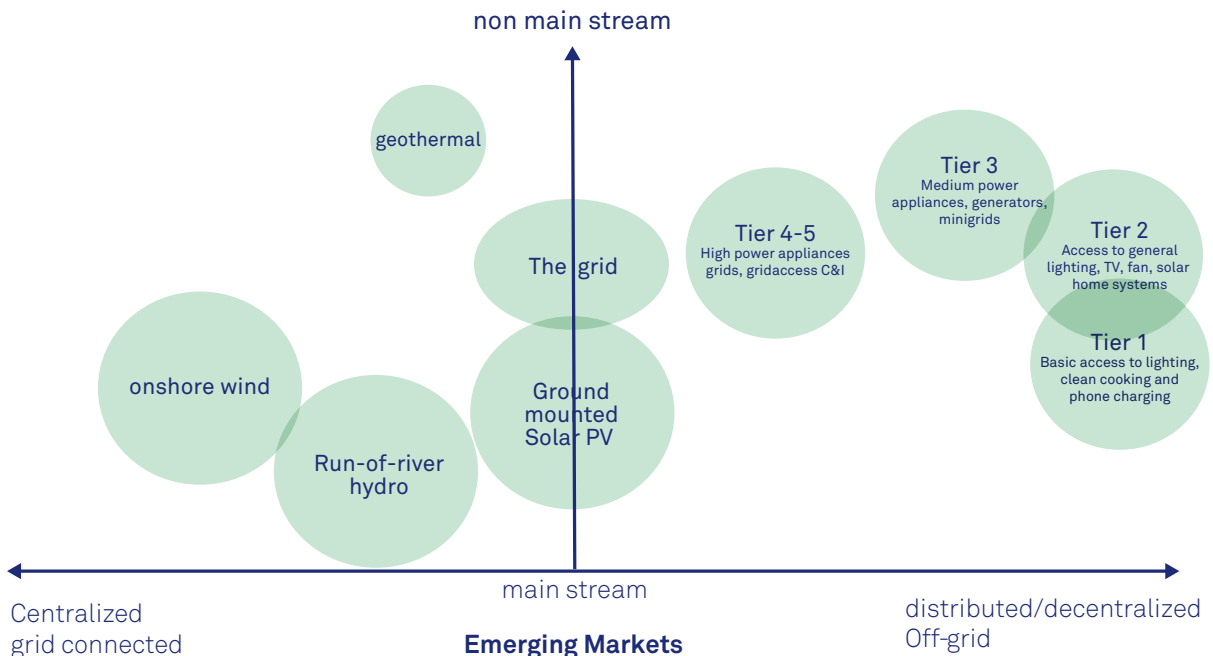


Figure 4.4: Triodos Bank strategic choice in renewable energy projects in emerging markets

Also, we increasingly and deliberately strive to take other sustainable goals into consideration: biodiversity, social inclusion, employment, environmental, circularity, etc. In emerging markets, we seek ways to develop the sector from 'managing for environmental, social and governance risk (ESG)' to capturing ESG opportunities 'by design'. We look for ways to incorporate this in our impact framework and reporting.

In May 2019, Triodos Investment Management issued its first Energy & Climate Impact report 2018, revealing its holistic view on impact investing in energy and climate and the 2018 impact results of its energy and climate funds under management. We will improve our impact framework and reporting on the energy transition in a more integral manner, also capturing other related development goals.

Ideally, Triodos Bank's partners should commit to the same goals and Triodos Bank should continue to take a leading role.

4.3 Our business agenda

In this section we translate the four changes mentioned above and the four key elements of an energy transition strategy (energy saving and e-efficiency; production of renewable energy; flexibility; energy democracy) into concrete business opportunities for Triodos Bank.

Mainstream projects in developed countries

- Triodos Bank will continue financing mainstream renewable energy projects. We have a very good reputation and expertise in this sector, and it is our bread & butter.
- These mainstream projects will increase in size, require a most efficient internal organisation and a different, European relationship approach towards institutional investors and large corporates.
- Onshore and increasingly offshore wind will be developed further.

- The solar sector will continue to be our focus, given the clear opportunities for solar PV, its crucial role in the distributed power sector and the built environment for the electrification of transport, and the combination with smart grid and storage. We focus our innovation of financing in this sector: standardising contracts (easement), co-siting with smart grid and storage and learning from each other.
- We will apply an integral and systemic view and strive to take other sustainable goals into consideration: biodiversity, social, employment, environmental, circularity, etc.
- Within mainstream wind and solar technologies, we will innovate and develop a specific proposition for citizen cooperatives. We learn from each other what works and what does not.

Non-mainstream projects in developed countries

- Non-mainstream projects are more distributed and decentralised by nature. This also requires a different relationship approach, work in/with networks and orchestrated learning and development within Triodos Bank. This shift to non-mainstream projects will be developed and facilitated preferably in partnership with 'aggregators' in this sector.
- Given the importance, highest carbon intensity per invested euro, energy saving and e-efficiency will be the priority and we want this to become a broader part in our portfolio. Especially in the built environment (commercial, public and social properties and private houses through mortgages), ESCO structures for SMEs, large corporates and potentially industry. This difficult market requires an orchestrated, well-facilitated and coordinated approach. As soon as offshore wind has finalised its pilot phase within Triodos Bank, we will start exploring the opportunities for financing this area. We will develop an energy efficiency sector risk analysis and market approach.
- Secondly, we will develop opportunities for financing the flexibility and reliability of the grid. These options are still in their infancy. They are innovative and risky and more eligible for

investments by our equity funds than for financing by Triodos Bank. We are already exploring several opportunities, like electricity storage through co-siting of batteries with generation (solar PV or wind). Triodos Bank in the UK is well positioned to be in the lead and has already written a sector report. Other opportunities may be the flexibility market; Triodos Bank in Germany has already financed a first deal in this market.

- Within the mainstream wind and solar technologies, we should innovate and develop a specific proposition for citizen cooperatives. We could learn from each other what works and what does not.
- Currently we have only a few financing activities in the electric vehicles transport sector. Electric vehicles, however, can play an important role in the flexibility of the grid. Moreover, in Belgium and France this sector is the single biggest source of GHG emissions and the second biggest in Spain and UK (more than 20%). Triodos Bank branches will research opportunities in this sector.
- Green hydrogen and green molecules: the future flexible power system will be inextricably linked to the overall sustainable energy-system, a smart mix of green electrons and green molecules. Green hydrogen and other green gases are energy carriers. The application range varies from industrial high temperature processes, heating of households by replacing natural gas, to transport and storage, for example for strategic or seasonal reserves. Green gases are important for the roll out of renewable energy production.

Emerging markets

- We envisage expanding our activities in financing renewable energy in emerging markets, both in on-grid and off-grid solutions.
- We will continue to focus on increasing the financing of utility scale renewable energy projects in emerging markets, but also increase the support of distributed small-scale projects and the improvement of access to energy. Within Triodos Groenfonds (one of Triodos Investment Management's impact investing funds), we can do

this by financing portfolios of distributed power projects, for example solar rooftop projects in the Netherlands. When financing projects, especially utility-scale projects, we seek ways to develop the sector from 'managing ESG risk' to capturing ESG opportunities 'by design'.

- We will continue to focus on wind onshore, hydro and solar for utility projects.
- Given the clear opportunities and crucial role for solar PV in emerging markets, this sector will continue to be our focus.
- Furthermore, we will increase the cooperation between Triodos Groenfonds, Hivos-Triodos Fund and the other Inclusive Finance funds of Triodos Investment Management, to see how we can elaborate on each other's experience. We envisage working with the existing relationships with financial institutions, and potentially the Global Alliance for Banking on Values (GABV) to provide green credit lines. Here we can add more value by cooperating within Triodos Bank to export our renewable energy knowledge to emerging markets. And we could work selectively on mid-size solar energy transactions jointly with those financial institutions/GABV members.
- Hivos-Triodos Fund can provide funding for Tier 1 to 3 solutions, from basic access to access to medium power appliances. Triodos Microfinance Fund and Triodos Fair Share Fund can provide funding to mature companies that offer financial services as part of their business model to provide access to energy solutions, such as M-KOPA.

Other financing options

- From project finance in the energy sector, by energy sector teams only, we will move to finance energy and energy efficiency projects more explicitly in the adjacent sectors we finance: (commercial) real estate, social real estate (healthcare) and SME financing.
- We will explore possibilities to move up the supply chain and offer private debt and equity/corporate finance for SMEs active in the energy & climate sectors. Within the private debt for SMEs a small part of our capital is allocated for slightly higher

risk debt instruments (at higher return). We will seek ways to increase our impact here.

- Triodos Investment Management's Impact Equities & Bonds Funds invest in equity, corporate bonds and green bonds issued by listed companies that are active in the energy and climate value chain, or by companies or governments for project funding. Through this approach, these funds invest with the aim to have a significant share invested in a range of companies that contribute to the transition to a low-carbon energy sector. We want to intensify collaboration and knowledge sharing within Triodos Bank.
- Further up the supply chain: venture capital. We will research the outcome of 'participation with passion' trial, to see what Triodos Bank could mean for the energy sector with this corporate finance instrument. Triodos Investment Management will also explore opportunities to have investment funds under its management, to invest more in venture capital funds, and to broaden the financing options for entrepreneurs in the energy transition.
- Ecologically sound hydro projects continue to be interesting in countries like the UK and France.

to do so. We might consider it, based on local-for-local biomass input, where the owner of the biomass is involved as an operator or sponsor of the project.

- In order to focus on energy saving and energy efficiency, we will deepen our knowledge in the energy efficiency sector. We will only consider biomass, waste heat or geothermal in cases where these technologies form an indispensable part of the energy transition and where our partners really want us to focus on these technologies together and offer sound ways to do so.

Excluded business opportunities

- As Triodos Bank, we continue to exclude financing nuclear energy projects and do not consider financing carbon capture and storage (CCS). We exclude nuclear energy because nuclear waste poses a significant threat that has not been solved. Moreover, nuclear energy is the only source of energy for which the levelized cost of energy has increased, as opposed to renewable sources of energy. Despite the fact that we acknowledge that forms of carbon capture and sequestration will most probably be needed, CCS technology does not yet really exist, is not proven, and in our view inhibits real innovation.
- Furthermore, we are hesitant to finance biomass projects, except in cases where these technologies form an indispensable part of the energy transition and where our partners really want us to focus on these technologies together and offer sound ways

5 The Climate Emergency: everybody must act now

In 2015, the world community adopted the Paris Agreement, but the results so far are a source of great concern. Up to 2019, global emissions are still rising, trillions of dollars are still available for fossil investments, and governments and business leaders are overall too hesitant to pursue the effective transition pathways we need.

We all know that present-day society and the economy are still heavily dependent on the use of fossil energy. Achieving the Paris goal of 1.5°C requires a huge and fast global transformation to a low carbon economy. The magnitude of this change is enormous and will affect society as a whole. That said, we should be aware that the risks of uncontrolled climate change are huge. A global temperature of more than 2.0°C will have a severe impact on societies, economies and the financial sector. The cost of inaction is high (at least 20% of global GDP (Stern, 2006)) and probably beyond imagination. This legacy should not be passed on to future generations.

Everybody must act now: citizens, societal organisations, business, finance and governments.

5.1 Call for Action: Change Finance

As part of the financial industry, Triodos Bank operates as a values-based bank that aims to contribute to a sustainable future. As presented in this document, we have been active for decades financing renewable energy projects and will intensify our efforts in the years to come. According to Triodos Bank all finance is impact finance. The financial industry can and must play a vital role in the transition to a low carbon economy and society.

We collaborate with the Global Alliance for Banking on Values (GABV) with like-minded colleagues who feel the urgency to act now. It's clear that more is needed, especially in the financial sector.

We urge mainstream financial institutions to start and/or accelerate deployment of effective sustainable

business strategies. In 2020 the global financial sector should adopt a worldwide ban on new fossil investments and radically reorient private financial flows to sustainable energy projects.

The points of application for a Paris-proof financing strategy are already available. We encourage the financial institutions to align with the broad range of climate related activities within the financial sector. Here are a few activities that Triodos Bank supports:

Financial practices and regulation: the EU action plan

In its publication 'New Pathways – Building Blocks for a Sustainable Finance Future for Europe', a collaborative effort by the GABV, Finance Watch, Mission 2020 and Triodos Bank (2017), we outlined an agenda for changing financial sector practices and financial regulation. We need to Change Finance. Banks and other financial institutions are indispensable in tackling climate change and other major issues in society. Banks do not exist simply for themselves. They fulfil many important functions in society. One of these functions is the financing of entrepreneurs and institutions committed to tackling major social and ecological issues.

In March 2018, the European Commission has launched the Action Plan on Financing Sustainable Growth. This action plan contains 10 different trajectories which probably will lead to significant change of the rules of the financial game. The connecting element of all EU activities is to create and disclose better insights into the impact of finance to promote sustainable funding.

This is a unique step in the history of financial regulation, because societal impact has never been an issue in regulatory affairs. Triodos Bank supports the general direction of the action plan. At the same time, we have spoken with EU policy makers about the action plan that should first and foremost lead to regulating what matters most now: phasing out and stopping fossil investments and funding of projects with a high carbon footprint. To create the right incentives, Triodos Bank tabled proposals in

Brussels to promote retail investment in renewables, a capital charge for ‘brown’ investments in banking regulation and an effective EU taxonomy for all financial products including unsustainable investments and loans.

Risk of stranded assets and financial instability

We embrace activities of supervisory authorities in the field of management of climate related risks (i.e. Network for Greening the Financial System). More pressure is needed to maintain financial stability during the transition and avoid financial institutions being overexposed to stranded assets. Financial institutions themselves could and should do more to understand, and change for the better, the impact of all projects and companies they fund.

PCAF - measuring the CO₂ impact of finance

Triodos Bank is a founding member of the Partnership for Carbon Accounting Financials (PCAF), a Dutch initiative of financial institutions that started in 2015. The group has developed an effective methodology to assess the carbon footprint of assets and portfolios. This approach enables financial institutions to measure the CO₂ impact of the projects and companies they finance.

Triodos Bank has applied this methodology and disclosed the results in its 2018 Annual Report. These results show that the values-based approach Triodos Bank has adopted since its foundation in 1980 pays off. For instance, as financier of the most European Renewable Energy deals for the last four years, our funding of renewable energy projects resulted in 2018 in avoided emissions close to 1 Mton of CO₂ (see figure 5.1). There is more to be done, also for Triodos Bank to bring down the carbon footprint of its portfolios. Triodos Bank’s ambition is to increase its efforts in sustainable energy projects, reduce positive emissions of our portfolios and level remaining positive emissions with sequestered emissions before 2030.

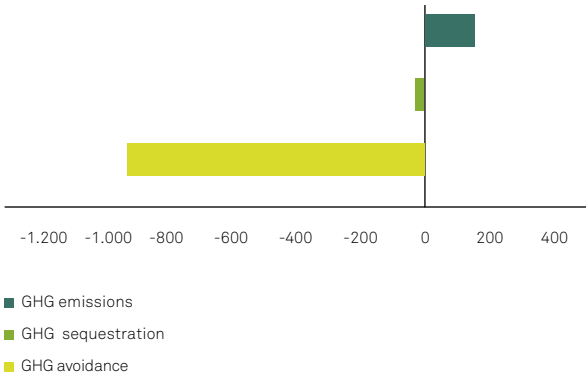


Figure 5.1: Climate impact of loans and investments of Triodos Bank (in ktonne CO₂ eq.), 2018

Internationally, Triodos Bank contributes to the distribution and utilisation of PCAF accounting wherever possible. We aim, together with PCAF partners, to inspire financial institutions to assess and reduce the carbon footprint of their funding. Triodos Bank acts on a European stage to promote the PCAF story, especially in Brussels and the EU countries where Triodos Bank is active.

Internationally, Triodos Bank encourages others to partner in a global effort to assess greenhouse gas emissions across the financial industry.

+50 committed financial institutions to the Dutch Climate Agreement

In the context of the Dutch Climate Agreement (the Dutch NDC), Triodos Bank has actively promoted the adoption of PCAF or likewise methodologies (e.g. PACTA) to measure and reduce the carbon footprint of assets and portfolios, in cooperation with sustainable friends in the financial community and the Dutch government.

This has resulted in a general commitment of over 50 financial institutions to the goals of the Dutch Climate Agreement. This commitment contains the promise that all endorsing financial institutions – banks, insurance companies, pension funds and investment management companies – will disclose

the carbon footprint of relevant assets, by 2020, and set reduction targets, no later than 2022. The scope of this commitment is about EUR 3,000 billion.

Triodos Bank is pleased to get this commitment and will actively contribute to the execution process. The approach followed the process of the Dutch Climate Agreement and Sustainable Development Goal no. 17, which calls for joint action of relevant stakeholders in society.

Adopting the UN Principles of Responsible Banking

In September 2019, the UN Principles of Responsible Banking will be adopted. These principles set out a roadmap for banks across the world to improve the knowledge of their impact on society and to act accordingly. Triodos Bank has played an active role as member of the founding group of banks, sharing our experience and discussing the principles of the GABV. We hope and expect that many banks will adopt these principles and change the way they operate to contribute to the realisation of the SDGs and the Paris Agreement goals.

5.2 Call for Action: business, governments and society

Triodos Bank stands behind the most ambitious Paris-scenario limiting global temperature rise to 1.5°C. This calls for immediate action and a radical transformation of the energy system and the economy. This requires a well-designed overarching transition strategy, steered by democratic governments and with participation of all stakeholders in society. Key elements of effective government policies and business strategies are the following:

We call for an ambitious and rigorous policy to phase out the fossil industry by rising CO₂ pricing and ending (implicit) fossil subsidies, that nowadays are globally 35 times higher than public funds for sustainable energy. A process of phasing out and controlled dismantling of fossil capacity should be

priority in government policies and business/finance strategies. Enterprises should embrace and use the concept of true pricing in order to steer their investment to sustainable products and operations. We promote strengthening of regulation on CO₂ reduction, leading to energy efficiency (housing, transport etc) and reduction of livestock.

We underline the importance of citizen involvement in the energy transformation, by supporting (and financing) community energy initiatives.

We call for robust and ambitious government policies in R&D (availability of new technology for industry, housing and transport), eco-design, regulation of the eco-efficiency of products and (local) policies to kick off large scale isolation and sustainable heat systems in the housing sector.

Triodos Bank operates based on the principle that the future should be the concern of all. Today's climate emergency can only be addressed when we all accept the responsibility to act and do so together. Dare to act. Now.

Sources

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