

Overarching Frequently Asked Questions and Answers

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The WGII overarching Frequently Asked Questions (FAQs) are an outreach material. They are based on the WGII Report and aim to help to interpret its concepts and findings to a broad audience. This version can still be subject to copyedits and tricklebacks.

1. What are the new insights on climate impacts, vulnerability and adaptation from IPCC?

Climate change is affecting nature, people's lives and infrastructure everywhere. Its dangerous and pervasive impacts are increasingly evident in every region of our world. These impacts are hindering efforts to meet basic human needs and they threaten sustainable development across the globe.

All life on Earth – from ecosystems to human civilization – is vulnerable to a changing climate. Since the first IPCC reports, the evidence has become stronger: our world is warming and dangerous climate change and extreme events are increasingly impacting nature and people's lives everywhere. This can be seen in the depths of the ocean and at the top of the highest mountains; in rural areas as well as in cities. The extent and magnitude of climate change impacts are larger than estimated in previous assessments. They are causing severe and widespread disruption in nature and in society; reducing our ability to grow nutritious food or provide enough clean drinking water, thus affecting people's health and well-being and damaging livelihoods. In summary, the impacts of climate change are affecting billions of people in many different ways.

Since the Fifth IPCC Assessment Report, published in 2014, a wider range of impacts can be attributed to climate change. In other words: there is new knowledge that climate change caused them or made them more likely. In particular, increasing heat and extreme weather are driving plants and animals on land and in the ocean towards the poles, to higher altitudes, or to the deeper ocean waters. Many species are reaching limits in their ability to adapt to climate change, and those that cannot adjust or move fast enough are at risk of extinction. As a result, the distribution of plants and animals across the globe is changing and the timing of key biological events such as breeding or flowering is altering. These trends are affecting food webs. In many cases, this reduces the ability of nature to provide the essential services that we depend on to survive – such as coastal protection, food supply or climate regulation via carbon uptake and storage.

Changes in temperature, rainfall, and extreme weather have also increased the frequency and spread of diseases in wildlife, agriculture, and people. We see a lengthening wildfire season and increases in the area burned. Roughly half of the world's population currently experiences severe water shortages at some point during the year, in part due to climate change and extreme events such as flooding and droughts. Drought conditions have become more frequent in many regions, negatively affecting agriculture and energy production from hydroelectric power plants.

People living in cities nowadays face higher risks of heat stress, reduced air quality because of wildfire, lack of water, food shortages and other impacts caused by climate change and its effect on supply chains, transport networks and other critical infrastructure. Globally, climate change is increasingly causing injuries, illness, malnutrition, threats to physical and mental health and well-being, and even deaths. It is making hot areas even hotter and drastically reducing the time people can spend outside, which means that some outdoor workers cannot work the required hours and thus will earn less.

Climate change impacts are expected to intensify with additional warming. It is also an established fact that they are interacting with multiple other societal and environmental challenges. These include a growing world population, unsustainable consumption, a rapidly increasing number of people living in cities, significant inequality, continuing poverty, land degradation, biodiversity loss due to land-use change, ocean pollution, overfishing and habitat

destruction as well as a global pandemic. Where trends intersect they can reinforce each other, intensifying risks and impacts, which affect the poor and most vulnerable people the hardest.

Climate change risks and impacts can be reduced, within limits, if humans and nature adapt to the changing conditions. The scale and scope of actions to reduce climate risks (adaptation) have increased worldwide. Individuals and households along with communities, businesses, religious groups and social movements are adapting to climate change already. However, the Working Group II Report identifies large gaps between ongoing efforts, and adaptation needed to cope with current levels of warming, with the scale of the challenge varying in different regions. The report also highlights that the effectiveness of available adaptation options decreases with every increment of warming. Successful adaptation requires urgent, more ambitious and accelerated action and, at the same time, rapid and deep cuts in greenhouse gas emissions. The quicker and further emissions fall, the more scope there is for people and nature to adapt (see FAQ 4 for further details).

The focus of our new report is on solutions. It highlights the importance of fundamental changes in society at the same time as conserving, restoring and safeguarding nature in order to meet the Paris Agreement and the Sustainable Development Goals. It is clear now that minor, marginal, reactive or incremental changes won't be sufficient. In addition to technological and economic changes, shifts in most aspects of society are required to overcome limits to adaptation, build resilience, reduce climate risk to tolerable levels, guarantee inclusive, equitable and just development and achieve societal goals without leaving anyone behind.

The strong and interdependent relationships between climate, nature and people are fundamental to reaching these goals. This is emphasized more strongly in the new Working Group II Report than in previous IPCC assessments. We now know that a healthy planet is fundamental to secure a liveable future for people on Earth and that's why we say that the needs of climate, nature and local communities have to be considered together and prioritized in decision making and planning - every day and in every region of our world.

2. How will nature and the benefits it provides to people be affected by higher levels of warming?

Healthy ecosystems and rich biodiversity underpin human survival. They provide countless services that make our Earth a habitable place. However, climate change and increases in extreme weather events are drastically and progressively impacting nature, weakening the structure, functioning and resilience of ecosystems. As a result, nature's contributions to human well-being are diminishing, threatening sustainable and just development – now and in the future.

The world's ecosystems on land, in freshwater and in the ocean provide a wide array of essential services to humans. They produce the food we eat and the oxygen we breathe. They filter our water, recycle nutrients and help to limit global warming by storing large amounts of carbon. Furthermore, they cool the air and offer "green" or "blue" spaces such as parks and lakes for fun, adventure and relaxation, thus improving our health and mental well-being. In short, healthy ecosystems are essential for human survival and make our Earth liveable.

Climate change – with its slow-onset events like sea level rise and ocean acidification and increases in extremes – is drastically and progressively affecting our world's biodiversity and ecosystems. Increasing temperatures and extreme events such as droughts, floods and heatwaves are exposing plants and animals to climatic conditions not experienced for at least tens of thousands of years. Observed increases in their frequency and intensity are starting to exceed the ability of many species to adapt. Based on increased observations and a better understanding of processes, we now know that the extent and magnitude of climate change impacts on nature are greater than previously assessed. The impacts we see today are appearing much faster, they are more disruptive and more widespread than we expected 20 years ago. And we know that climate change is strongly adding to, and even amplifying, the other stressors: many of our world's ecosystems are already facing a biodiversity crisis due to human impacts such as deforestation, pollution, overfishing and land-use change. For numerous ecosystems, climate change impacts are an additional stress and even a deadly burden, depending on the level of global warming.

We see a growing number of scientific studies that present multiple lines of evidence showing climate change impacts. Increasing temperatures and extreme events change the seasonal timing of key biological events such as flowering, when animals emerge from hibernation, or annual migration, causing mismatches with important seasonal food sources. Examples include the timing of fish spawning and plankton blooms that fish larvae depend on for food, and insect availability at the time when birds are breeding.

Changing climatic conditions, including warming, also progressively shift plants and animals to higher latitudes, higher elevations or deeper ocean waters. Approximately half of the many thousands of species studied on land and in the ocean already show corresponding responses, leading to climate-caused local population extinctions and shifts in vegetation zones. In the ocean, marine plants and animals including entire communities have shifted their distributions poleward at an average speed of 59 km per decade due to increasing water temperatures. Ocean acidification and decreasing oxygen in the water also play a part. Together all three processes have caused a reorganisation of biodiversity over the past 50 years, especially at the ocean surface. Those species that cannot adjust or move fast enough are at high risk of becoming extinct.

As a result, the geographic patterns and the regional and local abundance of plants and animals are changing, with potentially severe impacts for herders, farmers, fishers, hunters, foragers and other people who directly rely on nature's services. As an example, the sustainable potential for fishery catches of several marine fish and shellfish is estimated to have decreased by 4.1% globally in the 70 years between 1930 and 2010 due to ocean warming. Regions like the North Sea and Celtic Sea have experienced even stronger decreases in fisheries productivity primarily due to warming, but other human activities such as overfishing have played a role as well.

Although there have been some positive impacts on agricultural productivity in some high-latitude regions, with ongoing warming, current global crop and livestock areas will become increasingly unsuitable. Even in a world with low greenhouse gas emissions (warming below 1.6°C by 2100), some 8% of today's farmland is projected to become climatically unsuitable by 2100. Under the same conditions, fisher people in Africa's tropical regions are projected to lose between 3 to 41% of their fisheries' yield by the end of the century due to local extinctions of marine fish. Fisheries provide the main source of protein for about one-third of people living in Africa. It supports the livelihoods of 12.3 million people. Declining fish harvests could leave millions of people vulnerable to malnutrition.

Increases in frequency and severity of extreme weather events such as heatwaves and heavy rain are occurring across all continents and all oceans, resulting in local mass die-offs and local extinctions because the impacts of those events already exceed what many organisms can tolerate. Prominent examples of species being pushed way beyond their temperature limits are reef-building warm-water corals that are dying. Their global decline shows that we don't need to look into the future to recognize the urgency of climate action.

The more often ecosystems are impacted by extreme events and the more intense the event, the further they are pushed towards so-called tipping points. Beyond those points, abrupt and in some cases irreversible changes can occur – such as species going extinct. This risk increases steeply with rises in global temperature. Current projections imply that at a global warming level of 2°C by 2100, up to 18% of all species on land will be at high risk of going extinct. If the world warms up to 4°C, every second plant or animal species that we know of will be threatened.

The extinction risk is especially high for cold-loving species living in the high mountains or in polar regions, where climate change impacts are unfolding at global maximum speed and extent. With global warming of around 4°C by 2100 (very high greenhouse gas emissions scenario), mass mortalities and extinctions are expected that will irreversibly alter globally important areas, including those that host exceptionally rich biodiversity such as tropical coral reefs and cold-water kelp forests and the world's rainforests. Even at lower levels of warming of 2°C or less, polar fauna (including fish, penguins, seals, and polar bears), tropical coral reefs and mangroves will be under serious threat.

Impacts will continue to increase, weakening the structure, functioning and resilience of ecosystems and thus the services they provide, including their ability to regulate our world's climate. At present, ecosystems are removing and storing more carbon from the atmosphere than they emit, hence naturally helping to balance global warming. However, logging in remaining natural forests; draining and burning of peatlands, and increasing climate change

impacts, such as the thawing of Arctic permafrost, are causing some of those ecosystems to emit more carbon to the atmosphere (from decomposing dead plant material) than they naturally remove (through vegetation growth). The thawing of Arctic permafrost will cause enhanced methane release with further warming. All of these systems have the potential to contribute to accelerating climate change and further climate change will exacerbate this.

This and other trends can still be reversed by restoring, rebuilding and strengthening ecosystems and by managing them sustainably – which will also support the well-being and livelihoods of people. To achieve this balance, drastic greenhouse gas emissions reductions are required now to avoid further global warming and its deadly impacts on ecosystems around the world. For indeed, humans are just one of the many living organisms in our beautiful and complex world.

3. How will climate change affect the lives of today's children tomorrow, if no immediate action is taken?

Climate change impacts are increasingly being felt in all regions of the world with growing challenges for water availability, food production and the livelihoods of millions of people. We also know that impacts will continue to increase if drastic cuts in greenhouse gas emissions are further delayed – affecting the lives of today's children tomorrow and those of their children much more than ours. But science is also clear: with immediate action now, drastic impacts can still be prevented.

The scientific assessment in the WGII Report addresses the near-term (up to 2040), mid-term (2041-2060) and the long-term (2081-2100). Today, the latter two milestones may seem far away, but children who were born in 2020 will be 20 years old in 2040 and 80 years old in 2100. The end of the century is less than a lifetime away. Actions taken now to reduce emissions of heat-trapping greenhouse gases drastically and adapt to a changing climate will have a profound effect on the quality of their lives and their children's lives, as well as their health, well-being, and security. We also have to take into account that by 2050 almost 70% of the world's growing population will live in urban areas, many in unplanned or informal settlements. As a result, today's children and future generations are more likely to be exposed and vulnerable to climate change and related risks such as flooding, heat stress, water scarcity, poverty, and hunger. Children are amongst those suffering the most, as we see today.

But what is our children's future going to look like, if we do not limit global warming to well below 2°C, preferably to 1.5°C, compared to pre-industrial temperature? Based on the Working Group II assessment, we know that global warming is already changing much of the world as we know it. Its impacts will intensify in the coming decades with profound implications for all aspects of human life around the world. Our food and water supplies, our cities, infrastructure and economies as well as our health and well-being will be affected.

For example: children aged ten or younger in the year 2020 are projected to experience a nearly four-fold increase in extreme events under 1.5°C of global warming by 2100, and a five-fold increase under 3°C warming. Such increases in exposure would not be experienced by a person aged 55 in the year 2020 in their remaining lifetime under any warming scenario.

Globally, the percentage of the population exposed to deadly heat stress is projected to increase from today's 30% to 48-76% by the end of the century, depending on future warming levels and location. If the world warms more than 4°C by 2100, the number of days with climatically stressful conditions for outdoor workers will increase by up to 250 workdays per year by century's end in some parts of South Asia, tropical sub-Saharan Africa and parts of Central and South America. This would cause negative consequences such as reduced food production and higher food prices. In Europe, the number of people at risk of heat stress will increase two- to three-fold at 3°C global warming compared to warming levels of 1.5°C.

With ongoing global warming, today's children in South and Southeast Asia will witness increased losses in coastal settlements and infrastructure due to flooding caused by unavoidable sea level rise, with very high losses in East Asian cities. By mid-century, more than a billion people living in low-lying coastal cities and settlements globally are

projected to be at risk from coastal-specific climate hazards. Many of those will be forced to move to higher ground, which will increase competition for land and the probability of conflict and forced relocation.

Climate change will impact water quality and availability for hygiene, food production and ecosystems due to floods and droughts. Globally, 800 million to 3 billion people are projected to experience chronic water scarcity due to droughts at 2°C warming, and up to approximately 4 billion at 4°C warming, considering the effects of climate change alone, with present-day population. Children growing up in South America will face an increasing number of days with water scarcity and restricted water access, especially those living in cities and in rural areas depending on water from glaciers. As the Andean glaciers and snowcaps continue to melt, the amount of available water decreases as the glaciers shrink or disappear entirely. Countries in Central America will experience more frequent and stronger storms or hurricanes and heavy rainfall, causing river flooding.

Today's young people and future generations will also witness stronger negative effects of climate change on food production and availability. The warmer it gets, the more difficult it will become to grow or produce, transport, distribute, buy, and store food – a trend that is projected to hit poor populations the hardest. Depending on future policies and climate and adaptation actions taken, the number of people suffering from hunger in 2050 will range from 8 million to up to 80 million people, with most severely affected populations concentrated in Sub-Saharan Africa, South Asia and Central America. Under a high vulnerability-high warming scenario, up to 183 million additional people are projected to become undernourished in low-income countries due to climate change by 2050.

Africa is the continent with the world's youngest population (40% of the population are under 15 years old). Here, climate change will significantly increase the number of children with severe stunting (impaired growth and development which often leads to limited physical and cognitive potential), by approximately 1.4 million by 2050 under 2.1°C of warming due to malnutrition. The lack of food and under-nutrition are strongly linked with hot climates in the sub-Saharan area and less rainfall in West and Central Africa. Climate change can undermine children's educational attainment, thus reducing their chances for well-paid jobs or higher incomes later in life.

The concerning news is: all these projected impacts will not only reduce the prospects of sustainable development, but our Working Group II Report also projects an increase in poverty and inequality as well as increased involuntary migration of people due to climate change. These responses follow expected climate-driven increases in the frequency and strength of regional wildfires, increased floods and droughts, and an increase in temperature-related incidences of vector-borne, water-borne and food-borne diseases such as dengue, malaria, cholera and Rift Valley Fever.

In addition, we now know that multiple climate hazards will occur simultaneously more often in the future. They may reinforce each other and result in increased impacts and risks to nature and people that are more complex and more difficult to manage. For example, reductions in crop yields due to heat and drought, made worse by reduced productivity because of heat stress among farmworkers, will increase food prices, reduce household incomes and lead to health risks from malnutrition, as well as climate-related deaths, especially in tropical regions.

But there is also positive news: all these risks can be reduced substantially by taking urgent action to limit global warming and by strengthening our adaptation efforts – for example by protecting and conserving nature, and by improving planning and management of our cities (for details see FAQ 5). The youth movement, together with many non-governmental organizations, has led to a rising wave of public global awareness of climate change and its life-threatening impacts. To successfully secure our own future and the future of the coming generations, climate risks must be factored into each decision and planning. We have the knowledge and the tools. Now it is our choice to make.

4. How are people adapting to the effects of climate change and what are the known limits to adaptation?

If we want to deal with climate hazards and reduce risks for people and ecosystems that come from climate change, we have to adapt. Awareness of climate risks and action to reduce them have increased globally, but progress is uneven and our report highlights large gaps between adaptation action taken and what is needed in many regions. These gaps are caused by for example a lack of funding, political commitment, reliable information and sense of urgency. This leads to the most vulnerable people and ecosystems being hit hardest by climate change. In addition, the report clarifies: adaptation is essential to reduce harm, but if it is to be effective, it must go hand-in-hand with ambitious reductions in greenhouse gas emissions because with increased warming the effectiveness of many adaptation options declines.

Due to climate change, the world is experiencing higher temperatures, rising sea levels, and increased extreme events that impact life on land and in the oceans. To cope with these changes and avoid drastic losses and damages, humans and nature must adapt. For plants and animals, this means either adjusting to the changing climate and its effects by spending more time and energy on life-sustaining measures (like regulating their body temperature, selecting cooler places or staying hydrated) or, if possible, shifting to regions where environmental conditions are still in the climatic range that organisms are used to. For people and society, adaptation to climate change means adjusting our behaviour (e.g. where we choose to live; the way we plan our cities and settlements) and adapting our infrastructure (e.g. greening of urban areas for water storage) to deal with the changing climate - today and in the future.

Adapting successfully requires an analysis of risks caused by climate change and the implementation of measures in time to reduce these risks. That is the reason why IPCC authors ask five questions when assessing progress in climate adaptation regionally and globally: 1) Is there an awareness that climate change is causing risks? 2) Are the current and future extent of climate risks being assessed? 3) Have adaptation measures to reduce these risks been developed and included in planning? 4) Are those adaptation measures being implemented? 5) Are their implementation and effectiveness in reducing risks monitored and evaluated?

In our Working Group II Report, we conclude that the awareness and assessment of current and future climate risks have increased worldwide. National and local governments as well as corporations and civil society acknowledge the growing need for adaptation. At least 170 countries and many cities now have adaptation included in their climate policies and planning processes. Pilot projects and local experiments are being implemented in different sectors.

However, given the rate and scope of climate change impacts, actions on assessing and communicating risks, as well as on implementing adaptation are insufficient. For instance, current adaptation-related responses across all sectors and regions are dominated by minor modifications to usual practices or measures for dealing with extreme weather events – often allowing small or locally contained reductions of risks only. Whilst this may suffice in the short term, the long-term risks may require more extensive, transformative changes in our behaviour and infrastructure. In brief: ambition, scope, and progress on reducing climate risks are rising, but not by enough. Substantial adaptation gaps still exist, especially among populations with lower income. At the current rate of planning and implementation, these adaptation gaps will continue to grow. According to our new report, the world is currently under-prepared for the coming climate change impacts, particularly beyond 1.5°C global warming.

But there are also still large gaps in our understanding of climate change adaptation. For example, the extent to which adaptation actions are reducing climate risk, and for whom, is not always clear. Another important question is whether adaptation actions may have unintended consequences or side effects, causing more harm than good (this is called maladaptation). Built defences, such as sea walls, might protect coastal areas in the short term but their construction can destroy coastal ecosystems such as coral reefs. In the long term, these defences can even increase risks to people living behind them as more families move to an area that is supposedly safe to live in – as long as the sea wall is not over-topped or destroyed.

In our assessment we show that, in a warming world, measures that are effective now in one place might not work in 20 years, or in other places, which is why the monitoring and evaluation of the implemented actions are so important. Adaptation strategies might have to be revised constantly and those revisions will be most efficient if they are fact- and data-driven. But only a very few nations already have operational frameworks in place to track and evaluate implementation and results.

The Working Group II Report emphasises that the earlier the adaptation measures are implemented, the more the world will benefit because the potential to reduce climate risks through adaptation is higher until mid-century, and for global warming levels below 1.5°C. At higher levels of warming, the effectiveness of most land- and water-based adaptation options starts declining, and the extent of residual risks increases, as do the chances of future unintended consequences.

By investing in adaptation now, the world will avoid higher investments in the future because the potential benefits of adaptation activities outweigh their costs in the long term. In addition, adaptation can generate multiple benefits. Through various adaptation actions we may be able to secure productivity of fisheries, agriculture and companies, foster innovation, health and well-being, strengthen food security and peoples' livelihoods, and rebuild and strengthen nature, while at the same time reducing climate risks and damages.

The world should also be aware that the availability of adaptation options is constrained by limitations faced by the natural world and people, especially at higher degrees of warming. Biophysical, institutional, financial, social and cultural barriers can lead to *soft* and *hard adaptation limits*, particularly when combined. *Hard limits* occur when adaptive actions become infeasible to avoid risks. One prominent example is when small islands become uninhabitable due to sea level rise and lack of sufficient freshwater. In that case, inhabitants may have no other option than to abandon their homes. *Soft limits*, in contrast, can be overcome if additional financial, institutional or technological support becomes available. With sufficient funding, for instance, cities can invest in new parks and lakes, creating new spaces for citizens to find shade and cool down during heatwaves.

Our report finds that many species and ecosystems are currently near or beyond their hard adaptation limits, and people that rely on them to survive, are currently near or beyond their soft adaptation limits. Californian almonds for instance are predicted to increase their potential geographical range under climate warming, yet a trend of increasing drought has already resulted in trees being removed due to lack of access to irrigation water. This development hits small-scale farmers the hardest.

A lack of political commitment and funding as well as weak institutional capacities limit the implementation of adaptation options in agriculture, fisheries, aquaculture and forestry. In cities, governance capacity, financial support and the legacy of past urban infrastructure investment constrain how cities and settlements are able to adapt. We also see that in cities, the gap between what can be adapted to and what has been implemented is uneven. It is larger for the poorest 20% of the population than for the wealthiest 20%.

Poverty and inequality both present significant adaptation limits, resulting in unavoidable impacts for vulnerable groups, including women, young people, the elderly, ethnic and religious minorities, Indigenous People, and refugees. Climate change is likely to force many of them to switch from agriculture as the main source of income to other forms of wage labour, with implications for labour migration and urbanization.

Climate change is a global threat to which all people and ecosystems are vulnerable. Without effective adaptation, climate change has the potential to reverse the developmental gains in our world and push millions of people further into poverty. To avoid mounting losses, urgent accelerated action is required to adapt to climate change while making rapid, deep cuts in greenhouse gas emissions to limit warming so that we keep the range and scope of adaptation options as wide as possible.

5. What strategies could increase the climate resilience of people and nature?

Nature offers a lot of untapped potential, not only to reduce climate risks, and deal with the causes of climate change, but also to improve people's lives. By restoring and safeguarding ecosystems on land and in the ocean, we help plants and animals to build climate resilience. Nature, in turn, can help us regulate the climate, give us clean, safe water, control pests and diseases and pollinate our crops. However, investing in nature alone won't be enough. To secure a healthy, liveable planet for everyone, we need to transform our way of life fundamentally, especially key elements such as our industry and energy sector as well as how cities and infrastructures are planned and built. Taking action now gives us the best chance of success.

Climate change is a threat to human well-being and the health of the planet. According to our new report, it requires urgent and far-reaching actions and fundamental changes in all aspects of human life to increase people's and nature's ability to cope with, and respond to, climate change. One key to success is acknowledging climate, biodiversity, and human society as a coupled system, meaning that all components are interlinked. If we change one of them, it will affect the other two as well. Based on this recognition, conservation and climate change responses would be planned and implemented hand in hand – not only locally, but across landscapes, in cities as well as in rural areas, across sectors, state and country borders. All actions and decisions would be based on the overarching goal to get the best outcomes for climate, biodiversity and the people living in the areas, where actions will be implemented.

While planning those actions, we should keep in mind that only diverse and healthy ecosystems are able to provide the services that are essential for reducing climate change risks. Thus, protecting and restoring ecosystems on land and in the ocean is a key element for success. A range of scientific evidence indicates that the capacity to provide these services relies upon 30 to 50% of Earth's surface (land, freshwater and ocean) to be effectively conserved and for natural resources to be sustainably managed.

An increasing body of evidence demonstrates that climatic risks to people can be lowered by strengthening nature, meaning that we invest in protecting nature and rebuilding ecosystems to benefit both people and biodiversity. Flood risk along rivers, for instance, can be reduced by restoring wetlands and other natural habitats in flood plains, by restoring natural courses of rivers, and by using trees to create shade. Cities can be cooled by parks and ponds and by greening streets and buildings' rooftops and walls. Farmers may increase their businesses' climate resilience by diversifying their crops and livestock, by planting trees and bushes on the fields for shade and organic manure (agroecological farming), by increasing soil health (more soil organic matter), and by combining crops, livestock and natural elements such as trees and bushes.

Actions and solutions that safeguard nature are relatively inexpensive in many parts of the world because they do not rely on complex machinery or on the development of extensive infrastructure. However, to realize potential benefits and avoid harm, it is essential that these solutions are deployed in the right places and with the right approaches for that area, guided by local and indigenous knowledge, scientific understanding and practical expertise. Knowledge is the key.

But relying on nature alone won't be enough. An overall increase in climate resilience requires two combined sets of actions: first, a wide range of actions that reduce human-induced greenhouse gas emissions drastically; secondly, a similarly wide range of actions that transform the way we live our lives and puts human society on the path of sustainable development. The latter is fundamental to enable climate action because, without sufficient knowledge and income as well as governmental support and a fair chance of participation in decision-making processes, many human communities won't be able to contribute to emission reductions or adapt to change. That is especially true for the very poor, for whom struggling to feed the family may occupy all their time and resources.

That is the reason why sustainable development in a climate context includes for example clean energy generation, circular economies, healthy diets from sustainable farming, appropriate urban planning and transport, universal health coverage and social protection, training and education as well as water and energy access for everyone to help to reduce poverty.

The risks posed by climate change vary by location, time, and among different populations. That means each community and each nation has its own starting point for climate adaptation and sustainable development. But, whichever pathway is followed, Climate Resilient Development will only be possible with fundamental changes in five major areas: 1) in our world's energy systems; 2) in the way we use, manage and safeguard the land and freshwater, the oceans and their respective ecosystems; 3) in the way cities and infrastructure are planned, built, organized and governed; 4) in the way our economies and industries function and 5) in the way our societies function on a local, national and international level.

The earlier these changes are implemented, with an emphasis on equity and justice, the more options and solutions for Climate Resilient Development will become available. We don't have any time to lose. As our report has also shown, missing the Paris Agreement goals will limit our options for a sustainable and climate resilient future, because a warmer world brings higher climate impact risks to which people and places will have to adapt. We know now that securing a healthy and climate resilient future for all is difficult, if not impossible to achieve in many regions, with global warming higher than 2°C over the medium and long term.

6. What is Climate Resilient Development and how do we pursue it?

Worldwide action to achieve a climate resilient, sustainable world is more urgent than previously thought. But what can be done? Our report highlights a solutions framework that we call Climate Resilient Development. It combines strategies to adapt to climate change with actions to reduce greenhouse gas emissions to support sustainable development for everyone. Action to implement this concept has to start now because making progress is already challenging at current global warming levels. If temperatures exceed 2°C of warming, climate resilient development will become impossible in some regions of the world.

We know that climate change presents risks to nature, people and infrastructure around the world. These risks will increase with every small increase in warming, and reducing them is made more complicated by other global trends such as over-consumption, population growth, rapid urbanization, land degradation, biodiversity loss, poverty and inequity, etc. In short: the world is facing a long list of complex and interacting challenges that need to be dealt with simultaneously.

Both the urgency and the complexity of the climate change crisis require actions at a new depth and scale. Our report provides a solutions framework that successfully combines strategies to deal with climate risks (adaptation) with actions to reduce greenhouse gas emissions (mitigation) which result in improvements for nature's and people's well-being – for example by reducing poverty and hunger, improving health and livelihoods, providing more people with clean energy and water and safeguarding ecosystems on land, in lakes and rivers and in the ocean. This solutions framework is called Climate Resilient Development.

In developing countries and in areas that are particularly exposed to climate change (e.g. in coastal areas, small islands, deserts, mountains and polar regions) climate impacts and risks can exacerbate vulnerability and injustices which can undermine efforts to achieve sustainable development, particularly for marginalized communities. But each country will follow its own path. Importantly, each country has different capacities and opportunities for Climate Resilient Development. Nevertheless, our report clearly shows that rapidly scaled-up, well-aligned investment facilitates Climate Resilient Development and that it advances more quickly with increased international cooperation and financial assistance.

Striving for Climate Resilient Development means reducing exposure and vulnerability to climate hazards, cutting back greenhouse gas emissions and conserving biodiversity are given the highest priorities in everyday decision-making and policies on all aspects of society including energy, industry, health, water, food, urban development, housing and transport. It is about successfully navigating the complex interactions between these different systems so that action in one area does not have adverse effects elsewhere and opportunities are harnessed to accelerate progress towards a safer, fairer world.

Climate Resilient Development isn't achieved with a single decision or action. It's the result of all of the choices we make about climate risk reduction, emissions reductions and sustainable development on a daily basis. New scientific evidence shows that addressing the risks and impacts of climate change successfully involves a more diverse set of actors than previously thought – it not just policy-makers but everyone in government, civil society and the private sector. For example, if we consider changes in agriculture, it takes a combination of effective government policy and regulation as well as informed daily decisions by farmers, traders and agricultural companies to lead to fundamental change which is required to adapt to a changing climate, reduce greenhouse gas emissions and secure lives and livelihoods not just of those directly involved but for wider society as well.

In brief: Climate Resilient Development involves everyone. The prospects for effective action improve when governments at all levels work with citizens, civil society, educational bodies and scientific institutions, the media, investors and businesses and form partnerships with traditionally marginalised groups, including women, youth, Indigenous Peoples, local communities and ethnic minorities. In such a societal setting, scientific, Indigenous and local knowledge and practical knowhow can come together to provide more relevant effective actions. In addition, different interests, values and worldviews can be reconciled if everyone works together.

Targeting a climate resilient, sustainable world involves fundamental changes to how society functions, including changes to underlying values, worldviews, ideologies, social structures, political and economic systems, and power relationships. This may feel overwhelming at first, but the world is changing anyway and will continue to change so Climate Resilient Development offers us ways to drive change to improve well-being for all – by reducing climate risk, tackling the many inequities and injustices experienced today, and rebuilding our relationship with nature.

The choices we make in the next decade will determine our future. Our report clearly states Climate Resilient Development is already challenging at a warming level of less than 1.5°C, and will become more limited by 2°C. In some regions, it will be impossible if the temperature exceeds 2°C, including low-lying coastal cities, settlements and small islands, some mountain areas and polar regions.

This key finding underlines the urgency for climate action and that focusing on equity and justice as well as on adequate funding, political commitment and partnerships lead to more effective climate change adaptation and emissions reductions.

The scientific evidence is unequivocal: climate change is a threat to human well-being and the health of the planet. Any further delay in concerted global action will miss a brief and rapidly closing window to secure a liveable future.