Frequently Asked Questions

FAQ

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These Frequently Asked Questions have been extracted from the chapters of the underlying report and are compiled here. When referencing specific FAQs, please reference the corresponding chapter in the report from where the FAQ originated (e.g., FAQ 3.1 is part of Chapter 3).

Frequently Asked Questions

FAQ 10.1 | How Can We Provide Useful Climate Information for Regional Stakeholders?

The world is physically and culturally diverse, and the challenges posed by climate change vary by region and location. Because climate change affects so many aspects of people's daily work and living, climate change information can help with decision-making, but only when the information is relevant for the people involved in making those decisions. Users of climate information may be highly diverse, ranging from professionals in areas such as human health, agriculture or water management to a broader community that experiences the impacts of changing climate. Providing information that supports response actions thus requires engaging all relevant stakeholders, their knowledge and their experiences, formulating appropriate information, and developing a mutual understanding of the usefulness and limitations of the information.

The development, delivery, and use of climate change information requires engaging all parties involved: those producing the climate data and related knowledge, those communicating it, and those who combine that information with their knowledge of the community, region or activity that climate change may impact. To be successful, these parties need to work together to explore the climate data and thus co-develop the climate information needed to make decisions or solve problems, distilling output from the various sources of climate knowledge into relevant climate information. Effective partnerships recognize and respond to the diversity of all parties involved (including their values, beliefs and interests), especially when they involve culturally diverse communities and their indigenous and local knowledge of weather, climate and their society. This is particularly true for climate change – a global issue posing challenges that vary by region. By recognizing this diversity, climate information can be relevant and credible, most notably when conveying the complexity of risks for human systems and ecosystems and for building resilience.

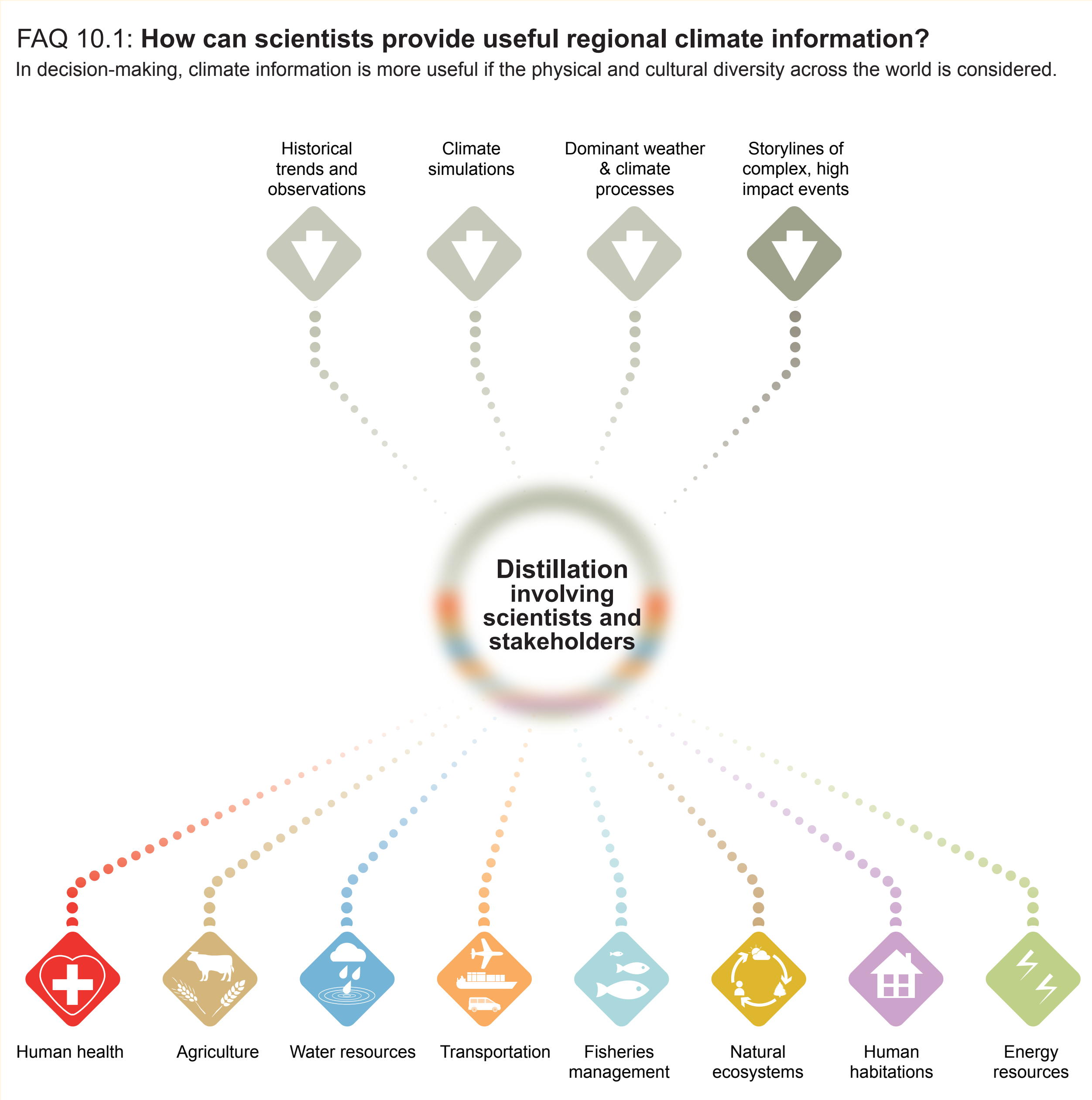
Constructing useful climate information requires considering all available sources in order to capture the fullest possible representation of projected changes and distilling the information in a way that meets the needs of the stakeholders and communities impacted by the changes. For example, climate scientists can provide information on future changes by using simulations of global and/or regional climate and inferring changes in the weather behaviour influencing a region. An effective distillation process (FAQ 10.1, Figure 1) engages with the intended recipients of the information, especially stakeholders whose work involves non-climatic factors, such as human health, agriculture or water resources. The distillation evaluates the accuracy of all information sources (observations, simulations, expert judgement), weighs the credibility of possible conflicting information, and arrives at climate information that includes estimating the confidence a user should have in it. Producers of climate data should further recognize that the geographic regions and time periods governing stakeholders' interest (for example, the growing season of an agricultural zone) may not align well with the time and space resolution of available climate data; thus additional model development or data processing may be required to extract useful climate information.

One way to distil complex information for stakeholder applications is to connect this information to experiences stakeholders have already had through storylines as plausible unfoldings of weather and climate events related to stakeholders' experiences. Dialogue between stakeholders and climate scientists can determine the most relevant experiences to evaluate for possible future behaviour. The development of storylines uses the experience and expertise of stakeholders, such as water-resource managers and health professionals, who seek to develop appropriate response measures. Storylines are thus a pathway through the distillation process that can make climate information more accessible and physically comprehensible. For example, a storyline may take a common experience like an extended drought, with depleted water availability and damaged crops, and show how droughts may change in the future, perhaps with even greater precipitation deficits or longer duration. With appropriate choices, storylines can engage nuances of the climate information in a meaningful way by building on common experiences, thus enhancing the information's usefulness.

Forging partnerships among all involved with producing, exploring and distilling climate data into climate information is at the centre of creating stakeholder-relevant information. These partnerships can occur through direct interaction between climate scientists and stakeholders as well as through organizations that have emerged to facilitate this process, such as climate services, national and regional climate forums, and consulting firms providing specialized climate information. These so-called 'boundary organizations' can serve the varied needs of all who would fold climate information into their decision processes. All of these partnerships are vital

FAQ 10.1 (continued)

for arriving at climate information that responds to physical and cultural diversity and to challenges posed by climate change that can vary region-by-region around the world.



FAQ 10.1, Figure 1 | Climate information for decision makers is more useful if the physical and cultural diversity across the world is considered. The figure illustrates schematically the broad range of knowledge that must be blended with the diversity of users to distil information that will have relevance and credibility. This blending or distillation should engage the values and knowledge of both the stakeholders and the scientists. The bottom row contains examples of stakeholders' interests and is not all-inclusive. As part of the distillation, the outcomes can advance the United Nations' Sustainable Development Goals, covered in part by these examples.

FAQ

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FAQ 10.2 | Why Are Cities Hotspots of Global Warming?

Urban areas experience air temperatures that can be several degrees Celsius warmer than surrounding areas, especially during the night. This 'urban heat island' effect results from several factors, including reduced ventilation and heat trapping due to the close proximity of tall buildings, heat generated directly from human activities, the heat-absorbing properties of concrete and other urban building materials, and the limited amount of vegetation. Continuing urbanization and increasingly severe heatwaves under climate change will further amplify this effect in the future.

Today, cities are home to 55% of the world's population. This number is increasing, and every year cities welcome 67 million new residents, 90% of whom are moving to cities in developing countries. By 2030, almost 60% of the world's population is expected to live in urban areas. Cities and their inhabitants are highly vulnerable to weather and climate extremes, particularly heatwaves, because urban areas already are local hotspots. Cities are generally warmer – up to several degrees Celsius at night – than their surroundings. This warming effect, called the urban heat island, occurs because cities both receive and retain more heat than the surrounding countryside areas and because natural cooling processes are weakened in cities compared to rural areas.

Three main factors contribute to amplify the warming of urban areas (orange bars in FAQ 10.2, Figure 1). The strongest contribution comes from urban geometry, which depends on the number of buildings, their size and their proximity. Tall buildings close to each other absorb and store heat and also reduce natural ventilation. Human activities, which are very concentrated in cities, also directly warm the atmosphere locally, due to heat released from domestic and industrial heating or cooling systems, running engines, and other sources. Finally, urban warming also results directly from the heat-retaining properties of the materials that make up cities, including concrete buildings, asphalt roadways, and dark rooftops. These materials are very good at absorbing and retaining heat, and then re-emitting that heat at night.

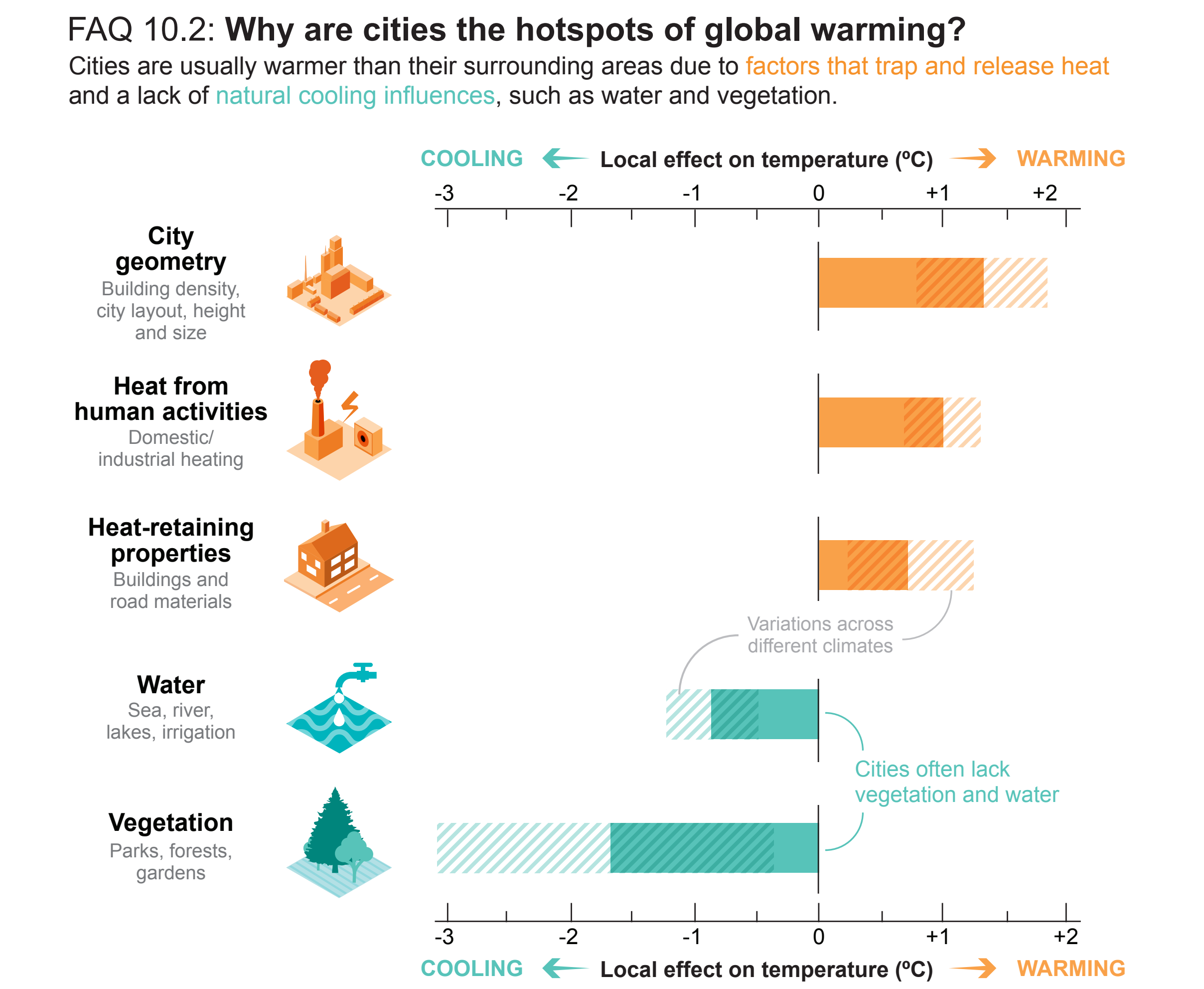
The urban heat island effect is further amplified in cities that lack vegetation and water bodies, both of which can strongly contribute to local cooling (green bars in FAQ 10.2, Figure 1). This means that when enough vegetation and water are included in the urban fabric, they can counterbalance the urban heat island effect, to the point of even cancelling out the urban heat island effect in some neighbourhoods.

The urban heat island phenomenon is well-known and understood. For instance, temperature measurements from thermometers located in cities are corrected for this effect when global warming trends are calculated. Nevertheless, observations, including long-term measurements of the urban heat island effect are currently too limited to allow a full understanding of how the urban heat island varies across the world and across different types of cities and climatic zones, or how this effect will evolve in the future.

As a result, it is hard to assess how climate change will affect the urban heat island effect, and various studies disagree. Two things are, however, very clear. First, future urbanization will expand the urban heat island areas, thereby amplifying future warming in many places all over the world. In some places, the nighttime warming from the urban heat island effect could even be on the same order of magnitude as the warming expected from human-induced climate change. Second, more intense, longer and more frequent heatwaves caused by climate change will more strongly impact cities and their inhabitants, because the extra warming from the urban heat island effect will exacerbate the impacts of climate change.

In summary, cities are currently local hotspots because their structure, material and activities trap and release heat and reduce natural cooling processes. In the future, climate change will, on average, have a limited effect on the magnitude of the urban heat island itself, but ongoing urbanization together with more frequent, longer and warmer heatwaves will make cities more exposed to global warming.

FAQ 10.2 (continued)



FAQ 10.2, Figure 1 | Efficiency of the various factors at warming up or cooling down neighbourhoods of urban areas. Overall, cities tend to be warmer than their surroundings. This is called the 'urban heat island' effect. The hatched areas on the bars show how the strength of the warming or cooling effects of each factor varies depending on the local climate. For example, vegetation has a stronger cooling effect in temperate and warm climates. Further details on data sources are available in the chapter data table (Table 10.SM.11).

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