I FEEL SLOVENIA

CLIMATE CHANGE AND SLOVENIAN TOURISM

Recommended measures to adapt to, and mitigate, climate change

FEBRUARY 2024

Climate change and sustainable tourism development in Slovenia

ARIS TRP PROJECT V7-2128

Report for work package 5:
Climate change guide for Slovenian tourism, March 2023

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I FEEL SLOVENIA

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REPUBLIKA SLOVENIJA
MINISTRSTVO ZA GOSPODARSTVO, TURIZEM IN ŠPORT

The lines mark global warming in Slovenia. The temperature is increasing faster in Slovenia than the global average. Since the start of systematic measuring in 1961, the temperature increased by 2.4 °C until 2020. The temperature increased the most in summer by as much as 3.3 °C and somewhat less in winter (2.7 °C) and spring (2.4 °C), and least in autumn (1.5 °C).

(source: Ministry of the Environment and Spatial Planning, 2022; source of visualisation: Hawkins, 2023).

Address by the Project Leader

The research project, Climate change and sustainable tourism development in Slovenia, provided important results: an analysis of impacts of climate change with regard to future projections, a model for calculating the carbon footprint of Slovenian tourism, a thorough analysis of possible climate measures and a final list of recommendations for the country, destinations, providers and people.

The website of the project enables access to all scientific reports, comprising more than 500 pages. We know that this is an excessive amount of data that does not benefit tourism unless we are able to showcase it concisely and comprehensively. To this end, we are exceptionally thankful to the Slovenian Tourist Board for designing and issuing this guide. We hope that it will reach a vast number of tourist stakeholders and help in understanding our joint role in climate action.

This guide features central climate analyses and adaptation recommendations for winter, urban, summer outdoor and summer waterside tourism, since each of these four types requires different weather conditions subsequently resulting in different impacts. We also recognise interdependence of impacts, for example with direct consequences on nature, climate change will result in a three-fold pressure on mountain areas due to the diversification from winter into summer tourism, extension of the summer season and expected retreat of tourists and hikers from heat to higher altitudes.

The project was launched in autumn 2021. At the time, our main concern was how to raise awareness of the severity of the problem. In summer 2022, we experienced the largest fire in the history of independent Slovenia. A year later, historic floods. In both cases, it is necessary to understand the bigger picture of the governance that allowed greater vulnerability. It is difficult to express my feelings of frustration when I read accurate forecasts in more than 20-year-old research and global tourism commitments in the Djerba Declaration (2003) and the Davos Declaration (2007). The recent Glasgow Declaration (2021) represents a step forward, as it includes clearly defined measures, deadlines and a commitment to publicly and regularly announce progress attained in climate commitments. This is a declarative document and I warmly recommend the adoption of the commitments of the Glasgow Declaration to every tourism company or institution.

But declarations will not suffice. And tourism is particularly exposed to criticism – not merely due to its carbon footprint, but because it is usually characterised as a leisure activity, and thus non-essential or even unnecessary. It is no coincidence that a renunciation of one transcontintental flight is frequently the first activity comparatively and illustratively recommended to citizens to reduce their carbon footprint. Flying has a very high carbon footprint, but it is also an activity regarding which it is easy to moralise.

The guide includes the latest findings relating to the measures for reducing the carbon footprint in transport, experiences, organisation of travels and gastronomy tourism. In doing so, it points to the necessary hierarchy of measures for climate change mitigation: considering the current capabilities, offsetting is only the last resort, and one that has been heavily criticised for greenwashing.. It is first necessary to find options to avoid the generation of emissions, then reduce the emissions with optimal use and, thirdly, seek alternatives in renewable energy sources.

How to combine two seemingly incompatible values: concern about climate change mitigation and tourism as a positive social force? That is tourism as a value in building peace, learning about cultures, personal growth, life satisfaction and health improvement? Answers are not simple, especially because greenhouse gas emissions are caused with the transport to a destination alone, which would not occur if we stayed at home. Transport to a destination represents three quarters of a tourist's carbon footprint, depending on the distance and mode of transport. Tourism growth is not compatible with the objective of halving emissions by 2030. At least until systemic conditions for transporting tourists to a destination are changed drastically.

The problem is complex and full of paradoxes. If we immediately tackle the most difficult issue: planes are understood as a part of a more expensive lifestyle, but they are in fact frequently cheaper than trains due to the incentives provided for air transport and low investment in railway transport. As recently analysed by Greenpeace, railway transport between European destinations is more expensive than air transport on more than 70% of the railway routes studied, at least in the summer period. Unfortunately, climate-friendly train travel is thus a privilege for those with more time, more money and, in the case of business travel, those with more benefits (not everyone is entitled to additional hours for rail travel).

However, Slovenian tourism in not helpless in this process, but merely interdependent. This interdependence denotes responsibility to engage in a more active call for systemic changes in the transport of tourists and the inclusion of Slovenia in the European rail system and also for strategic decisions on which tourists are addressed with regard to distance and mode of transport and, above all, how we exploit the tourism development incentives.

dr. Maja Turnšek
Faculty of Tourism of the University of Maribor

The V7-2128 project:
Climate change and sustainable tourism development in Slovenia

In 2023, the target research project, Climate change and sustainable tourism development in Slovenia, was completed. Its purpose was to analyse the projections of the climate change impact on Slovenian tourism and provide a tool for assessing the carbon footprint of Slovenian tourism.

According to the findings of the Slovenian Environment Agency, we are running out of time in which to act. Action is required at all levels. Tourism, an important pillar of the Slovenian economy, is facing the consequences of climate change, from global warming to snow-free winters.

As a response to the growing threat of climate change, the Government of the Republic of Slovenia anticipated a key measure in the Slovenian Tourism Strategy 2022–2028, which refers to the establishment of the national model for tourism adaptation to climate change and the establishment of a model for measuring the carbon footprint of tourism at various levels.

Climate change presents a double challenge for tourism: the need for adaptation and a simultaneous reduction of negative environmental impact. In this context, the door to various technical, business and sustainable measures is opening.

It is crucial to diversify the offer as dynamic pricing, the development of year-round tourism and cooperation of providers in tourism, sport, culture and other sectors represent possibilities for exceeding seasonal limitations. In doing so, it is necessary to pay attention to the impact on natural heritage and biodiversity. The latter is vital for tourism, as it is attractive for visitors.

To maintain a balance between tourism and nature, research, education and training in the fields of the green transition and biodiversity conservation are vital.

Slovenian tourism is at the crossroads. The challenges posed by climate change are also an opportunity for innovations and sustainable development. By means of a comprehensive approach that combines measures, offer diversification and sustainable practices, it is possible to preserve natural ecosystems for future generations and maintain tourist experiences for tourists and visitors.

Climate change mitigation requires each person and company and society as a whole to behave responsibly. In this context, we seek innovative solutions that enable sustainable travel and promote thoughtful decisions which can reduce every traveller's carbon footprint. Through the prism of tourism, let us think about how to become better guardians of nature.

The completed research and this guide, as a summary of key findings, provide an excellent review of the situation in Slovenian tourism with regard to the climate change impact and proposals of measures for adaptation and mitigation by individual activities in tourism. I am certain that stakeholders in tourism will frequently consult it when planning further tourism development.

Dubravka Kalin
Director-General of the Tourism Directorate at the Ministry of the Economy, Tourism and Sport

Address by the Director of the Slovenian Tourist Board

Dear Readers,

Climate change is one of the greatest challenges of modern times and modern tourism. Despite intense awareness of its impact on our lives and our sector, the experts find that the adaptation measures are still being implemented too slowly.

The challenges posed by climate change must be addressed actively and immediately. Tourist practices with a reduced carbon footprint must be developed and we must prepare for the changes which climate experts already consider inevitable.

Global warming is already dictating tourist flows and the forecasts show that this impact will only grow stronger in the mid to long term. We can expect less snow, longer droughts, coastal flooding, heat waves and numerous other extreme weather events. All of the above will also decisively transform Slovenian tourism.

Tourism stakeholders in Slovenia decided more than a decade ago to support sustainable development in broad consensus. We are certain that sustainable tourism is not only the right path for Slovenia, but the only one capable of keeping our beautiful country attractive for visitors and ensuring a high quality of life for us, its citizens.

One of the key initiatives of the Slovenian Tourist Board for sustainability in Slovenian tourism is the Green Scheme of Slovenian Tourism. Within the framework of this innovative programme, since 2015 we have been awarding the Slovenia Green labels to the destinations and providers who meet clearly defined sustainability criteria. By the end of 2023, we had conferred more than 300 Slovenia Green labels, which clearly shows the commitment of the players in Slovenian tourism to responsible conduct.

The Slovenian Tourist Board wishes to contribute to the fight against climate change by setting an example. To this end, we signed the Glasgow Declaration in 2023. Thereby committing ourselves to work towards carbon-free operations by 2050.

One of the important tools that may help us in more efficient implementation of green transition is digitalisation. We are establishing the National Information Centre (NIC) to facilitate monitoring on the ground and to formulate effective measures for a more sustainable future. As per the plans, the NIC will also include a tool for carbon footprint measurement, the application of which could greatly enhance the understanding of the impact of tourist activities on the environment and would serve as one of the key bases for adopting sustainable decisions.

I am certain that this publication also represents a step towards a more sustainable and responsible tourism sector in Slovenia. It is our common duty to preserve the natural and cultural treasures of our country and develop tourist practices for the greater good of the present and future generations. With knowledge and cooperation, it is possible to ensure that Slovenia remains one of the most desirable tourist destinations and a safe home for all its citizens.

mag. Maja Pak Olaj
Director of the Slovenian Tourist Board

1 Climate change adaptation

Climate is a set of weather conditions typical of a given region, together with the frequency of these conditions and their seasonal variability (one of the definitions according to Fedorov). It differs from the **weather**, which represents current conditions in the atmosphere and changes daily.

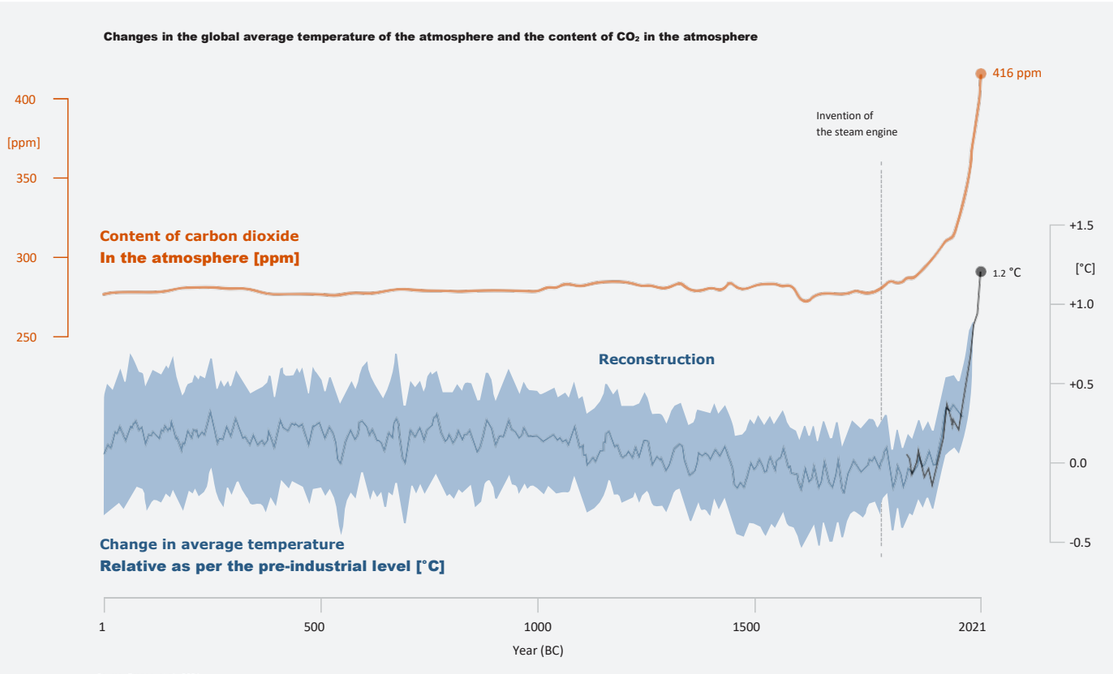
Time periods of **several decades** are used for describing climate in order to avoid natural variability at the level of individual years or shorter periods.

Various factors affect the climate:

- **solar radiation,**
- **atmospheric properties for the transmission of short-wave radiation from the Sun and long-wave radiation from the Earth,**
- **relief,**
- **surface properties,**
- **circulation in the atmosphere and oceans.**

The increase in the content of greenhouse gases in the atmosphere (carbon dioxide, methane and others) is responsible for the extremely rapid changes we have been witnessing in recent decades. This increase is particularly the result of anthropogenic (resulting from human activity) emissions of these gases since the beginning of the industrial revolution (use of fossil fuels, change in land use, livestock, etc.).

Short-wave **solar radiation is passing quite smoothly through the atmosphere, while the surface of the Earth absorbs it** and is subsequently warming up. The Earth emits long-wave radiation towards space, which is largely **absorbed by greenhouse gases in the atmosphere** and they then **radiate** in different directions – including back to the Earth. Due to the described greenhouse effect, temperatures on Earth are high enough to allow life. However, with **excessive** anthropogenic greenhouse gas emissions, their content in the atmosphere has increased excessively, which also means an **increased greenhouse effect** that is the cause of global warming.



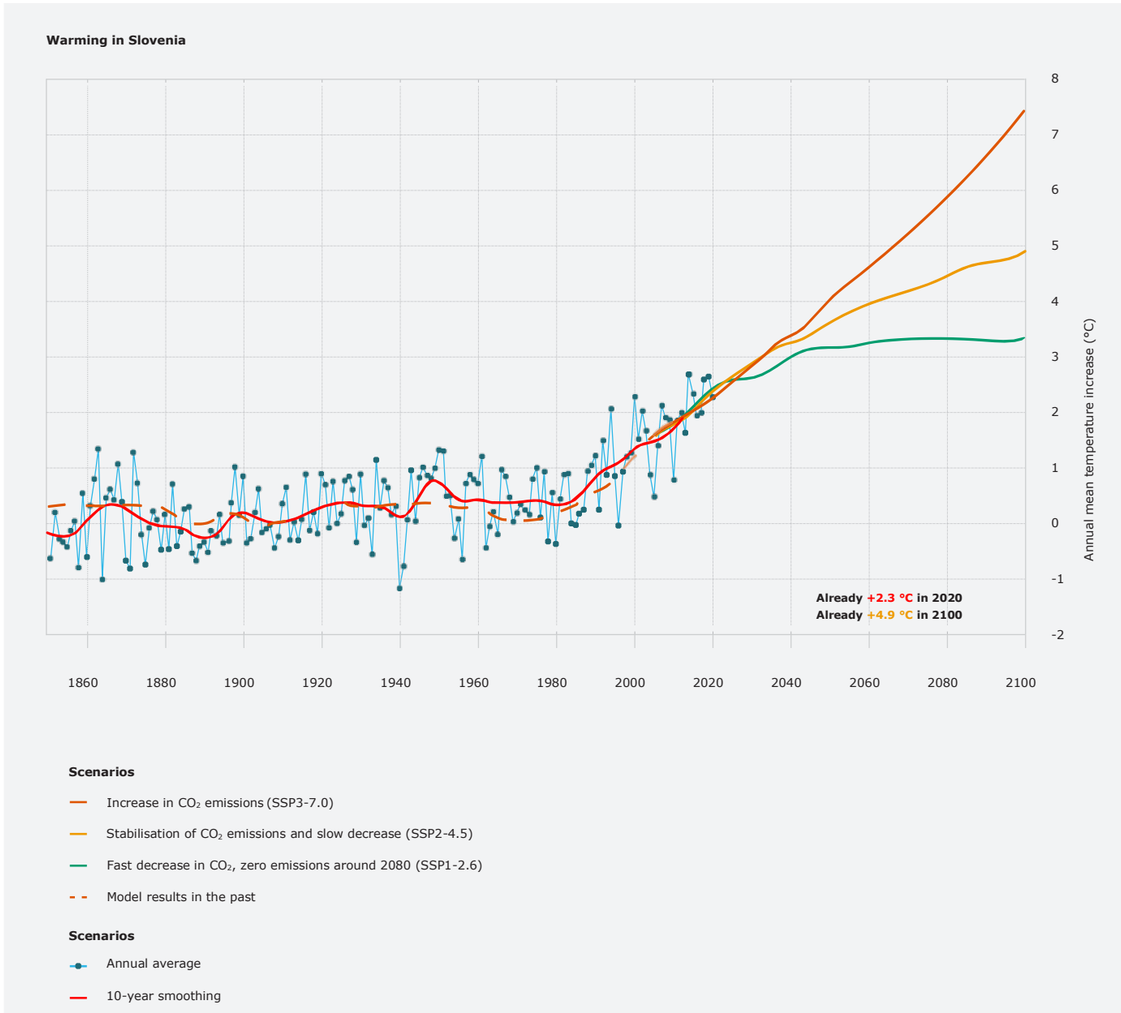
Source: Gregory et al., 2021.

The most prominent changes include **an increase in the average global air temperature**, which was 1.1 °C higher in the last decade than in the 1850–1900 period. The increase was greater over land (**1.6 °C**) than over **oceans (0.9 °C)**.

Average air temperatures have increased faster in Slovenia -> the temperature in the last decade was **2.1 °C** higher than in the 1850–1900 period.

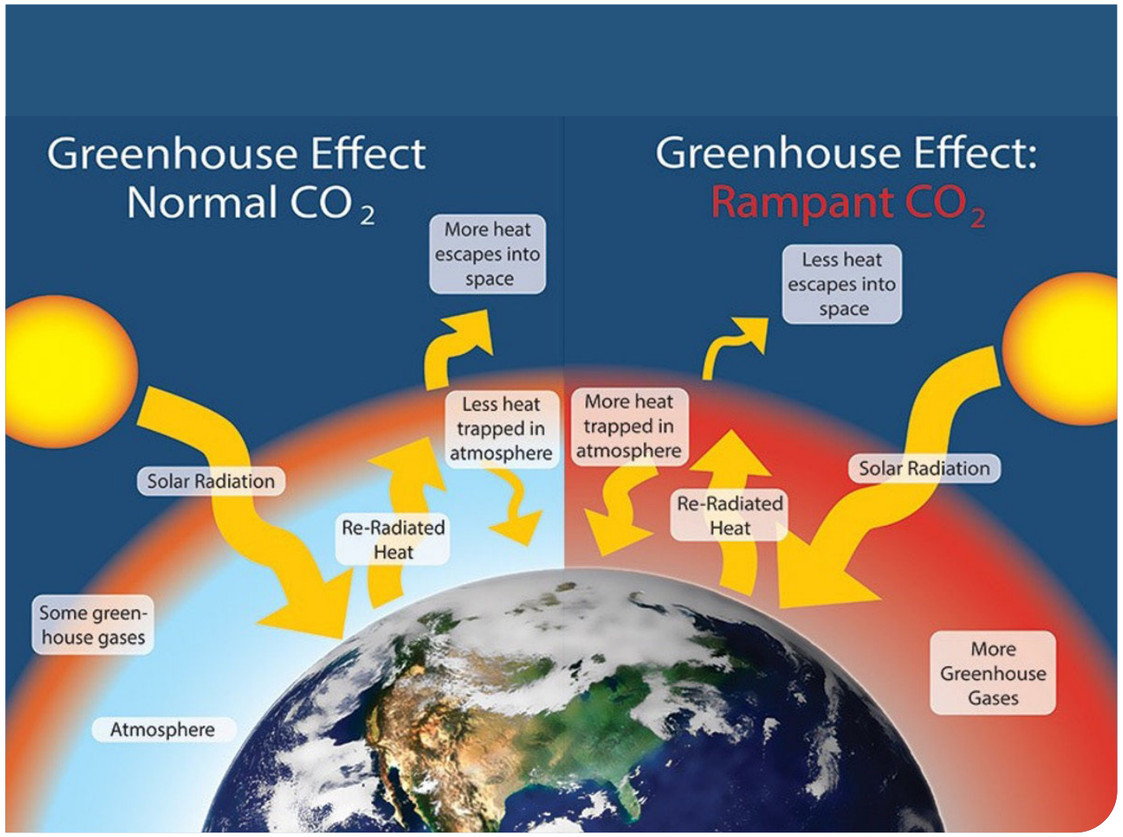
The average air temperature in Slovenia has increased the most in spring and summer in the last 50 years. The following is typical of Slovenia:

- **increase in the number of hot days and tropical nights,**
- **increase in the frequency of heat waves, which are increasing in intensity,**
- **decrease in the number of cold days,**
- **decrease in the amount of snowfall,**
- **change in the time patterns of precipitation (more intense precipitation events, longer intermittent dry periods).**



In most parts of the world, precipitation is becoming more unevenly distributed throughout the year and intense precipitation events are becoming more frequent. Climate change is being globally manifested in the disappearance of glaciers, long-term ice loss, rise in the average sea level, longer growing periods of plants and more frequent extreme events.

In addition to water vapour (which is not directly influenced by people), the main greenhouse gases include carbon dioxide (CO_2), methane (CH4) and nitrous oxide (N2O). To be able to compare their effects, they are converted to CO_2 equivalent (CO_2eq), taking into account their greenhouse potential (how much they affect the increased greenhouse effect and how long they remain in the atmosphere). The main anthropogenic source of CO_2 is fossil fuels. The consumption of 50 litres of petrol, for example, produces about 115kg of CO_2 emissions and 50 litres of diesel produces 135kg of CO_2 (mass is greater because these are C emissions which form CO_2 with oxygen in the air). (data source: Umanotera, 2023).



Source: adapted from NPS, 2020.

Climate change scenarios

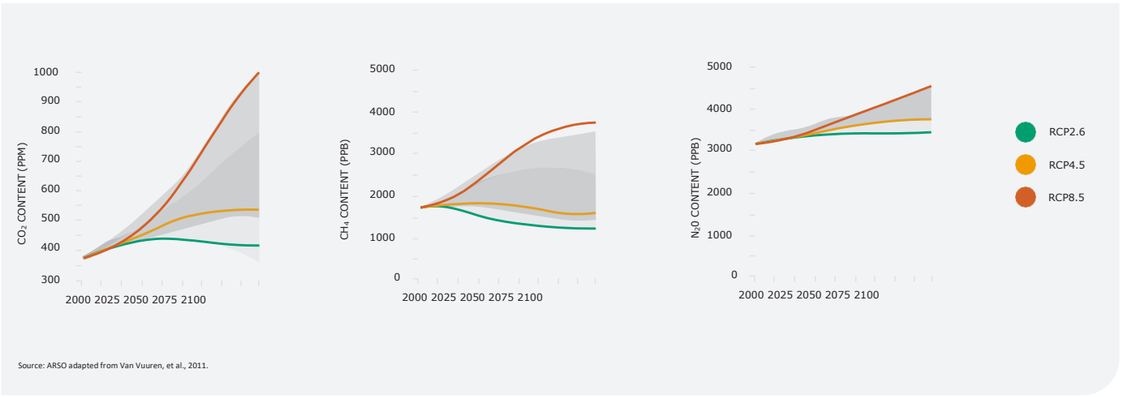
Climate models are used to predict the state of the climate in the future. These include computer simulations of the entire climate system, which are used for the preparation of **projections of the state of the climate** (e.g. average temperature, annual distribution of precipitation) under different conditions. Because the climate particularly depends on the content of greenhouse gases in the atmosphere, the projections are made on the basis of different scenarios that describe **changes in the emission** of these gases in the **future**.

Each of these scenarios depends on **social and economic factors**, such as population growth rate and gross domestic product in the 21st century. The purpose of using scenarios is not to predict what exactly will happen in the future, but to assess how different decisions might affect the future climate. Since climate models are an approximation of the real state of the climate system, the results have varying degrees of **uncertainty**. We can assess them by comparing the results of different models.

RCP scenarios

In the scientific community, the RCP (Representative Concentration Pathways) scenarios of climate change are established. These are also used in this research.

1. **RCP2.6:** The most **optimistic scenario**, which anticipates low emissions of greenhouse gases, the content of which in the atmosphere would reach its peak at the beginning of the 21st century and then gradually decline.
2. **RCP4.5:** A moderately optimistic scenario, which foresees a gradual reduction of emissions and stabilisation of the content of greenhouse gases in the atmosphere at the end of the 21st century.
3. **RCP8.5:** The most **pessimistic scenario** without an anticipated climate change mitigation, which assumes a high emission of greenhouse gases and a subsequent increase in their content even after the end of the century.



Source: ARSO adapted from Van Vuuren, et al., 2011.

Tourism climate indexes

For tourism climate indexes, Holiday Climate Index **(HCI): Urba**n (urban tourism) and Climate Index for Tourism **(CIT): 3S** (beach tourism), the projections **by the end of the 21st century** were analysed on the selected locations in macro tourist destinations. They were calculated on the basis of air temperature, humidity, cloud cover, wind and precipitation based on the results of climate models within the European Union's **Copernicus C3S** programme for the three RCP scenarios. The data is provided on a 12.5km grid resolution. The **points** selected are close to typical tourist destinations and **ARSO** (Slovenian Environment Agency) monitoring stations. Values for past periods were used for comparison of the calculated values with data from the ARSO archives, on the basis of which additional CIT indexes and effective temperature were also calculated for past periods **(1971–2020)**.

Other indexes

The ARSO projections by the end of the 21st century were analysed. These were made on the basis of regional climate models and the mGROWA snow model for:

- **number of hot days,**
- **number of warm days,**
- **number of tropical nights,**
- **number of days with snow cover,**
- **number of days with precipitation over 1mm, and**
- **number of days with precipitation over 20mm.**

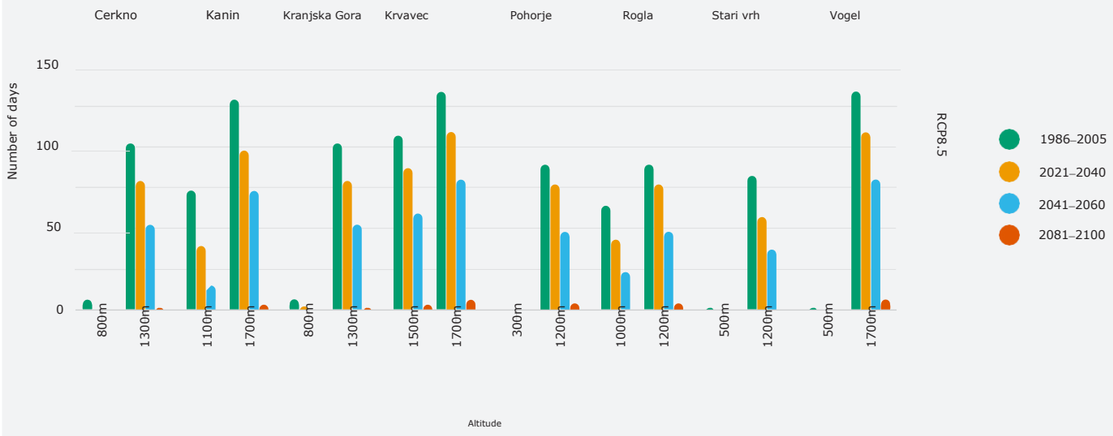
Winter tourism

The Copernicus C3S projections of climate change for eight ski resorts by the end of the 21st century were discussed:

- **number of days with at least 5cm or 30cm snow cover,**
- **amount of snowfall and**
- **number of hours with favourable conditions for snowmaking.**

The data is available at the level of NUTS-3 statistical regions with a height resolution of 100m. The ski resorts were classified into regions, the data for two altitudes per ski resort was used.

Days with at least 30cm of natural snow – the most unfavourable scenario; data source: Copernicus.



2 Adaptation of winter tourism to climate change

Impact of climate change on winter tourism

Mountain ecosystems are considered areas that are more exposed to climate change. One of the sectors particularly vulnerable to climate change is winter tourism. Climate change is a major challenge for winter tourism, as it must adapt to change. Furthermore, mitigation measures must be implemented to reduce the negative impact of said tourism on the environment. Among other things, the effects of climate change manifest through:

Higher temperatures in winter

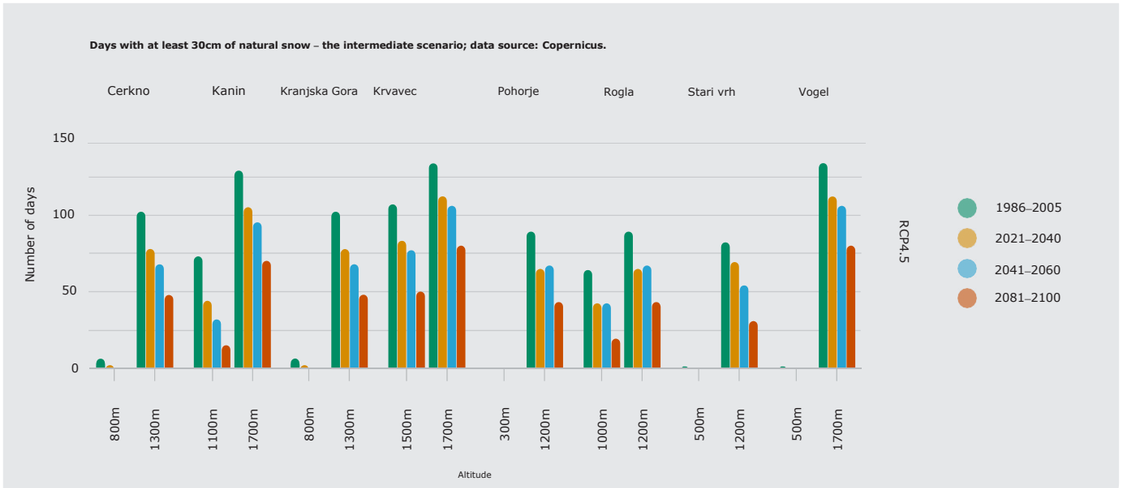
Shorter snow cover duration

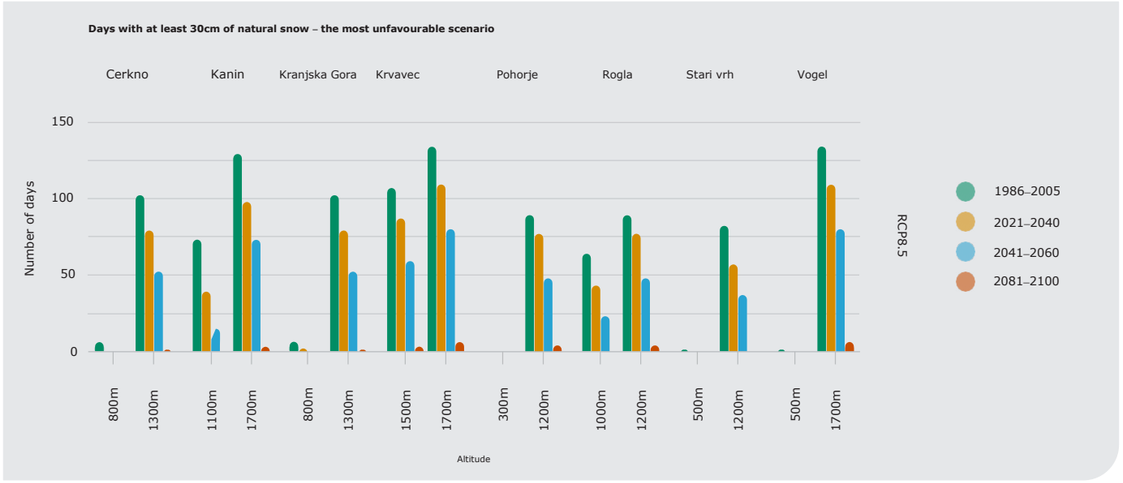
Less natural snow

Fewer possibilities for snowmaking

Higher rainfall

The charts below display the number of days with at least 30cm of natural snow as per the intermediate scenario and the least favourable scenario at various altitudes in the area of the relevant ski resorts. In both cases, we see a decrease in the number of days with at least 30cm of natural snow by the end of the century. The data in the charts was obtained from the EU Copernicus (C3S) programme, which was not corrected for Slovenia. This means that we are only observing deviations from the reference values and not the absolute values. The uncertainty of results is greater.

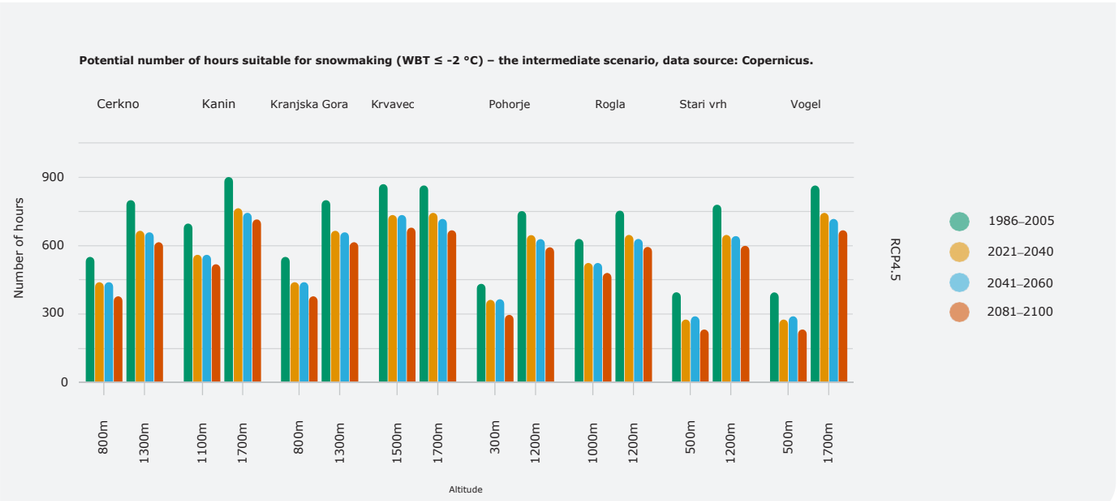


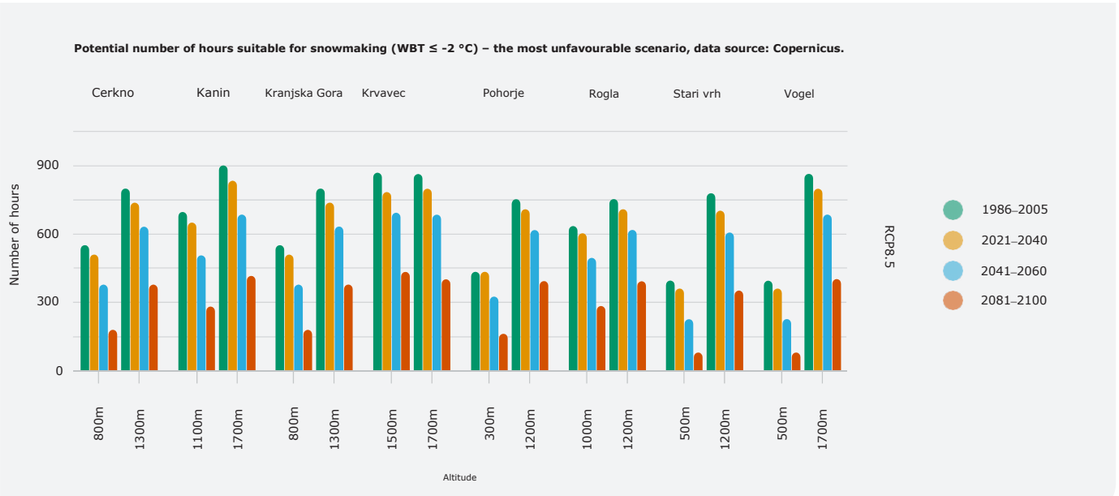


Fewer opportunities for snowmaking

The charts below display the average number of hours allowing snowmaking because WBT (wet-bulb temperature) is lower or equal to -2 °C in November and December for the destinations Cerkno, Kanin, Kranjska Gora, Krvavec, Pohorje, Rogla, Stari Vrh and Vogel. For the RCP4.5 intermediate scenario, the projections reveal a decrease in the average number of hours suitable for snowmaking in the coming periods at lower and higher altitudes. An even more prominent drop is evident in the RCP8.5 most unfavourable scenario, which reveals that the possibility for snowmaking in the Pohorje Hills and Stari Vrh at altitudes between 1200 and 1300m in the 2081–2100 period will be similar to that currently available at the altitude of 300m.

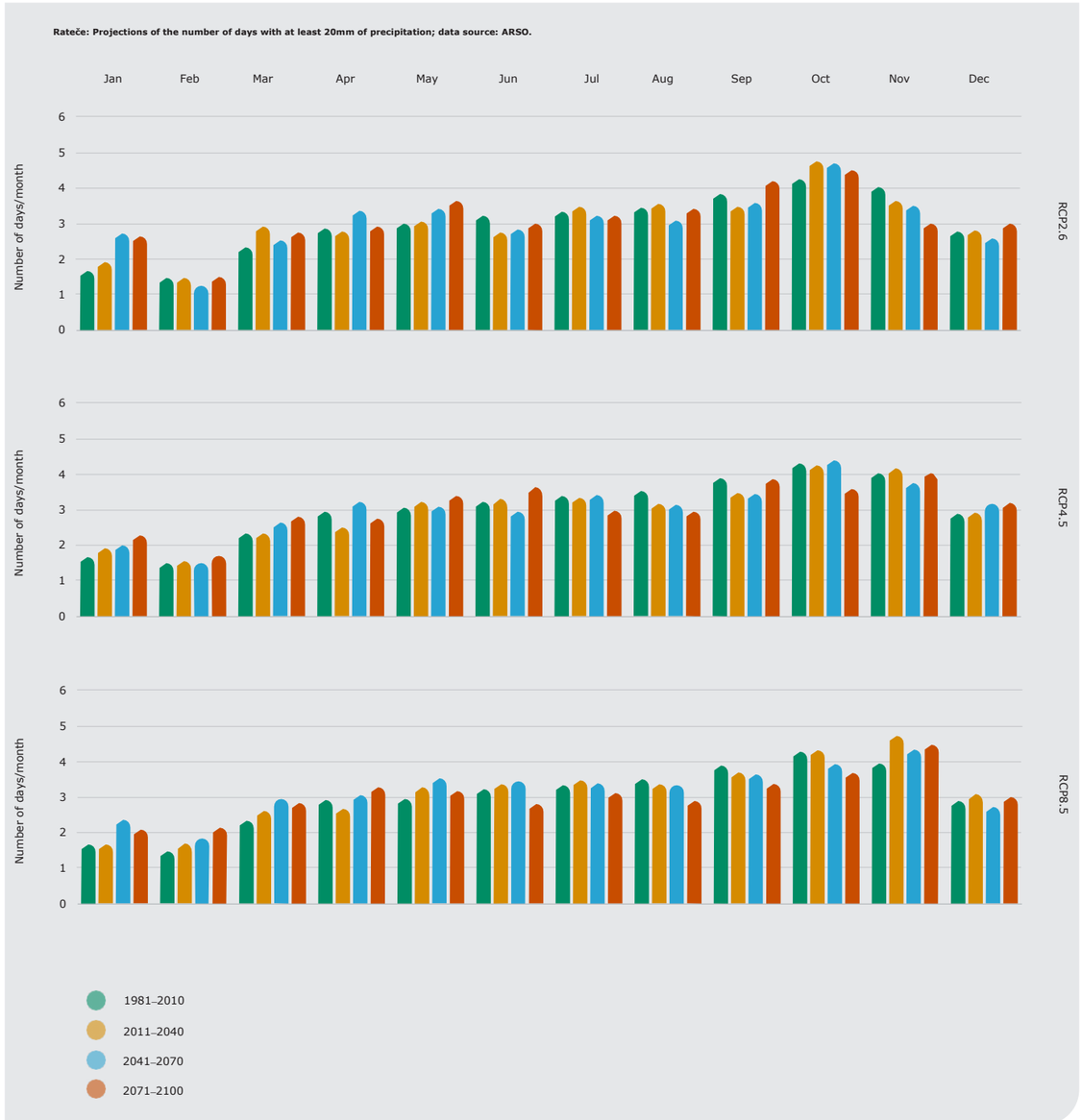
The data in the charts was obtained from the EU Copernicus (C3S) programme, which was not corrected for Slovenia. This means that we are only observing deviations from the reference values and not the absolute values. The uncertainty of results is greater.





More intense precipitation

The chart shows the average number of days per year with at least 20mm of precipitation in the area of Rateče. It is evident from the projections that the frequency of more intense precipitation events will increase in the future, particularly in the colder part of the year. Since the projections reveal less snow, more precipitation in the form of rain is expected in the coming periods, which will require adaptation of the tourist offer.



Adaptation of winter tourism to climate change

The possibilities for adapting include the preservation of winter activities in the snow, diversification of winter activities that do not involve snow and the design of a year-round tourism offer.

Technical measures

- Snowmaking and snow storage whereby snow (natural or artificial) is stored in a heap and covered with an insulation material.
- Generation of large quantities of renewable energy in summer and its storage for winter (e.g. a modern approach to the storage of thermal energy).
- Improvement of energy efficiency of buildings.
- Design of a long-term strategy with technical measures for better climate change adaptation.

Diversification of offer

- Dynamic pricing as per the weather forecasts.
- Development of year-round tourism and tourism products independent of snow.
- Adaptation to an increased number of rainy days in winter, care for the safety of tourists.
- Cooperation between the providers of sports activities with the providers of sightseeing tours and museums, event organisers, tourist guides, etc.
- Research, education and training with an emphasis on the green transition, biodiversity conservation and safety.

3 Adaptation of summer outdoor tourism to climate change

Impact of climate change on summer outdoor tourism

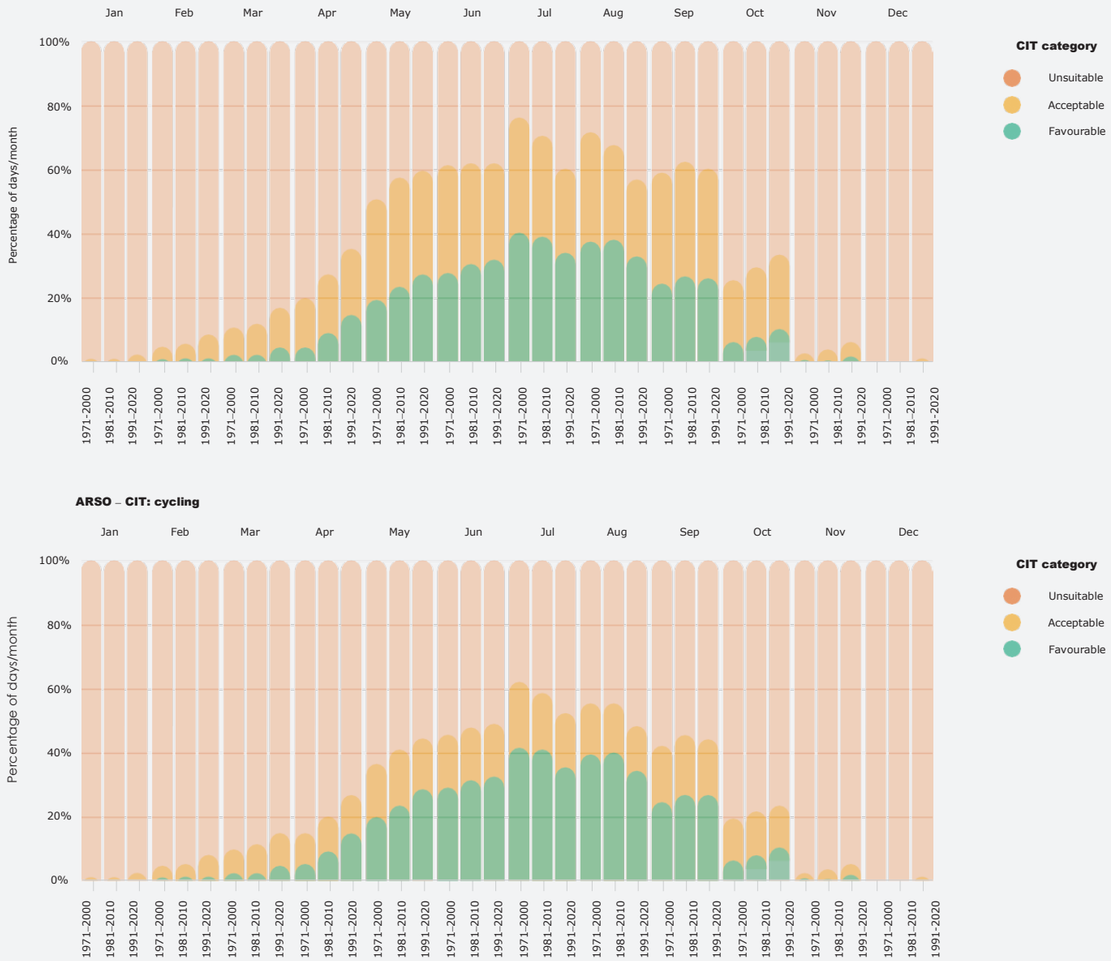
The past trends for hiking, cycling, football and golfing (1971-2020) show the extension of suitable conditions for these activities in all four macro destinations. In particular, May and September have become more suitable for summer outdoor activities.

On the other hand, July and August have become too hot for all-day outdoor activities in all macro destinations with the exception of Alpine Slovenia.

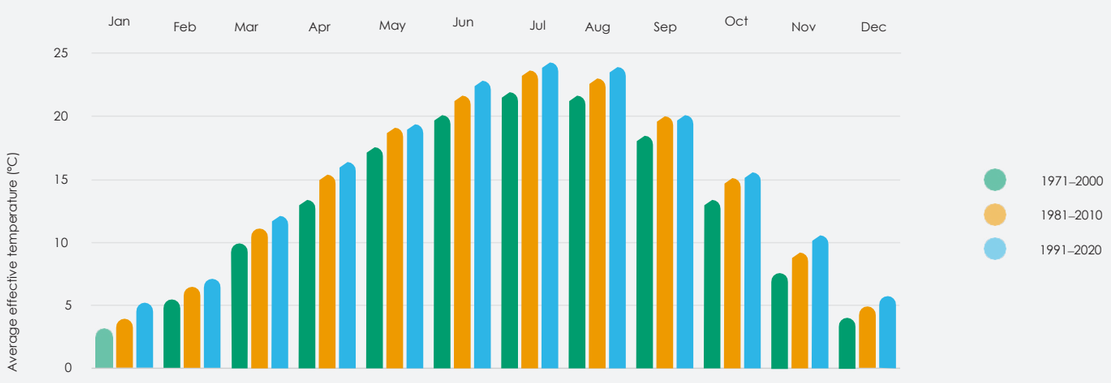
Future projections reveal an increase in temperature and humidity (average effective temperatures) in all analysed destinations, an increase in the number of warm and hot days and the extension of the season for outdoor activities in all macro regions.

More storms may be expected in the summer and thus an increased need to ensure the safety of tourists.

Kočevje: Past CIT trends for hiking and cycling (1971–2020); data source: ARSO.



Cerklje ob Krki: past trends of average effective temperature (1971–2020); data source: ARSO.



Health problems: heat, allergies and insects

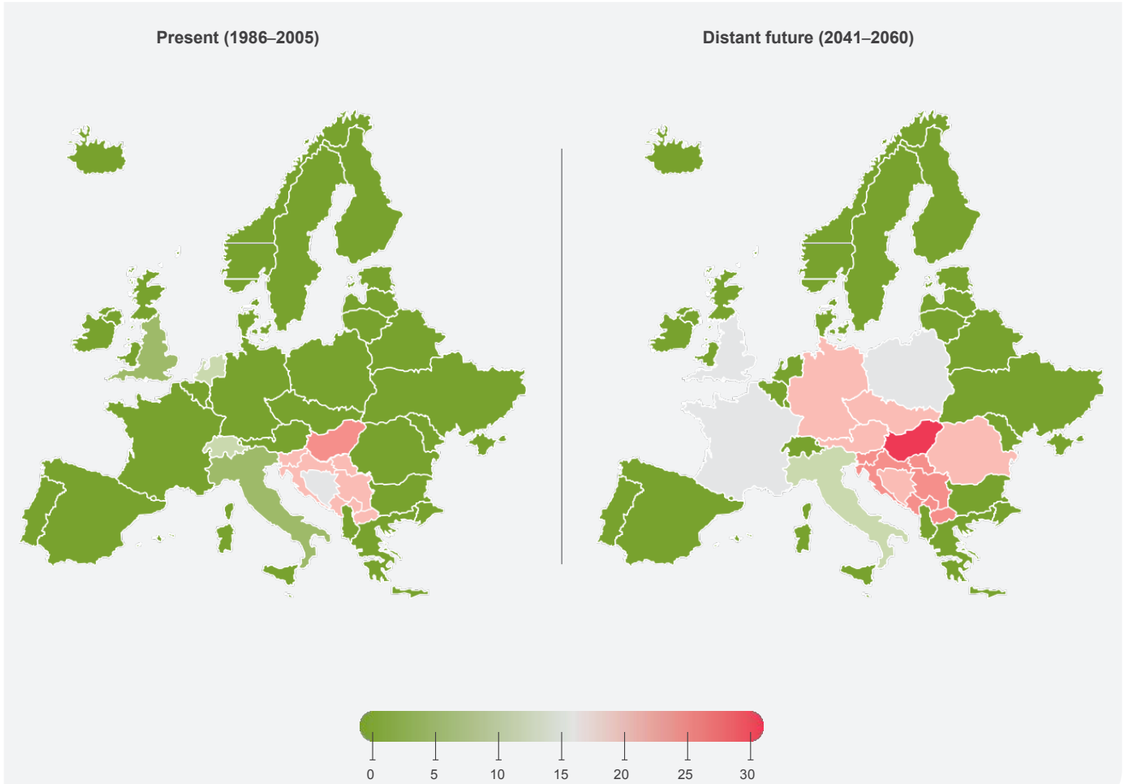
Extreme heat and humidity and the related health problems of tourists and workers in tourism will be most problematic for summer outdoor tourism.

According to the EASAC report (2019), the prevalence of allergic respiratory and skin diseases among the general population in Europe was estimated at 40% and has increased significantly in recent decades. In particular, sensitivity to ragweed pollen will be increasingly problematic for outdoor activities.

Outdoor tourism will also be affected by an increase in the number of insects and the spread of invasive species and the associated increase in transmittable diseases (e.g. tick-borne meningoencephalitis and caterpillar dermatitis caused by oak and pine processionary caterpillars).

Adjustments involving health protection are thus crucial:

- Appropriate number of defibrillators, accessibility of outpatient clinics, raising awareness among tourists about health risks, suitable education of tourism professionals to help tourists;
- Increased attention to safety at work and the issue of exposure to heat among tourism professionals and the adaptation of work organisation accordingly.



Percentage of European population sensitive to ragweed pollen; average results for WRF RegCM and CHIMERE, RCP4.5 and reference scenario of ragweed spread.

Source: Lake et al., (2017), p. 387.

Impact on biodiversity and natural heritage

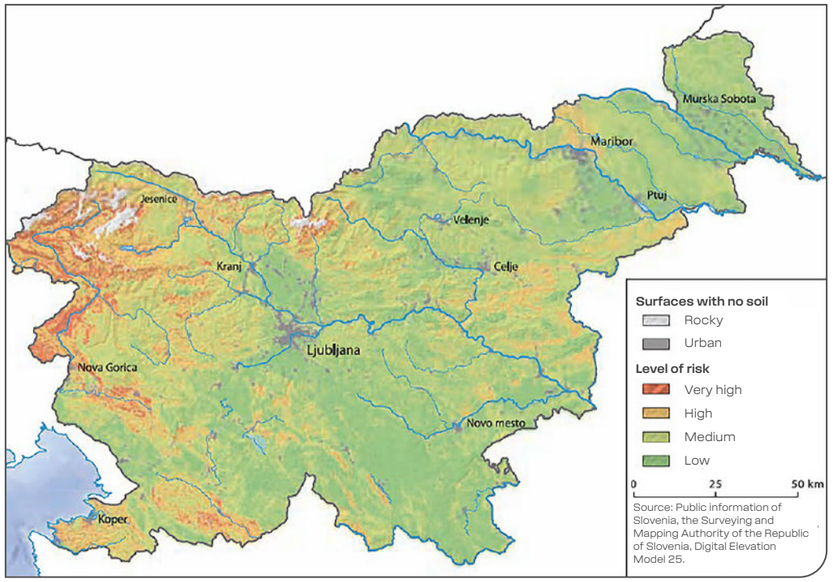
Biodiversity and climate change are closely linked: the deterioration of one causes a spiralling deterioration of the other. We can expect a redistribution of animal and plant species, an increase in fire risk and worsening of the conditions for natural heritage.

Tourism depends on natural heritage and also acts as its important guardian in suitable forms. As estimated by Chung, Dietz and Lui (2018) from the data on protected areas in 50 countries, a 1-per cent increase in biodiversity denotes a 0.87-per cent increase in visitation. On the other hand, tourism contributes significantly to all five main reasons for biodiversity loss: change of habitats, excessive use of resources, pollution, introduction of invasive species and climate change.

With direct consequences on nature, climate change will result in a triple impact of tourism on mountain areas due to:

1. **diversification from winter into summer tourism,**
2. **extension of the summer season,**
3. **expected retreat of tourists and hikers from heat to higher altitudes.**

In doing so, the issue of erosion of hiking trails, building of tourist infrastructure and conservation of protected areas is particularly problematic.



Department of Geography of the Faculty of Arts of the University of Ljubljana, 2009.

Potential natural threat to Slovenia from the aspect of erosion of hiking trails.

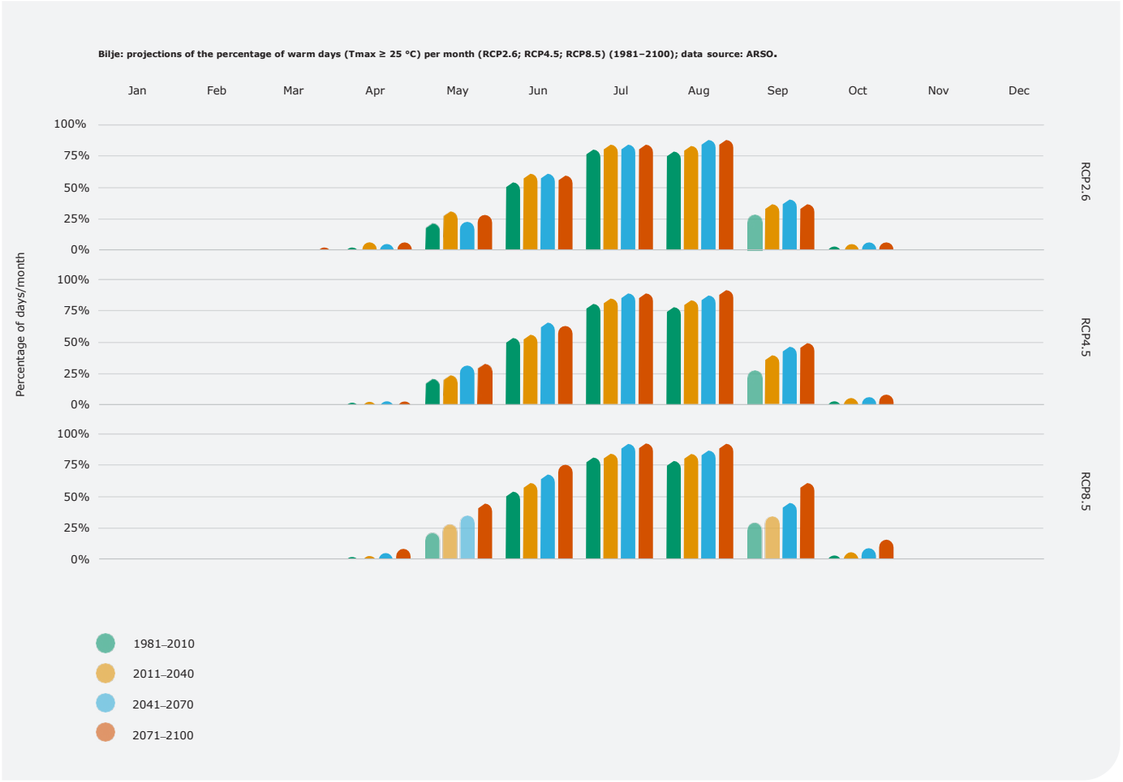
Source: Repe and Mrak, 2018, p. 161.

Extension of the season, but greater competition for these months

The extension of the season will likely benefit Slovenian outdoor tourism; however, greater competition from other European destinations for the same slots is expected. Due to the need for diversification from winter tourism in the Alps and great heat in the Mediterranean, it will be vital for these destinations to obtain tourists in the spring and autumn months, with which an ever increasing competition of destinations for tourism professionals in those periods is also linked.

An important question in the future will be how will climate change affect migration flows of seasonal work (in winter in the Alps and in summer in the Mediterranean).

The extension of the season is not a phenomenon merely dependant on the weather. Due to low productivity of workers in hot summer months and increased costs of cooling, employers will further strive towards the exploitation of annual leave entitlement in the summer, which is also linked with school holidays.



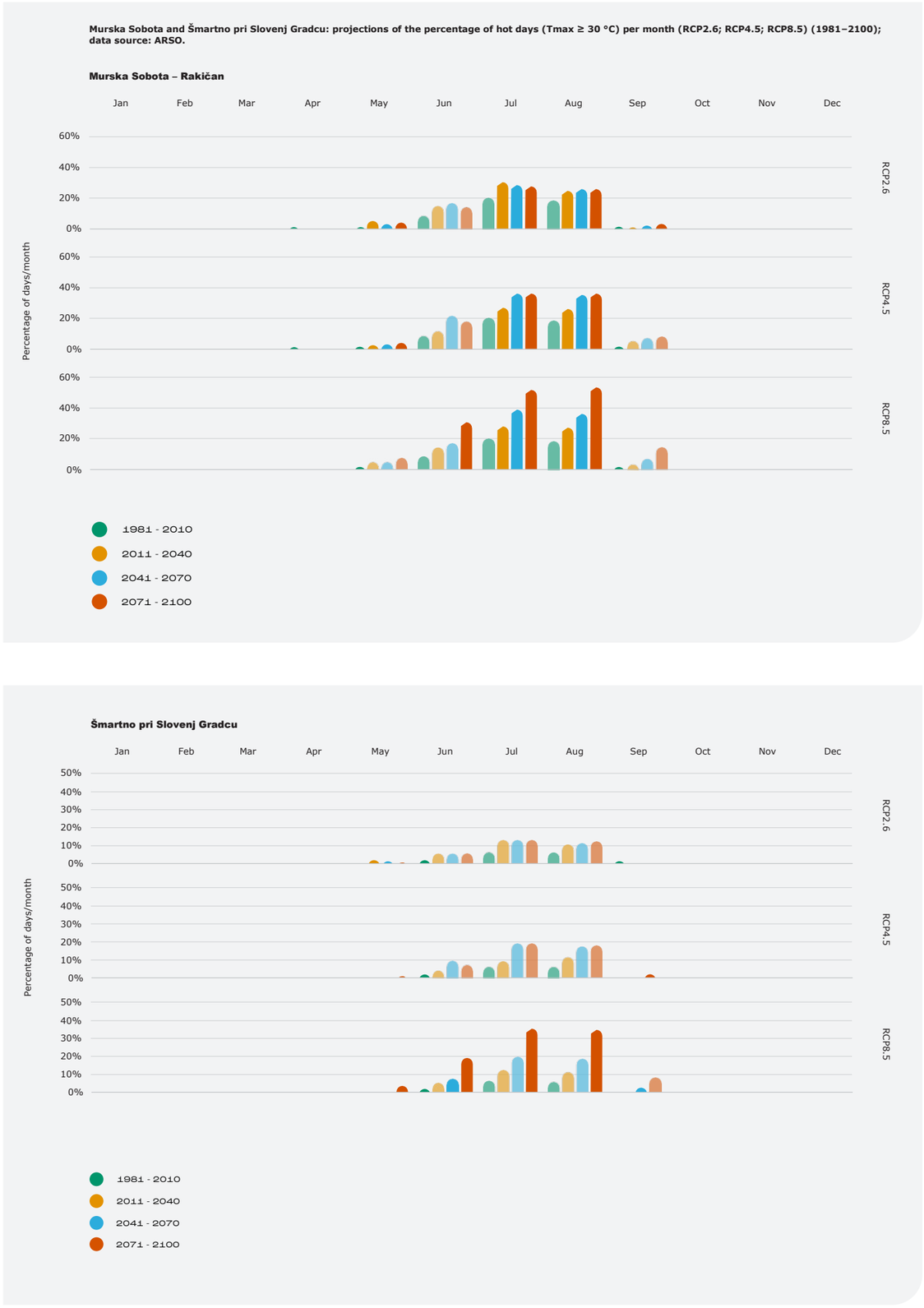
Will tourists avoid Slovenia due to heat?

An increase in temperature will not likely lead to tourists switching from Slovenia to another destination. It is more probable that the tourists will adapt to the heat by:

- avoiding mid-day activities,
- expecting air-conditioned facilities,
- adapting equipment and clothes: further increase in the use of e-bikes and motorhomes may be expected,
- retreating to higher altitudes,
- seeking waterside experiences.
- In this regard, the Slovenian tourist offer, marketing and work organisation must be adjusted accordingly.

It will be critical to seek appropriate forms of diversification of outdoor tourism, which denote an increase in carbon footprint (air-conditioning of facilities, increased use of motorhomes).

At the same time, the largest incentives can be expected for outdoor tourism by means of systemic changes of green mobility promotion, in which hiking and cycling represent the main forms of low-carbon tourism.



4 Adaptation of urban tourism to climate change

Key points

Conditions for urban tourism in Slovenia are also improving due to better climate in all seasons, including winter.

The season of urban tourism can thus extend over all the seasons and offer experiences 365 days in a year.

Greater possibilities for the occurrence of extremely high air temperatures that lead to thermal discomfort. The proportion of hot days and extremely high temperatures will increase in Ljubljana, Koper and Nova Gorica, particularly in July and August.

Although urban tourists are prepared to withstand higher temperatures, more adaptation measures must be adopted for their health.

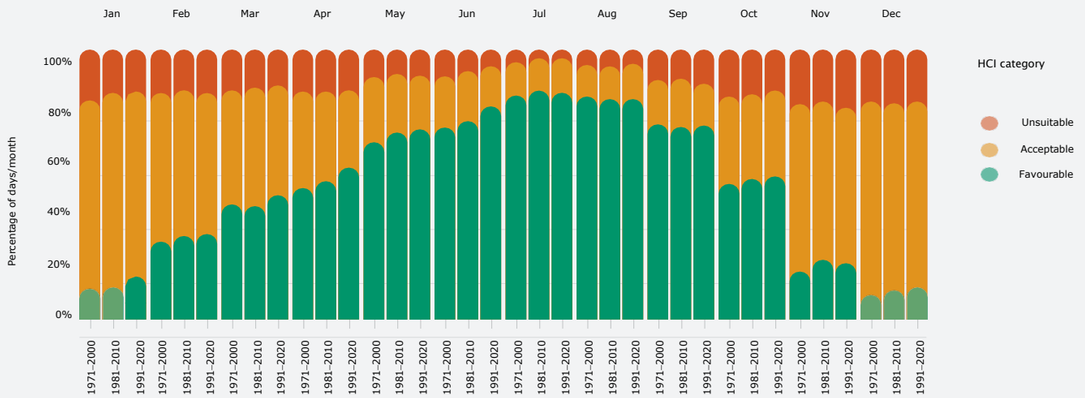
Projections of climate change in urban areas

Past observations (the first chart below) revealed that summer is the most appropriate season for urban tourism, as the number of ideal weather days is the highest. Over time, this period is being extended into spring and autumn.

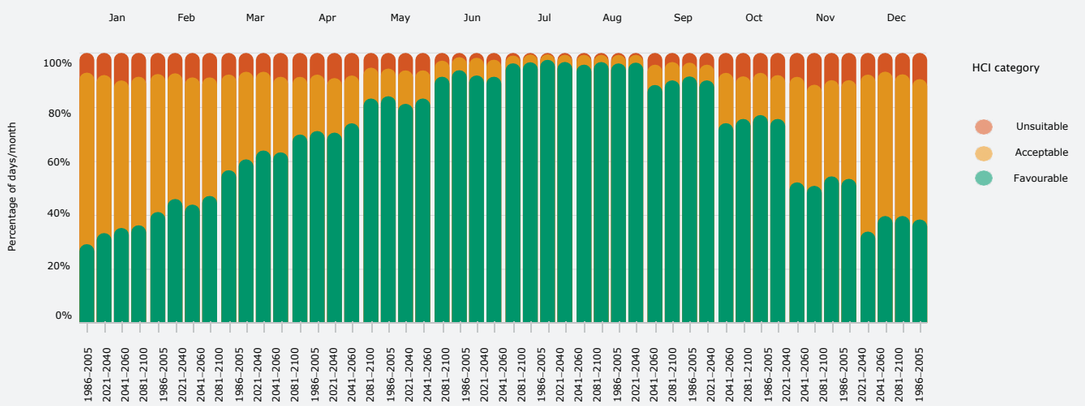
The most optimistic projections (the second chart below) that follow the scenario of least global warming reveal that thermal comfort will also increase in the winter months, which denotes an expansion of urban tourism to all seasons.

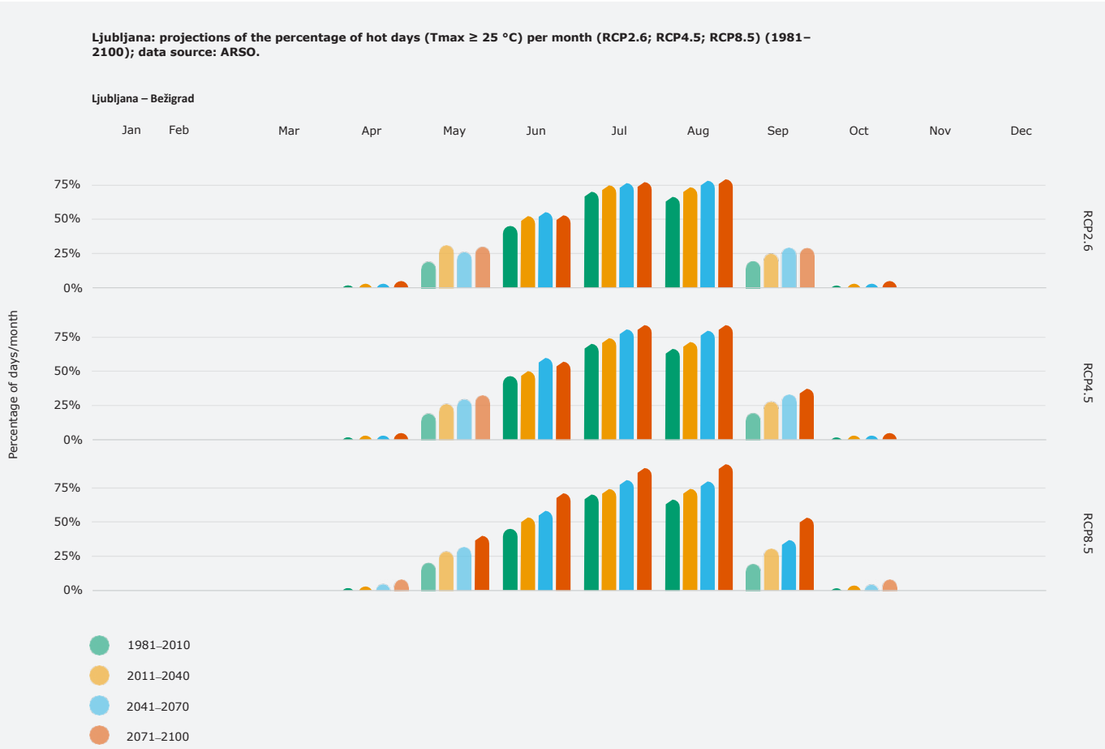
However, urban tourism will have to face a new challenge: how to ensure thermal comfort in the summer? The projections show that the average temperature in Slovenian towns will further increase. In the third chart for Ljubljana, the anticipated increase in the number of warm days (above 25 °C) can be seen. It is most prominent as per the pessimistic scenario RCP8.5. The projections for the increase in the number of hot days (above 30 °C) are similar.

Ljubljana: Past trends of HCI Urban for urban tourism 1971–2020); data source: ARSO.



Ljubljana: Projections of HCI Urban for urban tourism (1986–2100) – optimistic scenario; data source: Copernicus.





When towns turn into heat islands

There are many surfaces in towns which absorb solar radiation well (asphalt, dark roofs, etc.) and store heat. Buildings create an urban canyon effect and an urban heat island is created due to the lack of green and water surfaces (higher temperatures of surfaces and air in the centres of towns if compared to the countryside).

The urban heat island has a dangerous impact on health conditions and understanding of living comfort, the quality of life and economic wellbeing, higher energy consumption for cooling, which results in higher greenhouse gas emissions due to the use of air conditioners.

Higher air temperature combined with humidity is an important reason for reduced thermal comfort of tourists and local residents. To this end, adaptation measures must be carried out in towns, particularly in the summer, as the proportion of warm and hot days is increasing.

How to cool off in an urban environment?

- Walk in the shade of trees or other sunshades.
- Find cooler places; stay indoors.
- Drink more water – hydrate.
- Wear light clothes and hats.
- Use an umbrella or a parasol for shade.
- Wear your long hair up.
- Plan longer breaks.
- Choose accommodation in a greener suburb or the outskirts of a town.
- Postpone planned activities until a more favourable time.

Let our town become a green oasis

- Towns should provide more green and blue surfaces -> greenery (parks, alleys, trees, shrubbery, flowers) and water features (fountains, drinking fountains, sprinklers, rivers, lakes). These are areas that allow precipitation and reduce surface water runoff.
- Provide natural and artificial shelters for pedestrians -> enriched squares with trees and shade, benches and rest areas, variety of space to access sun/shade and exposure/protection against wind (arcades, parks, mobile gardens, pedestrian zones, open surfaces, windbreaks and canopies made from different materials, such as canvas, reeds, bamboo, vines).
- Promote the use of climate-friendly mobility within an urban destination and enable a network of public transport services.
- Provide environment-friendly cooling of rooms, good insulation and the application of traditional skills in construction and renovation. Urban development should take into account exposure to sun, shading, wind flows through streets and squares (while taking into account the density of urban textures, orientation of open areas and buildings, width of streets, height of buildings, accessibility to services without the use of cars, etc.).
- Offer package services to tourists in spring, autumn or winter. Summer activities should be done in the cooler hours of the day and healthcare should be provided accordingly.
- Summer outdoor events should be planned to take place in the morning or the evening or in shade. Plan more events to take place outside the summer season.

5 Adaptation of water-based tourism to climate change

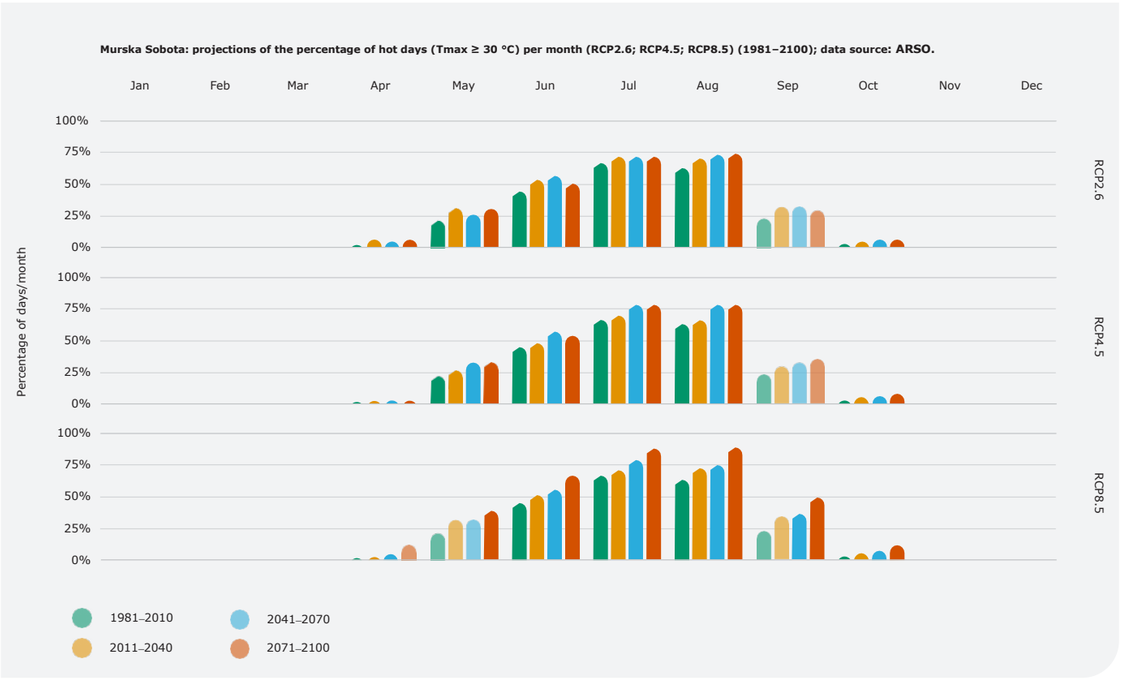
Key points

Extension of the bathing season into June and September.

Extremely high temperatures and heat waves will pose a great risk to human health.

A drop in the quality of water bodies for bathing and fishing is expected.

A lack of drinking water and a lowering of the level of rivers and still water bodies is expected.



Heat: A new silent killer?

The extension of the bathing season is positive for the tourist industry; however, the increased proportion of hot days will be the main reason for reduced thermal comfort of tourists and local residents. High air temperatures pose a large health risk factor, particularly for vulnerable groups, i.e. the elderly, the chronically ill and children.

It is necessary to introduce adaptation measures to ensure more favourable conditions for thermal comfort during outdoor activities, such as:

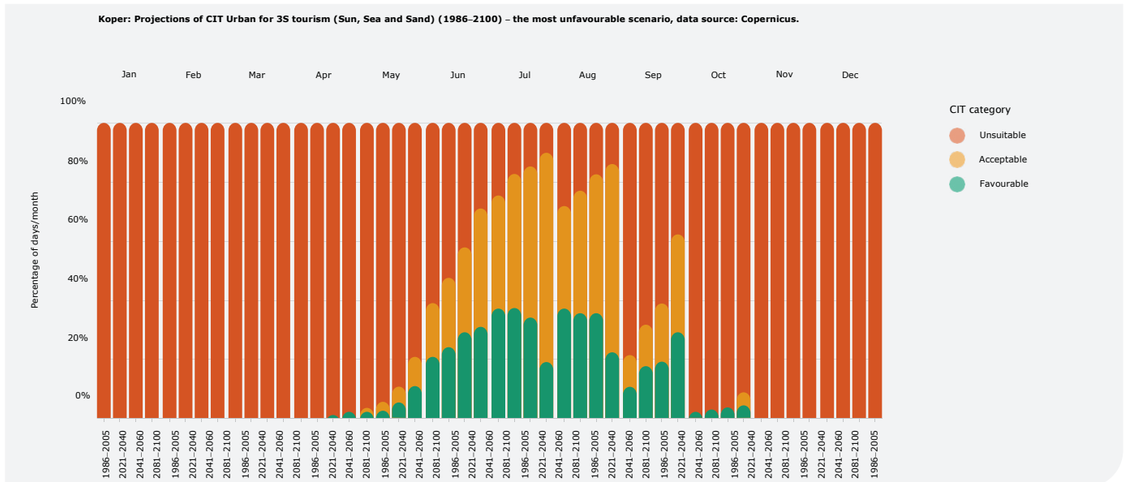
- installation of drinking fountains,
- provision of natural and artificial shade,
- adaptation of activities, e.g. time slots for entertainment at swimming pools,
- offer of protective equipment and clothes.

Finally, the education of employees about the provision of first aid in crisis events and of tourists about their possible adaptations to reduce health risks is vital.

Increased costs of cooling

High temperatures and heat waves will have a significant impact on energy consumption, which will be necessary for cooling of facilities. In particular, tourism providers must strive to:

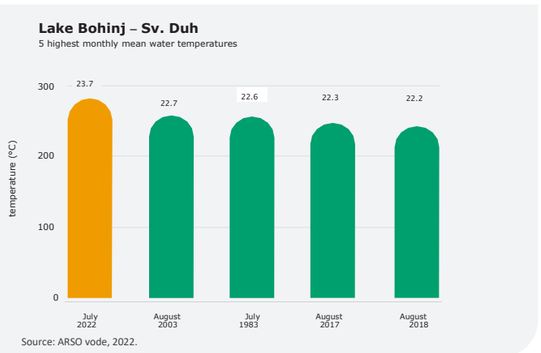
- reduce energy consumption (e.g. use of LED lights, switching off devices, optimisation of use with regard to working hours, etc.),
- improve energy efficiency (improve the coefficient of thermal conductivity of buildings) and
- convert to renewable energy sources (e.g. installation of photovoltaic systems, exploitation of geothermal energy for cooling, etc.).



The end of refreshing bathing in natural waters?

In addition to the weather, the temperature of water bodies is important for safe bathing and swimming in summer months. High water temperatures increase the possibility of bacterial and chemical infection and result in an increased harmful algal bloom. Past measurements of bathing waters revealed an increase in the temperature of water bodies, which is likely to continue in the future as well.

The monitoring of water quality and suitable communication with tourists are especially important. It is mandatory to ensure more frequent monitoring of bathing waters and all other waters with which tourists come in contact. Up-to-date notifications for swimmers on coasts and beaches is recommended.



Source: ARSO vode, 2022.

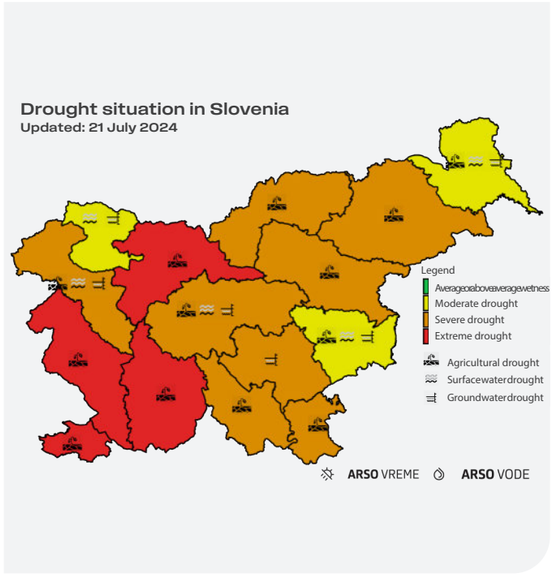
What will be the future of sport fishing?

Freshwater sports fishing is an important tourist activity in Slovenia. Although the projections show more ideal weather days for fishing, the warming of water bodies, fluctuation of water supplies and lowering of the biochemical quality of water has not and will not have a positive impact on fish populations. It will be necessary to adapt the scope, method and time of fishing with regard to the recovery rate of permanent fish stocks.

Changing flows of water bodies

Whitewater sports, such as rafting, kayaking and canyoning depend on the condition of water courses. Higher average air temperatures, variable precipitation, shorter snow cover periods in medium-altitude mountains and in the lowlands, and extreme events (heavy rainfall and lengthy droughts) affect the flow regimes of water bodies.

It will be necessary to draft guidelines for sports activities that will simultaneously protect participant health and minimise the possibility of worsening ecological conditions. Providers of water sports activities will have to prepare for the adaptation of their offer in accordance with current conditions or even temporarily suspend their activities.



Frequent drought periods lead to increased water shortage

Climate change has caused numerous extreme weather phenomena across the world. One of these is drought.

Tourist visits to Slovenia are concentrated in the summer months, when water consumption usually increases. The projections of higher air temperatures and longer periods with no rainfall further emphasise the urgency of addressing this issue.

Droughts and higher soil temperatures endanger the quality of drinking water and increase the likelihood of fire. Water consumption is also linked with reducing heat-related health risks. It will thus be crucial to find a balance between austerity measures and provision of health security of tourists and local residents.

Last but not least, it is important to point to the hazard of reduced aesthetic value of natural waters. Such aesthetic value is an essential promotional element of Slovenia as a tourist destination.

Saving drinking water is becoming a constant and a must in tourism, too

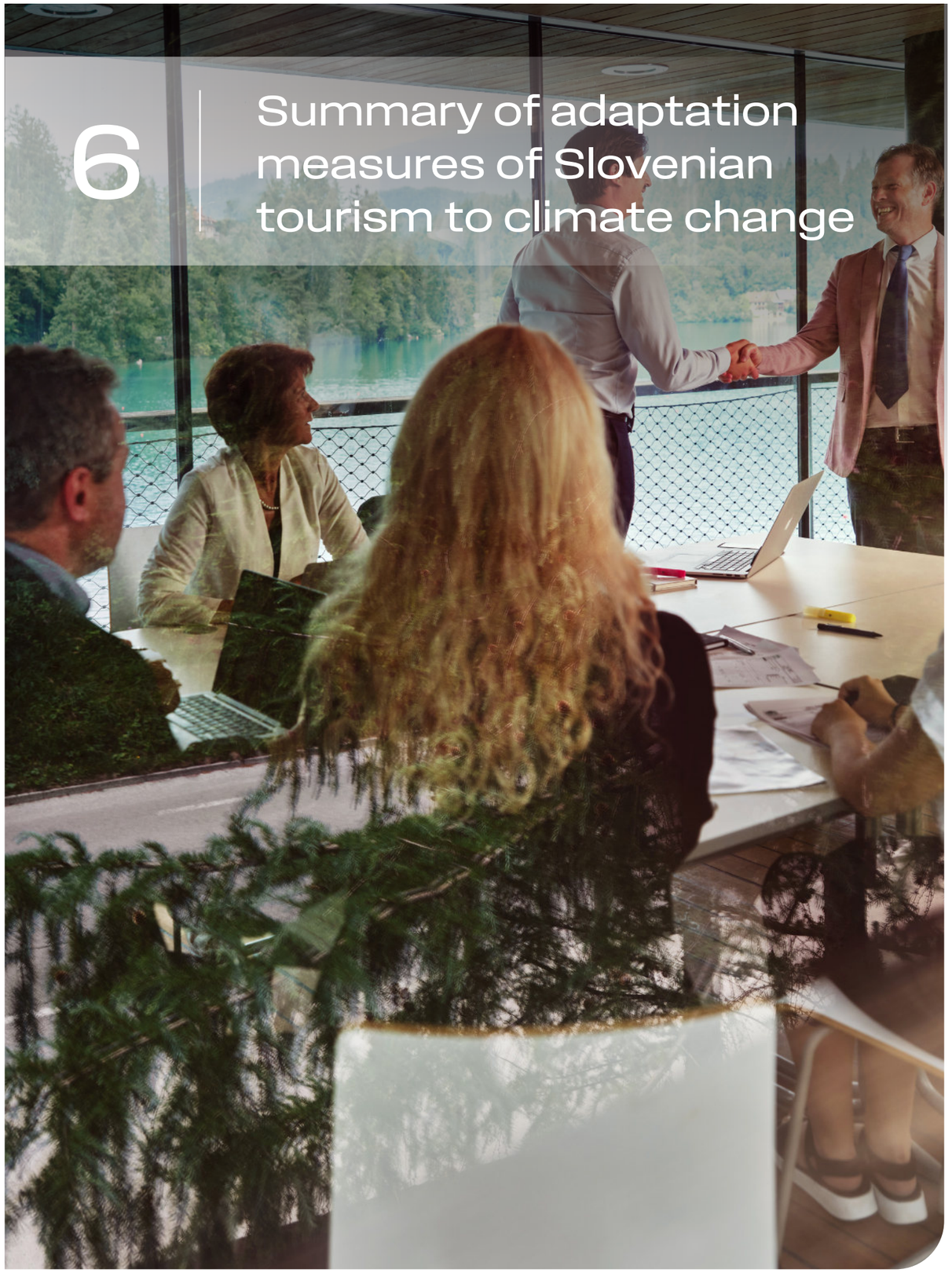
The adaptation of tourist providers is particularly urgent due to the projections of water source shortages. Possible measures include e.g. rainwater harvesting, greywater recycling systems and water consumption monitoring.

The most frequent measures to reduce water consumption in hotels include:

- installation of aerators or flow regulators on taps, dual flush toilet systems and sensors and/or timers for taps,
- establishment of a towel and linen reuse scheme.

Education for employees and guests during their stay on saving water in everyday work activities should also be carried out.

6 Summary of adaptation measures of Slovenian tourism to climate change

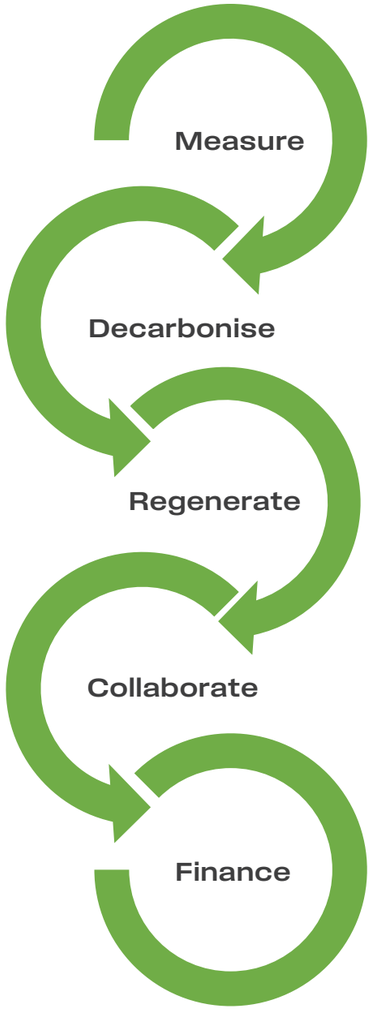


Summary of adaptation measures of Slovenian tourism to climate change

Types of effects:	Adaptation measures:	Risks and possible opportunities to mitigate climate change
Temperature increase: extension of the summer season + Extension of the season in spring and autumn for the majority of activities -/+ The Mediterranean will become too hot in summer, and the Alps will seek tourism diversification due to a decline in winter tourism => potential increase in competition for spring and autumn periods – Tourists in northern regions of Europe will have better conditions for domestic tourism and thus possibly a lesser desire to travel to other countries	· Diversification of tourism products in spring and autumn · Event organisation in spring and autumn · Extension of the season for urban and cultural tourism throughout the entire year · Adjustment of marketing to changes in key European markets	+ Increase in negative effects of tourism due to tourism growth resulting from extended seasons, e.g. negative effects on biodiversity and enhanced erosion of hiking trails + Increased green mobility (cycling, hiking) as the basic means of transport to and at the destination
Temperature increase: reduced snow cover - Reduced snow cover and the number of hours suitable for snowmaking - More rainy days can be expected	· Snowmaking · Indoor ski areas · Diversification of offer in the summer season · Diversification of activities that do not require snow, technical adaptation and change in tourist behaviour and expectations · Regulation: mandatory inclusion of climate projections in future investment and subsidies in winter tourism	- Greenhouse gas emissions will increase with the increased need for snowmaking and indoor ski areas - Increased need for snowmaking will result in increased pressure on water sources - Reduced snow cover can possibly result in a search for more distant locations and subsequent pressure on increased greenhouse gas emissions
Temperature increase: effects on tourist and worker health - Increase in the number and intensity of heat waves and an increase in health burdens due to heat combined with humidity - Increase in vector-borne diseases and allergies - Increased susceptibility to allergies in target markets, potentially resulting in travel avoidance and increased health risks - Continuation or possible increase in summer leave duration in target markets due to reduced energy costs for employers at the time of lowest productivity	· Technical measures and infrastructure: skins of buildings, ventilation, air conditioning, green areas · Notification systems for safety during heat waves · Increase in water tourism and indoor tourism · Escape from towns: increase in countryside tourism in summer · Change in tourist behaviour and raising awareness among tourists · Implementation of activities in the morning or evening · Organisational measures to change working conditions · Health plans, including accessibility of defibrillators, ambulances, appropriately trained staff and outpatient clinics for tourists	- With no prompt decarbonisation of electricity supply, greenhouse gas emissions will continue to grow due to an increased use of air conditioners - Increase in greenhouse gas emissions from transport due to temporary move of urban residents to cooler places during the time of heat waves, increased use of motorhomes and extended summer season
Changed summer precipitation patterns – Increased drought and decreased water levels in rivers and lakes – Worsening quality of bathing waters -/+ Increased water temperature	· Investment in water saving · Raising awareness and changes in tourist behaviour · Tourism may advocate investing in adjustments that are based on natural solutions (e.g. water reservoirs) · Regulation: mandatory inclusion of climate projections in future investment and subsidies in waterside tourism	– Increased pressure and conflict with regard to water sources due to: · increased tourism resulting from the extended season, · increased waterside tourism as an adaptation measure to summer heat, · increased snowmaking, · possible increase in golfing as an activity with high water consumption.
Reduced safety - Increased risk of forest fires - Increased number of storms, floods and landslides	· Security plans and notification systems, including raising awareness and changes in tourist behaviour · Enhanced connection between tourism development and forest management	
Impact on social changes: + Potentially enhanced awareness of tourists (particularly from Europe) about the need to mitigate climate change	· Market adjustments to a possible increase in tourist awareness	+ Increased tourist awareness could result in new opportunities for a sustainability-oriented offer in Slovenian tourism. + Enhanced awareness and stricter legislation will possibly lead to an increased supervision of the sustainable offer and ensuring that providers meet their sustainability commitments

7 Climate change mitigation

Glasgow Declaration:
Commitment to a decade of climate action in tourism



Glasgow Declaration
Climate Action in Tourism

Measure and disclose all travel and tourism-related emissions. Ensure our methodologies and tools are aligned to UNFCCC-relevant guidelines on measurement, reporting and verification, and that they are transparent and accessible.

Set and deliver targets aligned with climate science to accelerate tourism's decarbonisation. This includes transport, infrastructure, accommodation, activities, food & drink, and waste management. While offsetting may have a subsidiary role, it must be complementary to real reductions.

Restore and protect ecosystems, supporting nature's ability to draw down carbon, as well as safeguarding biodiversity, food security, and water supply. As much of tourism is based in regions most immediately vulnerable to the impacts of climate change, ensure the sector can support affected and at-risk communities in resilience building, adaptation and disaster response. Help visitors and host communities experience better balance with nature.

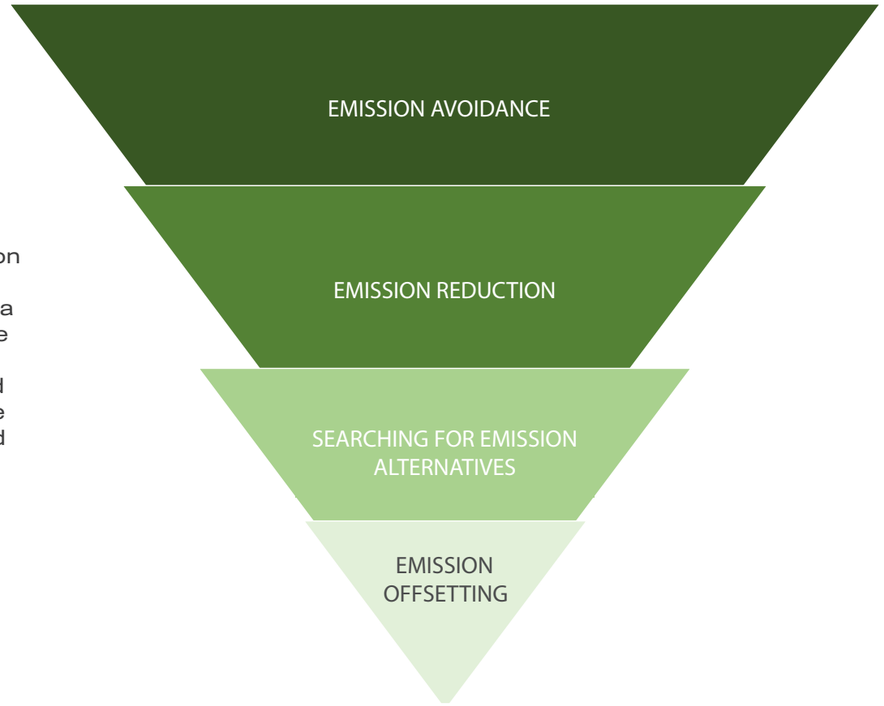
Share evidence of risks and solutions with all stakeholders and our guests, and work together to ensure our plans are as effective and coordinated as possible. Strengthen governance and capacity for action at all levels, including national and local authorities, civil society, large companies and SMEs, vulnerable groups, local communities and visitors.

Ensure organisational resources and capacity are sufficient to meet objectives set out in climate plans, including the financing of training, research and implementation of effective fiscal and policy tools where appropriate to accelerate transition.

The severity of the need to adjust Slovenian tourism to climate change is not in doubt, but it certainly varies with regard to the so-called climate change projection scenarios. Which scenario will be actually played out depends on the efforts at the global level. If greenhouse gas emissions continue to increase unstoppably, the climate change adaptation will have to be even more intensive. On the other hand, climate change mitigation denotes measures to reduce greenhouse gas emissions or, in other words, to reduce our carbon footprint.

In 2021, the World Tourism Organisation (UNWTO) asked tourism stakeholders to sign the Glasgow Declaration as a commitment to a decade of climate measures in tourism. In the Declaration, the signatories commit to design, publicly present and publicly monitor their action plans on climate measures. For the most part, the measures refer to the role of tourism in climate change mitigation, i.e. preventing the potentially worst scenarios to which we should adapt from ever occurring. The Glasgow Declaration calls on tourism players to measure their carbon footprint in tourism, reduce it, renew and protect ecosystems, participate and disseminate knowledge, and provide sufficient funds for necessary climate measures.

In the continuation of this guide, we focus on the issue of measuring and reducing the carbon footprint of Slovenian tourism.
We propose a priority of measures with regard to their efficiency: it is most efficient to avoid creating emissions, then comes emission reduction and searching for alternatives and, lastly, only as a last resort, financing of credible carbon offsets.
Several examples for each field are illustrated below. The entire list of measures recommended for selected areas in tourism is described in detail in the following chapters.



Emissions are reduced by lessening consumption and implementing carbon-free solutions.

COUNTRY AND DESTINATIONS:

- Further incentives for carbon-free mobility: cycling and hiking.
- Stop marketing campaigns addressed to the guests with the highest carbon footprint of the trip.

TOURIST PROVIDERS:

- Strategic orientation of the offer in the direction of replacing several shorter trips with a longer holiday. Subsequently, tourists will not be generating the emissions arising from several shorter trips.
- Waste prevention by reducing single-use plastics (and other materials) in the entire production chain.

TOURISTS

- Substitution of several shorter trips with a longer one.
- Avoidance of air travel or restricting it to trips that are necessary and not merely desirable.
- Avoidance of cruising.
- Enjoyment of slow tourism: increasing the role of cycling and hiking, both for mobility at the destination and travelling to the destination.
- Avoidance of waste generation and excessive material consumption.
- Selection of activities with no emissions (e.g. kayaking, rowing, SUPing in the case of waterside activities).

Emissions are reduced with better energy efficiency.

COUNTRY AND DESTINATIONS:

- Arrangement of the public transport system.
- Identification and addressing of key Slovenian tourism markets in terms of their carbon footprint, including distance, mode of transport, and complexity of the expected offer.
- Subsidies for the energy renovation of buildings subject to certification.
- Revision of the accommodation categorisation system to include mandatory carbon footprint assessment and climate change mitigation action plan.
- Flight ban for public employees for trips shorter than 500km. Formation of policies to replace business trips of public employees with online meetings where possible.
- Limitation of the number of cruise ships and the size of cruise ships in a certain period and introduction of the payment of fees in accordance with the amount of emissions generated.

TOURIST PROVIDERS:

- Carrying out of an action plan for carbon footprint reduction, including ongoing measurement and analysis of the success of the measures.
- Cooperation with local providers and local supply.
- Establishment of energy saving measures (e.g. energy efficiency of buildings, abandoning the installation of refrigerators in rooms, installation of sensors, etc.).
- Reducing the number of car journeys by introducing shared organised transport for guests who decide to take day trips or visit providers in the area.

TOURISTS:

- Use of public transport, organised bus or shared car for transport to the destination.
- Consideration of carbon footprint when selecting a provider and a destination, e.g. the most efficient flight among all available with the help of carbon footprint calculators and providers with certified eco-labels.
- Replacement of airplanes by other modes of transport (but not cruise ships or as a single passenger in a car).
- Observance of sustainable recommendations of the tourist provider, destination and country (saving energy and water, reducing the amount of food waste and other waste, purchase of local souvenirs made from natural materials).
- Demanding locally produced plant-based food.
- Self-education and raising awareness of others regarding the carbon footprint issue.

SEARCHING FOR EMISSION ALTERNATIVES

As an alternative, we can choose renewable energy sources instead of fossil fuels and use sustainable materials.

COUNTRY AND DESTINATIONS:

- Further incentives for the electrification of transport subject to renewable electricity sources.
- Regulation of the renewable energy system in accommodation facilities and encouragement of providers to switch to renewable energy sources.
- Financing development to enable the transition to sustainable aviation fuels (SAF).
- Provision of port infrastructure that enables ships to be connected to electricity when docked in the port under the condition of renewable electricity sources.

TOURISTS:

- Selection of providers and destinations where energy consumption is based on renewable energy sources ((ege.go. thermal energy, solar energy, wind energy).
- Selection of providers and destinations where construction and supply follow sustainable principles and the circular economy.

TOURIST PROVIDERS:

- Purchase of energy from renewable sources and replacement of fossil fuels for heating/ cooling with renewable sources (solar energy, wind energy, geothermal energy).
- Provision of charging stations for electric vehicles to hotel guests and employees. Purchase of an electric vehicle for business needs. Both under the condition of renewable electricity sources.
- Sustainable procurement and materials and the enforcement of circular economy principles.
- Revitalisation of abandoned buildings and premises instead of building or constructing new ones.

EMISSION OFFSETTING

Offesetting is the last resort option if it is impossible to avoid emissions or reduce them significantly and seek alternatives. In doing so, we create greenhouse gas sinks ourselves or pay for the proven service that promises to do so.

COUNTRY AND DESTINATIONS:

- Ensure strict supervision of the carbon offset market and regulate certification, as there is a high risk of greenwashing in offsetting.
- Funding of further research in support of the strategic measure of developing local (destination or national) sinks, which would enable local offsets to help form credible accreditation.

TOURIST PROVIDERS:

- Support for biodiversity conservation programmes in Slovenia (e.g. Natura 2000, nature parks, nature reserves and natural monuments).
- Replacement of felled sections of forest with new planting.
- Credible recommendation to guests on the offsetting schemes to offset their environmental footprint by financing CO_2 sinks.

TOURISTS:

- Purchase of a properly accredited voluntary carbon offset that is proven to finance carbon footprint sinks (e.g. accredited verifiable afforestation).
- Support for environmental organisations and programmes that take care of nature and arrange green public areas.

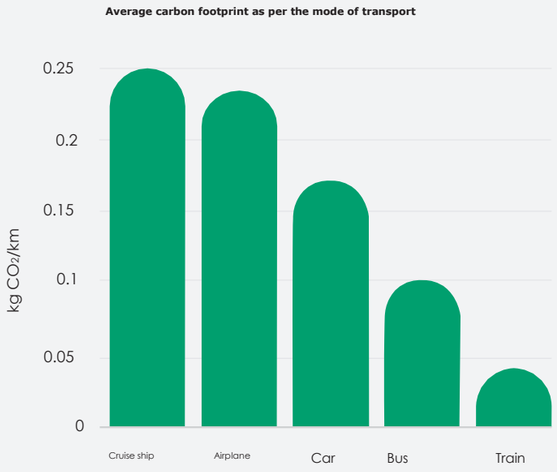
Carbon footprint of Slovenian tourism in 2019

Source: CRP project model.

Mitigation measures by areas of tourism are discussed in the continuation. As is evident from the chart, transport to the destination has the largest carbon footprint. It is followed by the activities at the destination which involve transport. Accommodation places third and tourists' food comes fourth.

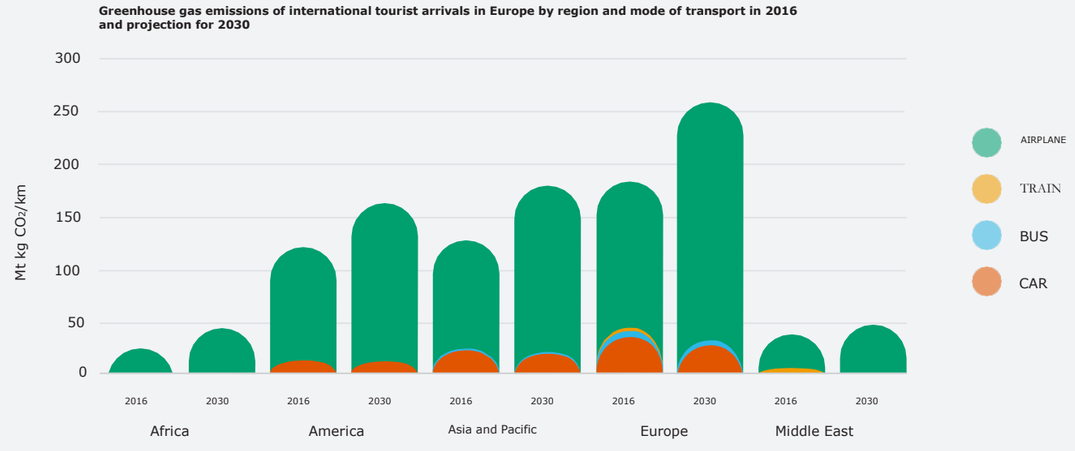
8 Climate change mitigation: Transport

Air transport and climate change mitigation



Data source for calculations: ICAO Carbon Emissions Calculator for airplane, WTTC 2021 for cruise ships, UNFC Greenhouse Gas Emissions Calculator for other data.

According to the UNWTO (2019), passenger transport by air represented as much as 138 Mt of CO_2 emissions among international arrivals of passengers to Europe in 2016 if compared with 34 for car transport, 3 for bus transport and less than 1 for train transport.



Airplane	25	41	101	149	104	161	138	223	30	42
Train	0	0	0	0	0	0	0	1	0	0
Bus	0	0	0	0	1	1	3	2	0	0
Car	0	0	10	7	12	9	34	29	1	0

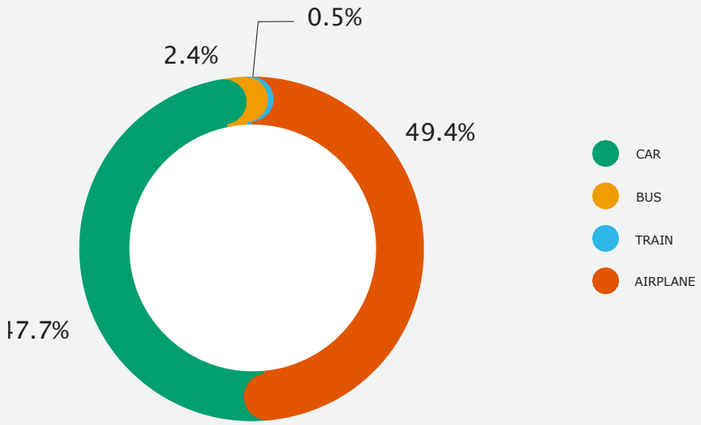
Source: UNWTO, 2019.

Air travel: The largest contribution to the carbon footprint of tourism

Among all forms of tourist transport, airplanes are second only to cruise ships in terms of carbon footprint per traveller. However, the number of tourists travelling by air is incomparably higher and the carbon footprint of air travel is therefore incomparably higher. Although the difference in the carbon footprint per kilometre travelled between airplanes and other modes of transport is not so great at first sight, airplanes primarily denote much longer distances and subsequently the biggest carbon footprint of tourists.

Carbon footprint of transporting tourists to destinations in Slovenia: airplanes 49%, cars 48%.
Compared to EU27, Slovenia ranks last in terms of air connectivity. As much as half of the carbon footprint generated in 2019 by tourists using transport to a destination in Slovenia can be attributed to travelling by airplane, although airplanes are only in 3rd place in terms of frequency of transport.

Carbon footprint of Slovenian tourism in 2019: Transport of tourists to a destination



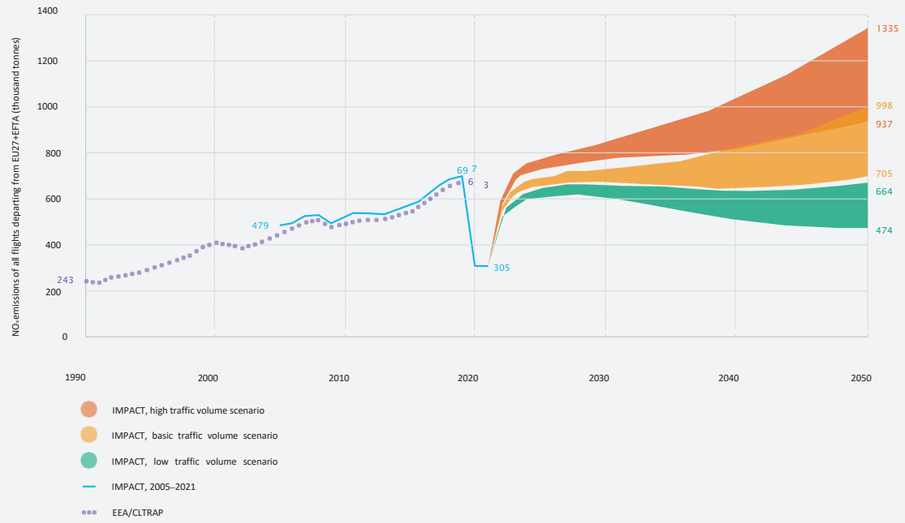
Source: CRP project model.

TRANSPORT:	ARRIVAL IN SLOVENIA:	LONGEST PART OF THE TRIP:
Car, van	63%	55%
Airplane	12%	32%
Bus	16%	5%
Motorhome	4%	4%
Motorcycle	2%	2%
Train	2%	1%
Other	1%	1%

Ljubljana Airport	38%
Venice Airport	17%
Zagreb Airport	14%
Vienna Airport	8%
Trieste Airport	4%
Graz Airport	3%
Treviso Airport	3%
Klagenfurt Airport	1%
Other airports	13%

Some 12% of foreign tourists used an airplane to arrive in Slovenia and 32% used an airplane for the longest part of their trip. Of the latter, 38% landed at the Jože Pučnik Airport followed by other large airports in the neighbouring countries (source: STO survey among foreign tourists 2019–2020).

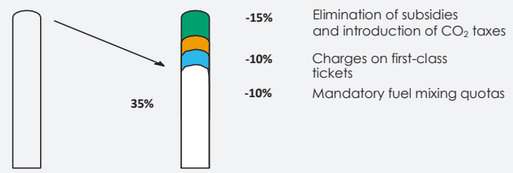
Projections of NO_x emissions from air transport by 2050 considering three scenarios of tourism growth after the COVID-19 pandemic



Source: EASA, 2022.
For each scenario, the upper limit anticipates the current situation of technology development and the lower limit the development of new technologies and further optimisation of air traffic management (ATM) processes.

With the expected further growth of tourism, which would follow the growth seen before the pandemic, the carbon footprint of air transport in Europe will more than double with the same technologies, and it will still increase by more than a third with all possible technological changes realised (EASA, 2022).

AIR TRANSPORT



Source: Gössling et al., 2023.

With the technologies and market measures developed so far, we can attain up to a 35% reduction in the carbon footprint of air transport in the short term, i.e. by 2030. The elimination of subsidies and taxation of air transport are assessed as the most efficient measures, which would enable up to a 15% reduction in the carbon footprint provided that further growth in air transport is frozen. The second most efficient measure is the taxation of flying in first class (-10%) and in third place is the statutory determination of mandatory blend-in quotas with a lower carbon footprint (Gössling et al., 2023).

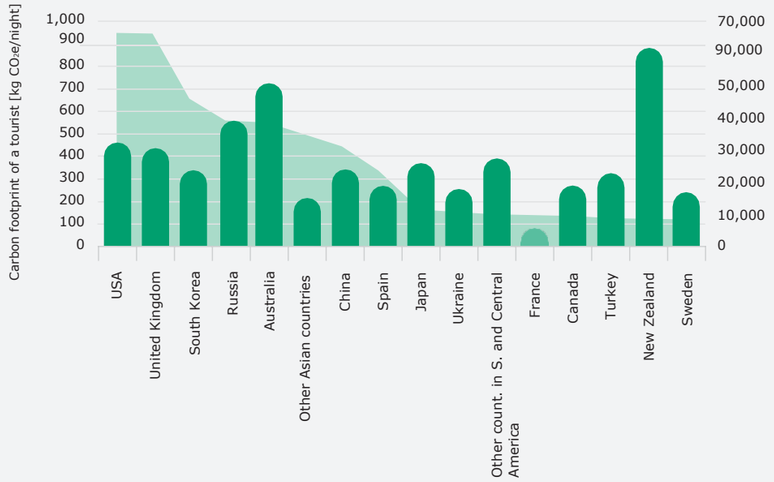
Anticipated measures in the European Union

- Revision and tightening of the EU Emissions Trading System (ETS).
- Single European Sky.
- Taxation of kerosene and abolition of the VAT exemption for airline tickets.
- Financing of development that will enable the transition to sustainable aviation fuels (e.g. hydrogen) and contribute to the greater technological efficiency of air transport.

Measures recommended for Slovenia

- Establishment of a monitoring system for the transport of Slovenian tourists and thus a more accurate assessment of the carbon footprint of air tourism.
- Definition and addressing of key Slovenian tourism markets in terms of distance and subsequently their carbon footprint.
- Elimination of public support for enhanced air connectivity.
- Strategic support to the Jože Pučnik Airport for optimal inclusion in the Single European Sky system (including a rail connection to the airport).
- Analysis of the situation in the field of public employee travels and formulation of recommendations for public institutions.
- Assistance to the MICE industry to strategically transform towards green tourism less dependent on air transport.
- Analysis of the situation in the field of carbon footprint of private transport and definition of private air transport.

Carbon footprint of tourists and main markets of Slovenian tourism, 2019



Source: CRP project model; data source for calculations: SURS.

Measures recommended for individuals

- Abandonment of air travel or restriction to travel that is necessary and not merely desirable.
- Replacement of aircraft with other modes of transport (but not as the only passenger in the car).
- Selection of the most efficient flight among all available ones (using carbon footprint calculators).
- Self-education and raising awareness of others regarding the carbon footprint issue.
- Purchase of appropriately accredited voluntary carbon offsets.

The most credible global air transport carbon footprint calculator is provided by the International Civil Aviation Organisation (ICAO).

Cruise and climate change mitigation

Cruising is one of the least environmentally friendly forms of travel. Although this sub-sector of tourism is relatively small, it is the most energy- and carbon-intensive tourist product per person.

In addition to CO_2 emissions, cruise ships also generate other emissions that pollute the air and its other emissions pollute the sea. Last but not least, cruise ships are a form of mass tourism, as the large number of passengers who disembark also puts a lot of pressure on the visited destinations.

Carbon footprint of selected travel types and overview of carbon footprint ranges based on estimates, source: WTTC, 2021, p. 15.

Mitigation for individuals as cruise passengers:

- Selection of sustainability-oriented shipping companies;
- Arrival/departure to the port of departure by cruise lines;
- Selection of low-carbon activities when visiting destinations (e.g. cycling tours);
- Selection of sustainable receptive travel agencies that offer sustainable experiences;
- Environmentally friendly behaviour on board (e.g. saving energy, waste separation, etc.).

Possible adjustments of ports:

- Construction of infrastructure to offer shore power to cruise vessels while docking in ports.
- Limitation of the number and the size of cruise ships in a certain period.
- Introduction of payment of fees in accordance with the amount of emissions generated.
- Introduction of regulations and inspections for high-carbon vessels.

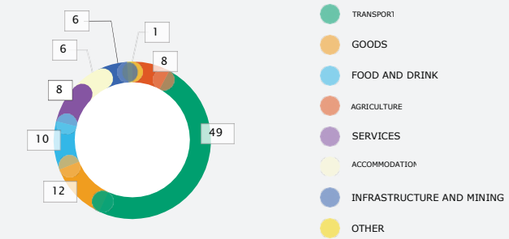
It is imperative to create a destination management plan based on actual calculations of the carbon footprint in the Port of Koper and the economic impact of passengers and crews that visit Slovenia. This process should also include all stakeholders (local residents, the port, tourism service providers, etc.).

Support of the state in carbon footprint mitigation:

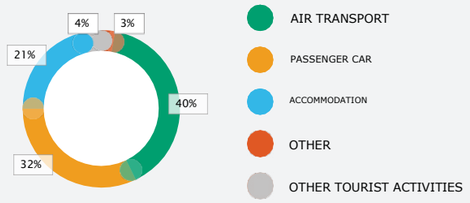
- Provision of support and resources for infrastructure electrification.
- Minimising the carbon footprint of cruise passengers at a destination (tourist flow management and design of sustainable experiences at a destination).
- Support for the European Union in its efforts to limit the carbon footprint of maritime transport.

Transport creates by far the largest carbon footprint in tourism

According to the estimates, transport accounts for between half and three quarters of all emissions from tourism. Among all forms of tourist travel, the largest share of emissions (40%) is attributed to air transport, while road transport accounts for about one third.



Source: Sustainable Travel International, 2020; data source: study by Lenzen et al., 2018.

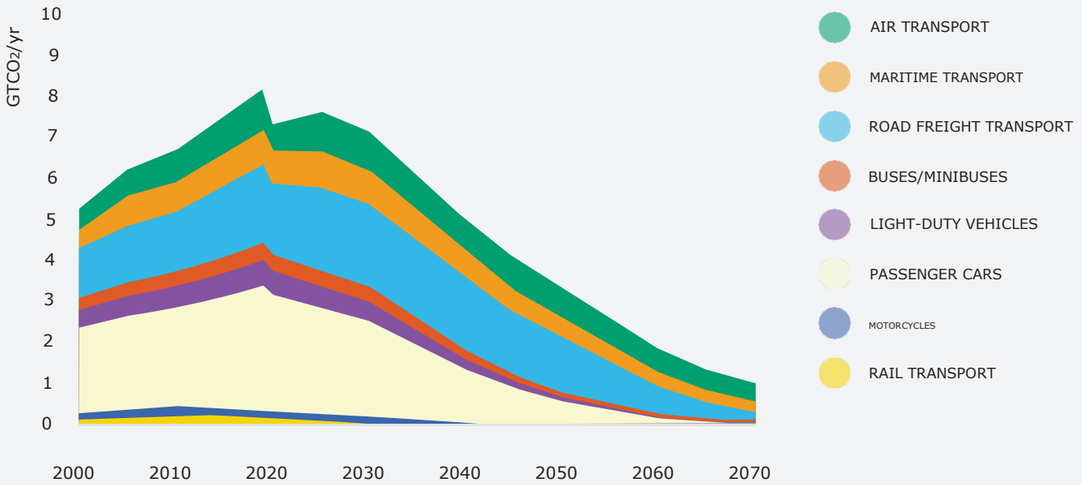


Source: UNWTO.

World on the road to global decarbonisation

Europe has committed to decarbonise society. The key challenges include the decarbonisation of transport and the establishment of sustainable mobility practices. Climate neutrality is to be achieved by replacing methods of propulsion (clean electricity instead of fossil fuels) and by simultaneously switching to more sustainable forms of transport (airplanes and cars replaced by public transport – train, bus).

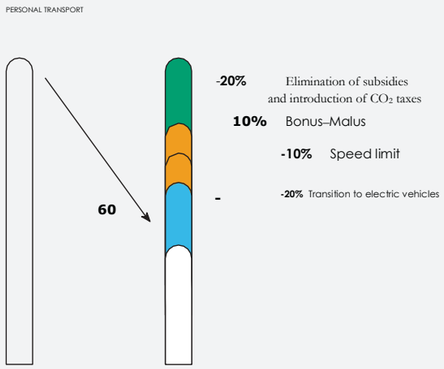
Projection of the reduction of the carbon footprint of transport under the sustainable development scenario



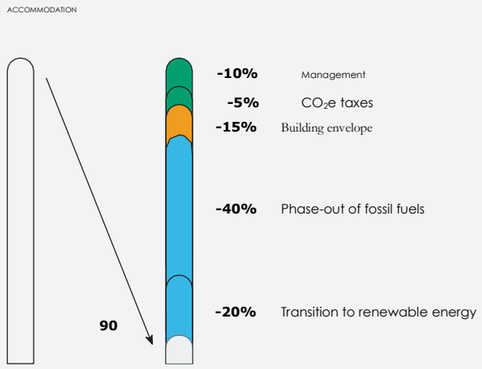
Source: IEA 2020, p. 154.

Potentials for reducing emissions are great

Emissions from tourism can be reduced significantly with few basic measures. We will contribute the most to the reduction of the overall footprint by reducing air transport emissions. The greatest potential for achieving minimum emissions is in the field of accommodation.



Source: Gössling, et al., 2023, p. 11.



Source: Gössling, et al., 2023, p. 11.

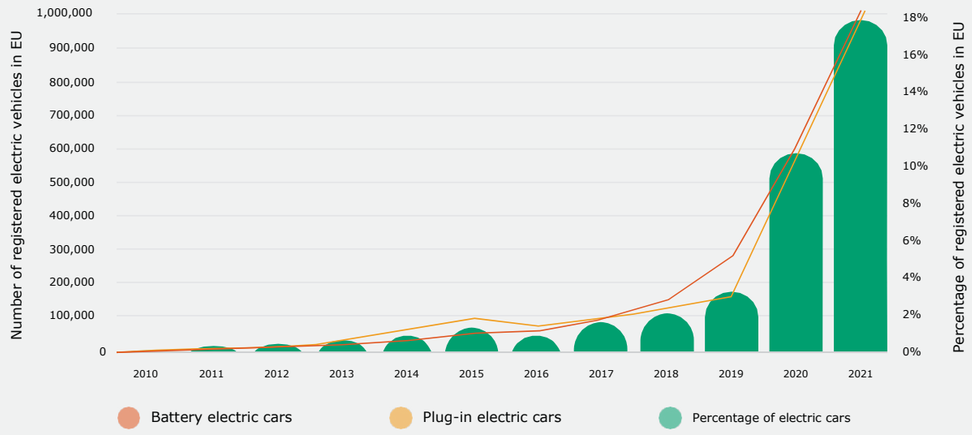
Choice of a mode of transport is crucial

It is very important to consider and carefully plan your journey, including the choice of a mode of transport. Furthermore, the length of the journey (to reduce distances and increase time) and the number of passengers should also be considered when using a mode of transport that produces emissions.

YOUR DECISIONS COUNT.

Source: Gösling et al., 2023.

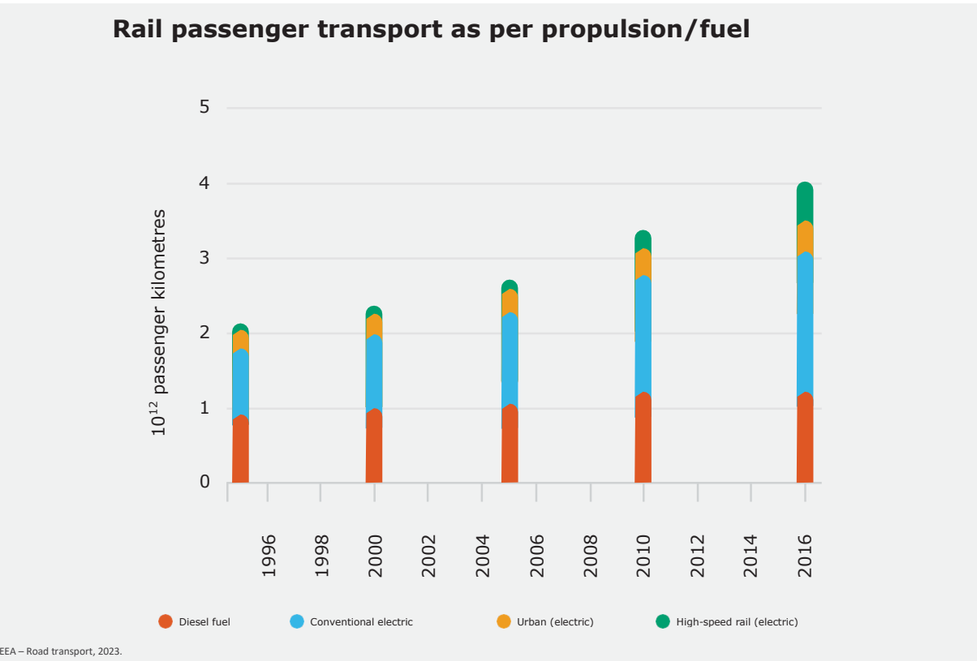
The electrification of road traffic is inevitable. The use of electric vehicles is growing rapidly and the supporting infrastructure is already adapting accordingly. Due to its nature – somewhat shorter range and longer/different stops – electric mobility also brings changes in travel flows and habits, which will follow the gradual development of this type of infrastructure until a good support network is established.



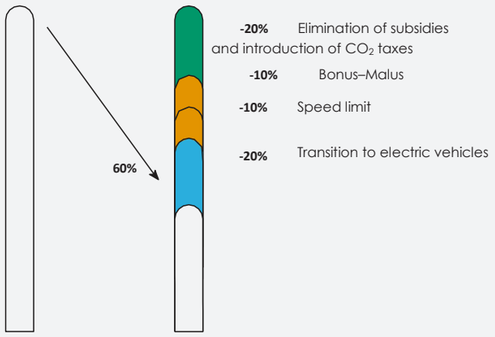
Source: EEA – Road transport, 2023.

Train travel is gradually coming to the forefront in Europe with new and faster connections. Comfortable, affordable and low-emission – if low-emission electricity drives the train. Exceptional investments and incentives in railway infrastructure can be expected. Whereby:

- many train journeys are a tourist product in themselves,
- abandoned railway lines are, due to their favourable configuration, very suitable for transformation into new ecological forms of transport – the best option is bicycle connections.



Source: EEA – Road transport, 2023.



Source: Gössling, et al., 2023, p. 11.

Gössling et al. (2023) anticipate that, with relatively simple and promptly realised measures, it is possible to reduce the footprint from road traffic by 60%.

- It is essential to set a realistic price of transport (abolish subsidies and tax the carbon burden fairly).
- It is important to reward low-carbon choices and burden large users of carbon in transport.
- Lower speeds denote lower emissions.

All of the above greatly impacts mobility habits, i.e. the use of sustainable, low carbon forms of transport. Among other things, this also means the use of electric vehicles, which would further reduce the emissions of road traffic.

Where and how can the following participants contribute in the field of road and rail transport ...

COUNTRY

- carefully plan transport policy
- (In the first place, it consistently manages the participatory approach and complies with environmental guidelines.);
- introduce changes in the field of sustainable mobility (incentives, reliefs, restrictions, penalties) (It realistically evaluates the price of individual modes of transport and encourages more environmentally acceptable forms - rail and bus transport, etc.);
- ensure the development of appropriate transport infrastructure and its effective integration into the transport system (Investments in bicycle and railway infrastructure, long-distance connections that are well integrated into the existing transport system - simple modal shift);
- implement good mobility practices in its management structures (Application of electric mobility based on renewable sources, promotion of the use of public transport for commuting to/from work, business trips, etc. in order to set an example for everyone else).

PROVIDER

- communication about sustainable values, provision and support of opportunities for sustainable mobility of guests;
- alignment of internal operations in accordance with the principles of sustainable mobility;
- monitor and upgrade their quality and sustainability orientation with the support of certificates.

DESTINATION

- promotion of cooperation and integration (from the state to providers);
- implementation of sustainable mobility measures in the field, encouragement of providers, posing as an example and setting the standards;
- evaluate the work and progress in the fields of sustainable mobility through a quality scheme.

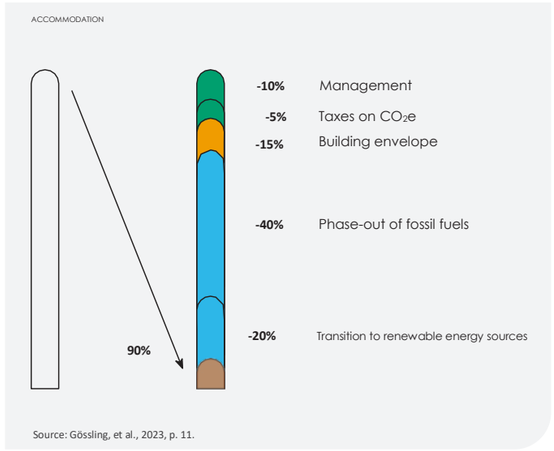
INDIVIDUAL

- travel less frequently, but for a longer time; travel more slowly, to nearby places and more in-depth;
- opt for low-carbon modes of transport;
- check travel carbon footprint and offset it with appropriately certified measures.

9 Climate change mitigation: Accommodation

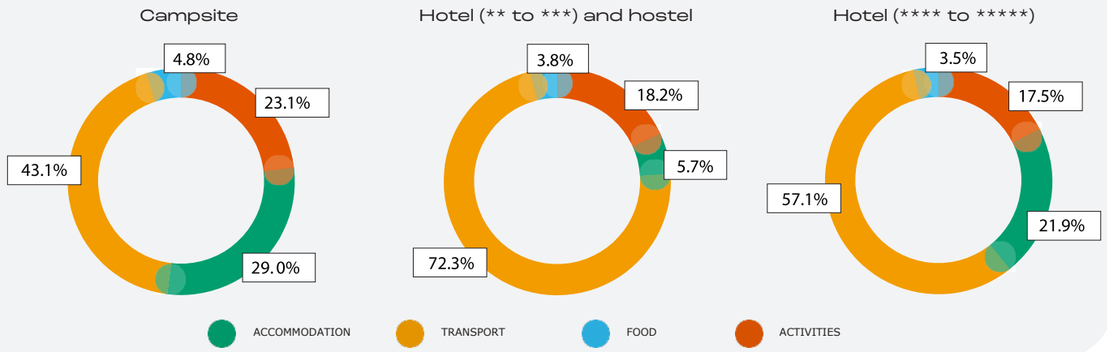
Carbon footprint of accommodation facilities

The accommodation sector is the most demanding energy consumer among all categories of the building stock and represents a sector with great potential for achieving energy savings. Gössling et al. (2023) find that through proper management, taxes on CO_2e emissions, building envelope, phase-out of fossil fuels and the use of renewable energy and sources, it is possible to reduce the carbon footprint of accommodation facilities by up to 90% (chart on the right). The results for Slovenia in 2019 (below) show that transport accounts for the largest proportion of the carbon footprint, followed by the carbon footprint of accommodation facilities and activities and food in hotels, hostels and campsites (charts below). The total emission of hotels of higher category is higher than that of hotels of lower category.



Source: Gössling, et al., 2023, p. 11.

Carbon footprint of an overnight stay in Slovenia, 2019; data source: CRP project model.



Measuring the carbon footprint of accommodation facilities

The most useful model for calculating the carbon footprint of an accommodation facility is currently the »Hotel Carbon Measurement Initiative« (HCMI), which was developed by the International Tourism Partnership (ITP) or Sustainable Hospitality Alliance (HSA) in collaboration with the World Travel & Tourism Council (WTTC) and is already used by more than 24,000 hotels. In Slovenia, this methodology is followed by the Green Key certificate.

To calculate and compare the carbon footprint of an accommodation facility, the following steps must be followed:
1) collection of information;
2) carbon footprint calculation;
3) analysis, comparison and determination of measures.

The figure shows input and output data of the HCMI model (Green Key, 2022).

- Area of all rooms and appertaining corridors
- Area of the conference section of the facility
- Area of air-conditioned (heating and/or cooling) rooms
- Area of private or leased rooms within the facility
- Number of guest rooms
- Number of occupied rooms in the reporting period
- Electricity consumption in the measurement period
- Gas consumption in the measurement period
- Fuel oil consumption in the measurement period
- Consumption of other fuels for heating
- Amount of renewable energy purchased
- Renewable energy produced
- Amount of gasoline/oil, diesel fuel, LPG used
- Amount of dirty laundry in the measurement period
- Possible gas leakage of more than 100kg over the measurement period

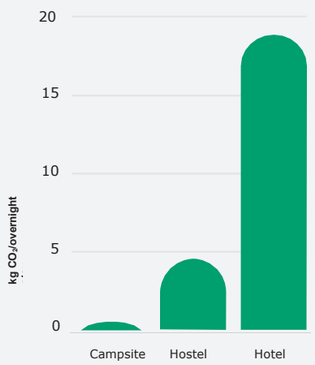
→ **MODEL** →

- Total carbon footprint in the reporting period (in tonnes)
- Total carbon footprint of guest rooms (in tonnes)
- Total carbon footprint of common areas (in tonnes)
- CO2 emissions of an occupied room per day
- Carbon footprint of a square metre of common areas per hour (in kg)
- Total renewable energy used in the facility (kWh)
- Total renewable energy used in the facility (% of all energy consumed)

Higher category, higher carbon footprint

The chart shows that as hotel categories increase, so does the carbon footprint per occupied room. Large differences within categories exist. Four- and five-star hotels in the Mediterranean located on the coast have, for example, a smaller carbon footprint than inland hotels. While inland hotels of lower categories have on average a smaller carbon footprint than coastal hotels (Ricaurte and Jagarajan, 2019).

Carbon footprint by accommodation facility type



Source: DEFRA UK, 2020.

Carbon footprint of a hotel by private room ($kgCO_2e$)

Source: Ricaurte and Jagarajan, 2019.

Measures at the level of an accommodation facility

The main measures to reduce the carbon footprint of accommodation facilities take place at the management level of the accommodation facility and the drafting of a strategy for low-carbon operations at the level of building equipment and energy consumption.

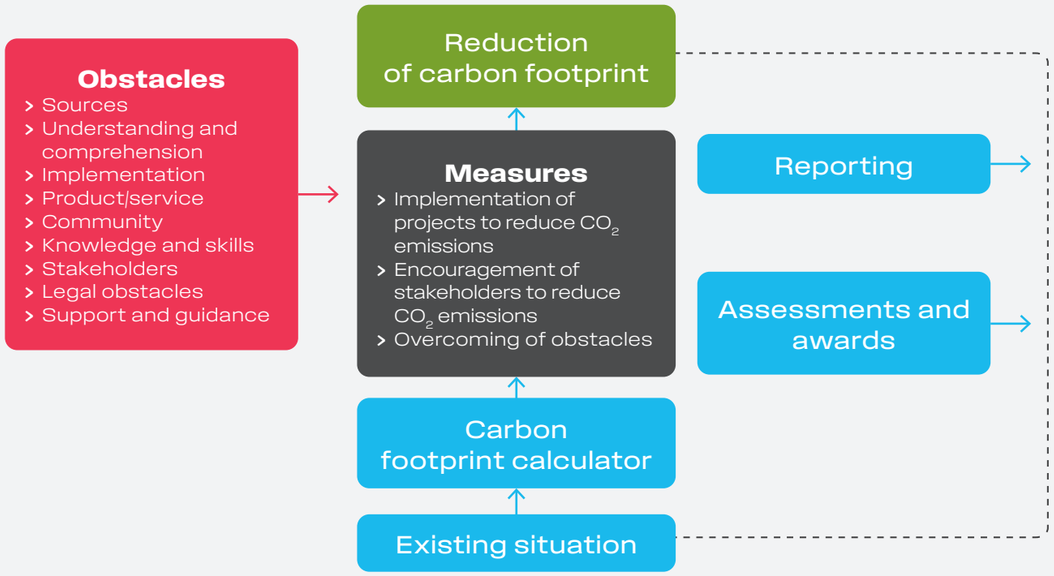
When implementing measures, accommodation facilities encounter various challenges:

- Maintenance of a balance between ensuring high-quality accommodation services and implementation of environmental programmes;
- Provision of financial resources to implement sustainable practices;
- Provision of properly qualified staff who understand and agree with the sustainable method of operations, and care for the acquisition of knowledge about the environment, for environmental awareness and professional advice for employees;
- Active cooperation with all stakeholders in reducing the carbon footprint by means of shorter supply chains, cooperation with local providers, sustainable modes of transport, etc.;
- Harmonisation of service quality with environmental performance and sustainable operations, and optimisation of the costs of service delivery and maintenance of facilities and materials;
- Use of local and sustainable materials;
- Standardisation or a detailed structured plan to attain zero carbon footprint;
- Ongoing monitoring of the results of measures and adaptation to changes in business operations;
- Targeting the design of the offer and marketing to informed tourists from nearby locations who use public transport and stay at the accommodation facility for extended periods;
- Raising awareness among tourists, as they can contribute to a lower carbon footprint of the accommodation facility as individuals.

Measures for providers

- Modernisation of infrastructure and equipment (installation of energy-saving devices);
- Optimisation of energy consumption and production of own renewable energy sources;
- Commitment to sustainable business operations by obtaining an environmental label;
- Establishment of a local supply chain with seasonal and organic food and other products;
- Promotion of sustainable tourist behaviour (energy and water saving);
- Promotion of travelling to a destination by public transport and organisation of group transport;
- Promotion in geographically close markets, which generally result in a lower carbon footprint;
- Promotion of an extended stay at a destination;
- Protection of, and support to, natural ecosystems that act as carbon sinks.

Enabling the process of reducing the carbon footprint of an accommodation facility



Measures at the level of an individual

- Selection of accommodation facilities with a lower carbon footprint.
- Compliance with measures to reduce the carbon footprint, as recommended by the accommodation facility.
- Self-education and raising awareness of others about the carbon footprint and its reduction, both in the home environment and when travelling.

Measures at the national level

The Slovenian Tourism Development Strategy comprises three scenarios of potential tourism development. Scenario 1 anticipates a lag in quantitative growth with full focus on quality and added value. Scenario 2 anticipates further acceleration of quantitative growth with stagnation or a lag in quality. Scenario 3 anticipates moderate quantitative growth with accelerated growth in quality and added value (Ministry of Economic Development and Technology, 2022). At the level of the state, the following is necessary to attain these objectives:

- Effective guidelines for destinations, accommodation facilities and individuals: programmes, such as Green Key International or the Green Key for Slovenia, can crucially contribute to improving the carbon footprint issue in accommodation facilities.
- Promotion of motivation and efforts to implement sustainable policies at the levels of destinations, companies and people through education, regulation and incentives.
- Optimisation of the planning and approval process for investing in green technologies and supervision of the efficiency of regulations and enforcement of regulations and government acts.
- Provision of climate mainstreaming in public financing and compliance of tourism development policies with policies of green transition, biodiversity preservation and climate change adaptation.
- Support when preparing the Slovenian accommodation sector for the changes planned to the EU Emissions Trading
- System (EU ETS) in the European Union, which will also include the area of heating of buildings as of 2026.

Measures at the destination level

- Provision of support to accommodation facilities in the activities to reduce their carbon footprint, including with the help of qualified consultants and the provision of expert advice.
- Promotion of networking of accommodation facilities and green suppliers into green supply chains to reduce the carbon footprint.
- Connection of tourism with local policies and unification of interests among stakeholders.
- Promotion of sustainable and low-carbon orientation through promotional activities among accommodation facilities and suppliers, as well as among tourists and local residents.
- Strategic targeting of destination marketing towards tourists who are informed, come from nearby locations, use public transport and stay at the destination longer.

10 Climate change mitigation: Water experiences

Climate change mitigation: Water experiences

Slovenia is rich in water sources that are also exploited for tourist purposes. There are spa, thermal, wellness, coastal, riverside and other forms of water tourism, which are usually considered recreational activities of tourists.

These forms of tourism and related accommodation facilities generate considerable amounts of greenhouse gas emissions, as they annually consume a lot of energy to ensure the thermal comfort of tourists. Additionally, they heat up substantial volumes of sanitary water and generate large quantities of food waste and disposable products. Finally, the needs for washing towels, bed linen and other textile products are great in such facilities.

Measures at the level of an individual:

- Selection of activities on/by the water that do not generate emissions (kayaking, rowing, SUPing);
- Avoidance of plastic waste (preferably use a reusable bottle);
- Use of public transport or, if you use a car, share it with more people;
- Selection of providers of accommodation facilities and activities with sustainability certificates;
- Reduction of energy and water consumption and the use of towels;
- Support for environmental organisations that take care of nature and the arrangement of public areas.

Measures for decision-makers at the destination and national levels

- Support for the development of sustainable products and offers (multi-day tourist packages based on low-carbon modes of transport, accommodation facilities and catering providers);
- Provision of economic incentives for low-carbon investments (use of geothermal energy sources, energy building renovation, installation of solar power plants);
- Promotion of electrification under the condition of water sports offers that incorporate renewable sources (boats, scooters and other electrically powered equipment);
- Restriction of construction of new tourist infrastructure (particularly in or near protected nature or ecosystem areas which serve as carbon sinks).

11 Climate change mitigation: Travel organisation

Tour operators
play a key role in the process of reducing carbon emissions, as they combine services into products which they largely choose on their own. At the same time, they can offer low-carbon services to individual customers, which reduce emissions from tourist travels.

Carbon footprint calculation for rafting on the Soča River as per the selected transport mode to Slovenia from the Netherlands, CO_2/product (kg)

ce: SNP, 2022.

Measures for individuals as tour operators' customers

In the case of an individually tailored tour, customers may demand the following from tour operators:
- Calculation of carbon footprint of the trip or its individual components;
- Proposals of low-carbon alternatives based on the carbon footprint calculation of individual components;
- Selection of accommodation providers or other providers that possess an environmental label testifying to their efforts to reduce emissions;
- Presentation of carbon offset options based on the value of generated carbon emissions.

In the case of an individually tailored tour, customers may demand the following from tour operators:
- Decision to visit nearby destinations;
- Travelling by public or organised road transport instead of by air;
- Longer stay at a destination;
- Decision to take one longer trip instead of several short trips;
- Selection of a direct flight connection;
- Selection of a sustainable accommodation provider;
- Selection of low-carbon activities at a destination (cycling, hiking, horseback riding, etc.);
- Environmentally friendly behaviour (energy saving, minimum waste generation, etc.).

- Travel agencies can obtain the Slovenia Green Travel Agency label based on one of the two internationally recognised sustainability labels acknowledged by the Green Scheme: the Travelife certification for travel agencies or the Green Globe certification.
- By obtaining the label, a travel agency commits to reducing emissions through its own operations and in the development, sale and implementation of tourist products.

Development of the carbon reduction strategy

> As one of the urgent measures for all travel agencies that are committed to reducing their carbon emissions, we propose the development of their own management strategy for reducing carbon emissions, which functions on the principle of:

MEASURE

- Measurements of direct emissions (e.g. amount of electricity consumption in branch offices);
- Measurements of indirect emissions (e.g. kg CO_2/person per implemented package).

REDUCE

- Development of packages with a low-carbon mode of transport;
- Selection of sustainable

OFFSET

- Offsetting the carbon footprint of trips taken by travel agencies' customers;
- Support for projects that protect natural ecosystems, support reforestation and the development of renewable energy sources.

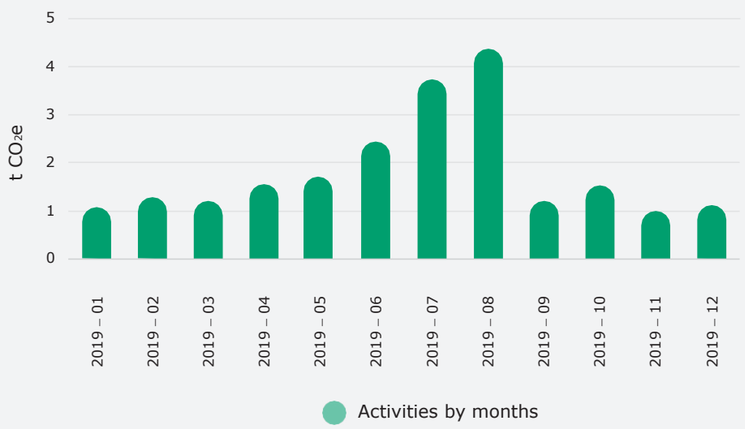
12 Climate change mitigation: Cultural tourism

Cultural tourism and climate change mitigation

Each tourism industry sector can help mitigate climate change. Providers of cultural content and events can also contribute to reducing greenhouse gas emissions.

Each tourism industry sector can help mitigate climate change. As the activities in Slovenian tourism contribute to greenhouse gas emissions, the providers of cultural content and events can also contribute to reducing greenhouse gas emissions (the first chart displays the contribution of emissions from tourist activities in Slovenia in 2019).

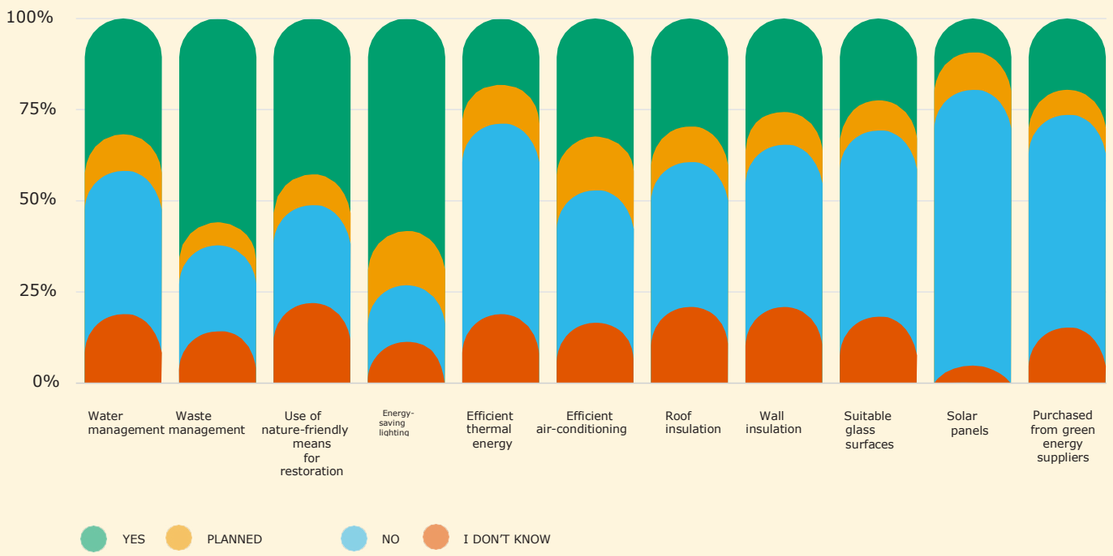
Carbon footprint of Slovenian tourism in 2019: Tourist activities at a destination



Source: CRP project model.

Cultural institutions also include museums. The survey "Museums in the climate crisis" revealed how European museums cooperate in the climate change mitigation.

Introduction of environmentally friendly infrastructure in European museums in 2022



Source: The Network of European Museum Organisations [NEMO], (2022). Museums in the climate crisis. Berlin: NEMO.

Calculate your carbon footprint

Do you know how much your institution or organisation contributes to the carbon footprint? Find the most suitable CO_2 calculator for culture and events and identify your weak points which you can improve.

GET GREEN EVENTS TOOL

Scope 3 Evaluator powered by GREENHOUSE GAS PROTOCOL Quantis

Outils Creative Green CANADA

Creative Green Tools CANADA

The Climate Toolkit For Museums, Gardens and Zoos

How to approach climate change mitigation in cultural institutions and in the organisation of events

- Renovate your buildings, reduce the use of water and heating and use renewable energy sources.
- Use public transport for business trips. The logistics should include short supply chains with environmentally friendly modes of transport.
- Organise zero-waste events. Use reusable or degradable containers and other materials.
- Provide local food, preferably plant-based.
- Green your surroundings and parking areas by planting trees.
- Raise the awareness of your visitors and educate your employees.

How can the state promote mitigation activities in culture and at events

The state and municipalities can subsidise energy-efficient renovation of historic buildings and promote environmentally friendly construction of new cultural buildings. Furthermore, they can help establish efficient public transport and arrange the urban environment to make the parking areas of cultural institutions as green as possible. In designing climate change policies, they should also listen to the cultural content providers.

13 Climate change mitigation: Winter tourism

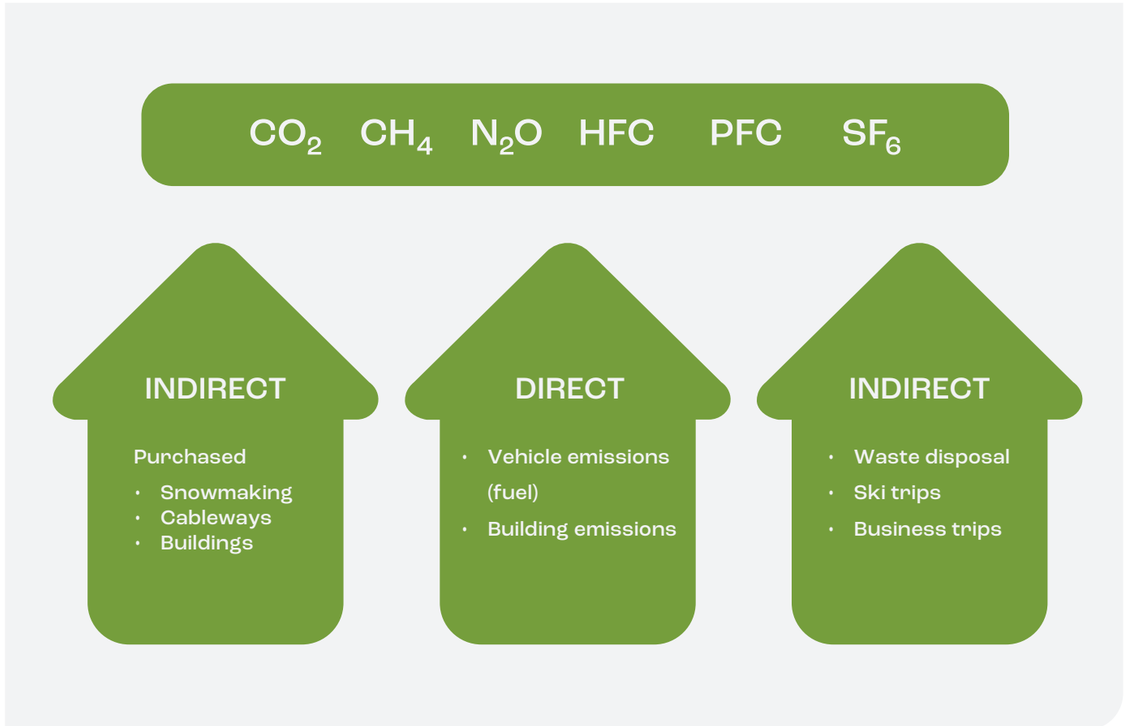
Winter tourism: from vulnerability to additional burdens

The skiing industry is one of the most important fields in the travel and tourism sector, with approximately 400 million visits and some 120 million enthusiasts annually visiting 6,000 ski resorts in 80 countries.

Climate change brought about many challenges for numerous ski resorts, particularly those situated at lower altitudes and latitudes. Tourist demand simultaneously increased, as visitors expect excellent snow conditions, a longer season and high-quality services irrespective of weather conditions.
At the same time, this industry is one of the most exposed to climate change and the most criticised for engaging in unsustainable forms of adaptation that cause additional greenhouse gas emissions and represent a burden for the environment.

Categories of winter tourism emissions

Emissions of the first category include direct emissions from the course of the process, such as emissions from mobile sources (e.g. vehicles – commuting to work and trips to winter tourism destinations). Emissions of the second category are indirect emissions related to energy consumption and purchased electricity (electricity needed to operate snow guns and cable cars). Emissions of the third category include all indirect emissions arising from the life cycle of a product or service.



Winter tourism and climate change mitigation

Individuals:

- Lower the criteria on the expected experience quality.
- Take into account the distance to the ski resort and the mode of transport.
- Use sustainable equipment and materials.
- Opt to purchase voluntary carbon offsets.

Organisations:

- Integration of climate scenarios into investment planning to avoid future forms of maladaptation.
- Design of a more environmentally friendly travel offer for winter sports tourists that is adapted to climate change.
- Monitoring and implementation of energy management systems, assessment of cableway energy efficiency and replacement of dilapidated cableway systems with modern technology.
- Optimum water management.
- Use of modern and efficient snowmaking technology.
- Snow storage.
- Assessment of energy consumption of buildings, improvement of energy efficiency of buildings and improvement of heating and ventilation systems.
- Use or own production of renewable energy.
- Afforestation within the region.
- Investment in research for individual areas or ski centres.

Destination level:

- Provision and promotion of more sustainable modes of travel (public transport, trains, carpooling, etc.).
- Shorter distances to target markets.
- Promotion of longer stays and making guests aware of sustainable practices.
- Economic incentives for sustainable supply and appropriate consumer behaviour.
- Informing of tourists about environmental measures and climate change mitigation programmes when these are in place.

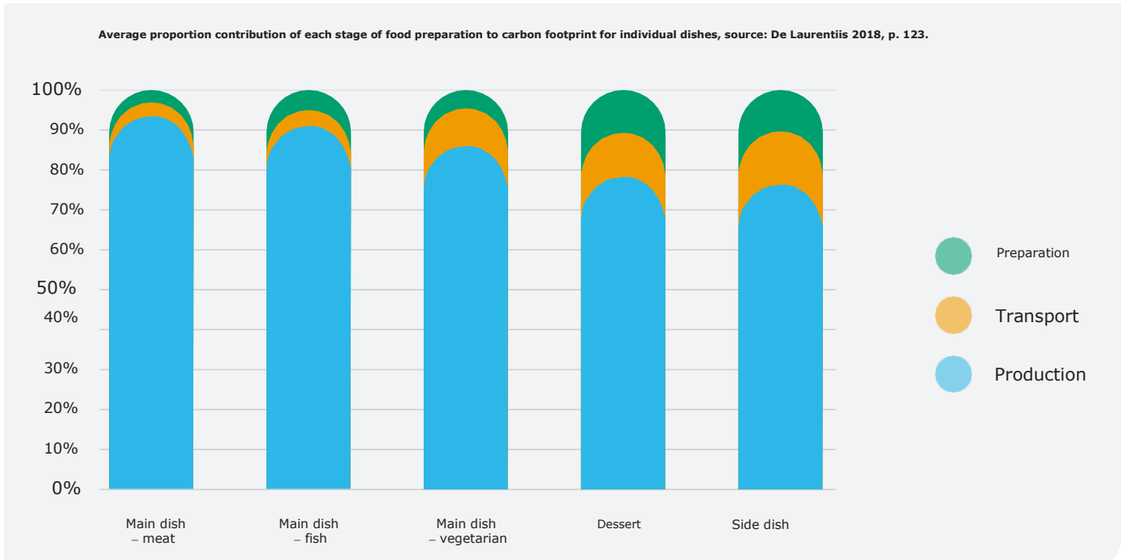
National level:

- Development of sustainable environmental and sports policies to tackle environmental challenges.
- Inclusion and integration of stakeholders in various fields and for the purpose of pledging.
- Climate change mitigation strategy and investment in research in the field of carbon footprint, effective mitigation measures and the feasibility of shifting to other forms of tourism.

14 Climate change mitigation: Gastronomy tourism

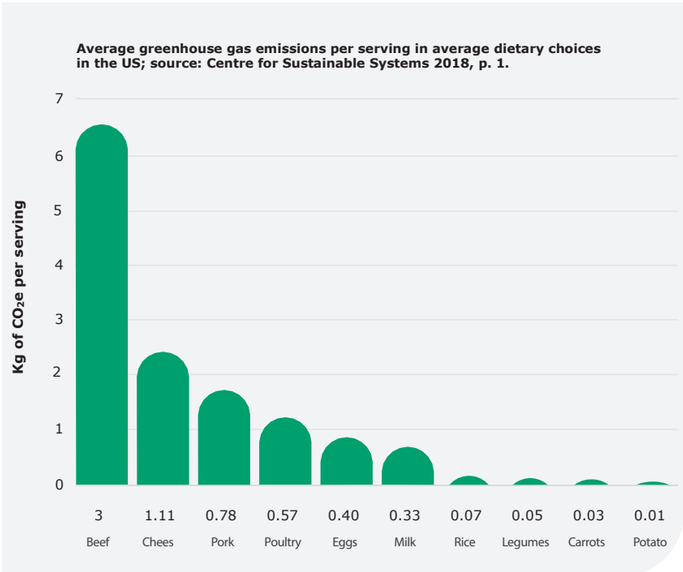
Climate change and Slovenian tourism

Decisions about our daily diet have a significant impact on global climate change. Different studies show that the entire food system on a planetary scale contributes between 26% and 30% of anthropogenic greenhouse gas emissions. When switching to a more sustainable diet, defined by FAO as healthy, low-carbon, affordable and culturally acceptable, we can have a significant impact on overall emissions. The results of the EAT-Lancet Commission show that we should drastically reduce the amount of food of animal origin if we want to achieve SDGs (Coluccia et al., 2022).

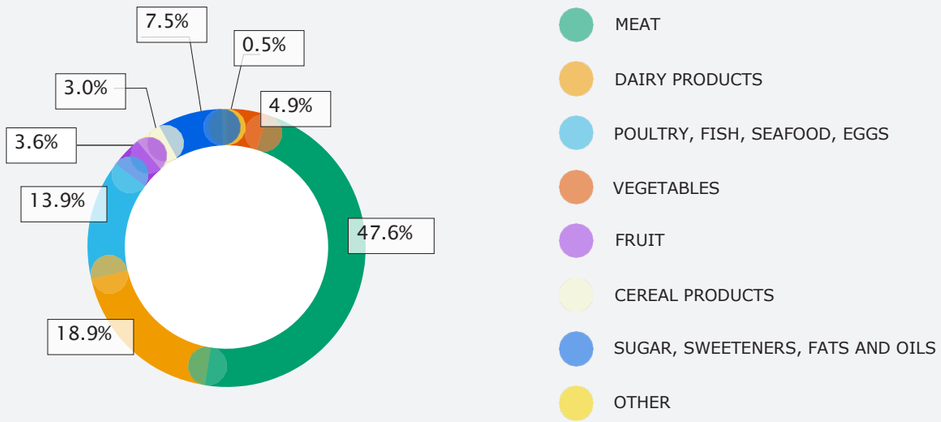


If the average western diet was replaced with a more environmentally sustainable one, we could reduce CO_2e emissions by more than 70%. Furthermore, less land would be used and water consumption would be reduced by 50% (Aleksandrowitz et al., 2016, p. 7). Climate change can threaten the production of certain types of crops and products, whereas certain local and indigenous breeds and varieties prove to be more resilient and adaptable. The use of local high-quality produce and products has a positive effect on the greater resilience and local character of the gastronomic offer.

A study of food consumption in Greece in the case of one four-star and one five-star hotel showed that the average menu per overnight stay contained 0.385kg of meat, 0.139kg of seafood and fish, and 0.294kg of dairy products and eggs. Beef has the biggest impact on the carbon footprint, followed by cheese and pork, poultry, eggs and milk. In particular, the figure shows the ratio between individual foodstuffs. We also highlight that 100g of beef generates 50kg of CO_2e, the same amount of pork or farmed fish generates between 6 and 8kg and poultry generates 6kg of CO_2e emissions. Some 100g of cheese generates 11kg and 1 litre of milk generates 3kg of CO_2e emissions. Fruit and vegetables are more environmentally friendly; for example, root vegetables generate 0.4kg of CO_2e, and tomatoes, especially when grown in a greenhouse, generate 2.1kg of CO_2e emissions (Juvan et al., 2021). In addition to the generated carbon footprint, excessive water consumption (between 4,500 and 8,000l of water per day for food preparation and consumption by one tourist) and the use of land also have significant consequences for food preparation.



Greenhouse gas emissions from food consumed in average dietary choices in the US, Source: Centre for Sustainable Systems 2018, p. 1.



Food waste represents a large proportion of the carbon footprint. In their research, Juvan et al. (2018) report that hotel guests usually leave 15g of food on their plate at breakfast, while the leftover at dinner amounts to 45g. With the finding that less food is usually left over in catering and tourism in Europe than in domestic households (Juvan et al., 2021) and with the information that 48% of overnight stays were carried out in hotels in 2022 (SURS1, 2023), it is possible to assume that the above estimates are a suitable starting point for evaluating food left over on the plates. To this end, it is possible to calculate that 233.7 tonnes of food was left after breakfast and 779.1 tonnes of food was left after dinner in Slovenia in 2022. Juvan et al. (2021) further report on the basis of other studies that as much as 92% of leftover food could be prevented without worsening the quality of a tourist experience.

To reduce greenhouse gas emissions, it is usually necessary to consider and address the entire supply chain – from growers to processing, transport, trade, and consumers (Poore and Nemecek, 2018). Producers and providers in gastronomic tourism can choose from various measures to reduce the carbon footprint in their work and adapt to climate change. The table includes measures that increase (-) or decrease (+) the generation of the carbon footprint in gastronomic tourism. By following the measures in the column of measures that reduce the carbon footprint, we can better adapt to the effects of climate change in gastronomic tourism.

If they use organic produce and products, gastronomic tourism providers are more resilient to climate change. Gastronomic tourism providers were recognised as the leading stakeholders in the Slovenian system when setting the trends in gastronomy, followed by agriculture and the food processing industry. Gastronomic tourism plays a great role in raising awareness among individuals about the impact of their dietary choices on the environment, which can be used to promote sustainable behaviour at the level of the individual. The Slovenian tourism policy promotes small providers with short local supply chains and quality labels.

Short local supply chains
Fresh ingredients
Seasonal ingredients
Crops and products from extensive and organic production
Green energy sources
Reducing portion sizes
Reducing meat consumption
Taking home leftover food
Education
Breeding and cultivation of indigenous breeds and varieties
Raising awareness of guests
Smart food storage
Energy efficiency in food preparation

Packaging
Highly processed products
Precooked products
Disposable products
Food waste
Long distance transport
Purchase based on the lowest price criterion

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