**GMT implications: Scoping of implications for the state of environment in Slovenia and draft implication factsheets**

***Background document for the Influence of global megatrends on the state of environment in Slovenia: Workshop on risks and opportunities, policy links and gaps, Ljubljana 11 April 2018***

1. Introduction

This paper has been prepared as background to the forthcoming workshop on risks and opportunities, policy links and gaps, Ljubljana 11 April 2018.

It has been developed as part of the Slovenian Ministry of the Environment and Spatial Planning and the Slovenian Environment Agency commissioned project ‘Influence of global megatrends on the state of environment in Slovenia’. For more information on the project see the separate document: *Interim report: Influence of global megatrends on the state of environment in Slovenia.*

Following this introduction, this paper describes the work to-date under the project (Section 2) and presents factsheets (Section 3) based on a review of national information. This review was related to those implications considered ‘important to consider further’ at the Scoping workshop held in November 2017 in Ljubljana including an implication requested to be addressed by the Slovenian Environment Agency and discussed in the workshop as potentially important to review further (see Section 2). These factsheets will form the basis for discussions during the workshop on risks and opportunities, policy links and gaps, Ljubljana 11 April 2018.

1. Scoping of GMT implications for the state of environment in Slovenia

This paper reflects the outcomes of the work on Scoping of GMT implications for the state of environment in Slovenia. The work completed to date under the project includes:

* The collation and review of national indicators related to GMT 7: Intensified global competition for resources and GMT 9: Increasingly severe consequences of climate change. In discussion with the Slovenian Environment Agency for the purpose of the first expert workshop, ecosystem vulnerability and energy stability in Slovenia were identified as thematic areas of focus, leading to the identification and compilation of a list of key national indicators and a record on the national issues related to agricultural land use, biodiversity and drinking water (under ecosystem vulnerability thematic cluster) as well as renewable energy sources, dependency on fossil fuel imports, biomass – land use/forests (under energy stability thematic cluster), through a review of available evidence.
* The thematic clusters identified formed the basis of discussions at the Scoping workshop held in Ljubljana in November 2017, which brought together national stakeholders to discuss the initial evidence and engage in a scoping exercise to identify and prioritise implications from GMT 7: Intensified global competition for resources and GMT 9: Increasingly severe consequences of climate change. The project focussed on these two GMTs at the request of the Ministry, as they were felt to be most relevant to and likely to have strongest effects on the state of environment in Slovenia.

The working sessions at the Scoping workshop were:

* Working session 1a – experts discussed and recorded the most important implications from GMTs 7 & 9 that may be influencing the environment in Slovenia considering the proposed clusters of indicators. To support the identification of implications, the groups developed simple causal chains (on paper) for selected global drivers / trends and implications.
* Working session 1b & 1c - participants discussed and reflected on the connections between global drivers / trends and identified potential implications in Slovenia with facilitators ‘live-mapping’ those connections on screen to create simple causal chains / mind-maps using Vensim[[1]](#footnote-1) software.
* Working session 2 – for each implication identified in Working session 1, through a facilitated group exercise, participants considered the likelihood, magnitude and timescales of effects to inform the prioritisation of the implications.

The outcomes from the two working sessions were:

* A long-list of potential national implications of global megatrends, based on expert judgement and a review of initial scoping work completed (by the project team) before the workshop.
* Causal chains / mind-maps exploring the logic / telling the story of how GMTs may be influencing the environment in Slovenia
* An initial assessment of all potential implications to identify a short-list of potentially key implications, considering likelihood, extent and time-frames.

A summary of the assessment of the potential key implications from working session 2, considering likelihood, extent and time-frames is presented in Table 1, and the shortlisted implications are presented in Table 2.

The scoping assessment was based on expert judgement, through discussion considering whether:

1. The likelihood of the implication was ‘high’ (considered very likely to happen) or ‘low’ (considered very unlikely to happen).
2. The magnitude of the implication was ‘high’ (considered likely to have significant effects in the country) or ‘low’ (considered likely to have limited effects in the country).

A traffic light system (see Table 1) was used to facilitate the prioritisation of key implications for additional research following the Scoping workshop. Following the methodology described in the method tool kit “Understanding the impacts of global megatrends at the national level” the implications assessed were given a ranking where:

* **Rank 1** was assigned to implications with ‘high’ likelihood and ‘high’ effects or if there was considerable uncertainty assessing these criteria. Such implications were considered important and were selected in the first instance for further review.
* **Rank 2** was assigned to implications with ‘high’ likelihood / ‘low’ effects or ‘low’ likelihood / ‘high’ (medium) effects. These implications are potentially important to review further if the level of potential effects or certainty require further exploration
* **Rank 3** was assigned to implications with ‘low’ likelihood and ‘low’ effects, thus considered a low importance for further review.

Implications assessed as Rank 1 – considered important – were selected for further review and were carried forward for more in-depth evidence collation and review and the preparation of the factsheets presented in Section 3 of this note. These implications are presented in Table 2. To facilitate the gathering of information and recognise the connectivity between various implications, the decision was to group these in three clusters: Environmental pressures related implications, Resources and economy related implications and Climate related implications.

Table 1 Summary of key implications’ scoping exercise

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| **GMT** | **Implications** | **Estimated likelihood****(high/low)** | **Magnitude****of effect****(high/low)** | **Timescale over which implication may occur[[2]](#footnote-2)** |
| **GMT 7**  **Intensified competition for natural resources** | Increased privatisation of natural resources | high | High | medium term(has already started but the implications are not felt yet)  |
| Economic dependence | high | High | short /medium /long term |
| Increasing environmental burden | high | high | short term (increased burden)long term (decreased/increased burden) |
| Demand on natural resources (increasing) | high | low (transition to circular economy) | medium term |
| high (no transition to circular economy |
| Energy import dependence | high | high | long term |
| Pressure on water quality and supply  | high | high | long term |
| **GMT 9 Increasingly severe consequences of climate change** | Food Security | high | low  | short term (low magnitude) |
| high | medium/long term (some present aspect will significantly increase with time) |
| Extreme weather events (flooding, draughts, winds, hale) | high | high | short term (increase in time) |
| Human health risks (related to heating/cooling and food security) | high | low  | short term (low magnitude) |
| high | long term (high magnitude) |
| Risk to forests (biomass) | high | low  | short term (low magnitude) |
| high | medium to long term (increasing to high magnitude) |
| Infrastructure damage | high | high | short term to high? |
| Threats/ risks to biodiversity | high | low | long term |

Table 2 Rank 1 implications – judged as important to consider further

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|  | **Implication**  | **GMT** |
| **Environmental pressures related implications** | Pressure on water quality and supply | GMT7 Intensified global competition for resources  |
| Increasing environmental burden | GMT7 Intensified global competition for resources |
| **Resources and economy related implication** | Economic dependence | GMT7 Intensified global competition for resources |
| Energy import dependence | GMT7 Intensified global competition for resources |
| Increased privatisation of natural resources | GMT7 Intensified global competition for resources |
| **Climate related Implications** | Extreme weather events  | GMT9 Increasingly severe consequences of climate change  |
| Infrastructure damage | GMT9 Increasingly severe consequences of climate change |

Following a request from the Slovenian Environment Agency the project team also prepared a factsheet on ***Food security***. This implication was also recognised as important in the Scoping workshop especially in the long term and was assessed by the experts as potentially important to consider further (Rank 2) due to the low magnitude of effect in the short term (to 2020).

1. Draft GMT implication factsheets

Following the methodology described in the method tool kit on ‘Understanding the impacts of global megatrends at the national level’, the information collected on the prioritised implications was used to draft 'factsheets' to define the implications in more detail and illustrate as far as possible how the implication may be having effects on the state of environment in Slovenia. Each of the factsheets includes:

* a title of the implication and the outcome of the scoping exercise in Session 2 of the first workshop;
* a description of the implication, including which EEA SOER GMT(s) it relates to and how it is connected to national observations (based on Scoping workshop outcomes);
* a summary of identified evidence / information about how the implication may be having effects / have effects in future in Slovenia;
* an overview of existing policies and strategies that are relevant to the implication;
* an overview of any recognised policy gaps and needs/ vulnerabilities.

***Preparation for the Workshop on Risks and Opportunities***

This background note presents six implication factsheets, based on those identified as ‘important’ by experts at the Scoping Workshop (November, 2017) as well as one indicated as important to be included by the Slovenian Environment Agency. The factsheets are intended to support discussion at the Risks and Opportunities Workshop, providing a description of the implications and a summary of relevant national information.

Given some of the close links between implications highlighted in the Scoping Workshop, and the limitations of time for their detailed consideration, the project team merged:

- Economic dependence and Energy import dependence

- Extreme weather events and Infrastructure damage

The resulting implications for discussion in the Risks and Opportunities workshop are:

**Environmental pressures cluster**:

* Increasing environmental burden
* Pressure on water quality and supply

**Resources and economy cluster**:

* Economic and Energy import dependence
* Increased privatisation of natural resources

**Climate cluster**:

* Extreme weather events and Infrastructure damage
* Food security

The implication factsheets are based on a review of a list of 110 national indicators identified before the November workshop and an additional review of literature identified through a search for reports, data or indicators covering each of the prioritised implications. The review of existing evidence in particular focussed on historical and current national studies, indicators of change driven by or resulting from the implications and evidence from projections, scenarios, horizon scanning and qualitative and quantitative outlooks that relate to the specific implication. More than 40 studies and reports reviewed included those published by national institutions, NGOs and international organisations and research projects / academic studies.

Additional information and sources were provided by national experts following a request for suggestions of relevant information that could add to the list of previously identified sources as well us with the information in some additional meetings. We are grateful for the contributions from the following experts who responded to our request:

* Nataša Vodopivec, Water and Investment Directorate, Ministry of the Environment and Spatial Planning (Slovenia)
* Darja Piciga, Secretary of Environment Directorate, Ministry of the Environment and Spatial Planning (Slovenia)
* Bernarda Podlipnik, Ministry of the Environment and Spatial Planning (Slovenia)
* Tomaž Miklavčič, Spatial Planning, Ministry of the Environment and Spatial Planning (Slovenia)
* Helena Matoz, Ministry of the Environment and Spatial Planning (Slovenia)
* Barbara Simonič, Climate Change Section, Ministry of the Environment and Spatial Planning (Slovenia)
* Urška Kušar, Water agency (Slovenia)
* Jernej Stritih , Consulting service on sustainable development (Slovenia)
* Andrej Lukšič, Faculty of Social Science (Slovenia)
* Lidija Globevnik, Water thematic centre (Slovenia)
* Barbara Lampič, Faculty of Arts, Department of Geography (Slovenia)
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* Barbara Bernard-Vukadin, Slovenian Environment Agency (Slovenia)
* Natasa Kovac, Slovenian Environment Agency (Slovenia)
* …

Information on gaps and needs in relation to existing policy across the factsheets is discussed on a high level else this would require extensive policy analysis which is not the aim of these factsheets. Existing policies/strategies and corresponding policy gaps and needs/vulnerabilities will be discussed and explored during the workshop, in Ljubljana 11 April 2018 that are not defined for all implications described in Section 3 below.

Environmental pressures related implication factsheets

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| **Implication title**  | *Increasing environmental burden (GMT 7)* |
| **Scoping result**From workshop 1 | **Estimated likelihood***(high/low)* | **Magnitude****of effect***(High/low)* | **Timescale over which implication may occur[[3]](#footnote-3)** |
|  | High | High | short term (increased burden); long term (decreased/increased burden) |
| **Implication description**  | ***Implication summary***Environmental burden is defined as any activity affecting the environment or any consequence of such activity which, exclusively or simultaneously, has caused or continues to cause environmental pollution, environmental risk or the use of a natural asset (Stevens & Bolton LLP, 2013).Increasing environmental burden is identified as a global implication in the SOER 2015 (GMT 7: Intensified global competition for resources), with increasing demand and escalating use of resources often triggering ‘harmful processes in the environment’. Increasing environmental burden was identified as a potentially important issue for Slovenia’s state of the environment during the expert workshop held in Ljubljana (November 2017).***National trends and observations***The following ‘observations’ were highlighted by experts as potentially having an effect on the estimated likelihood, magnitude and timescale for the implication during group discussions at the workshop: * Transport and transit transport identified as one of the main drivers of increased environmental burden.
* Broad middle class[[4]](#footnote-4) (including a declining rate in people living under the poverty threshold - 0.4% reduction in at-risk-of-poverty rate in 2016 compared to 2015 – with 13.9% of population living below the threshold) with “western lifestyle” and national trend for population relocation to coastal areas are important for increased environmental pressure in Slovenia.
* Increased pressure on water management (including water supply) in coastal areas and the rising use of chemicals for water quality treatment are also likely having an effect on local ecosystems and biodiversity.
* Decrease in water quality (Karst, Eastern Slovenia, intensification of agriculture, decreased self-sufficiency).

Through expert consultation after the scoping workshop additional issues were indicated to add to the increasing environmental burden in Slovenia: * Poor spatial planning resulting in profligacy in the use of land. Lack of data; databases are still being established.
* Decision-making – often other interests outweigh consideration to environmental protection

***Related global drivers and trends***This implication will be further aggravated by the increasing global population (GMT 1 “Diverging global population trends”) bringing radical changes in global consumption patterns and thus demand for resources. Increasing global economic output and expansion of middle class are expected to contribute to accelerating global resource use/consumption (GMT 5 “Continued economic growth?”) thus increasing environmental burden.Shift from diffuse rural living to compact urban settlements (GMT 2 “Living in an urban world”) and technological innovations (GMT 4 “Accelerating technological change”) could further raise pressures on the environment, while at the same time new technologies and denser settlement can result in less resource-intensive lifestyles if appropriate policy and strategies are in place. |
| **Summary of existing evidence**  | During the expert workshop, the implication *increasing environmental burden* was assessed as being high in terms of likelihood and magnitude of impacts. When assessing the timescale over which implication may occur the experts agreed that in the short term (up to 2020) this implication will continue to be an issue whereas for the long term the opinion varied between decreased/increased burden depending on the development (new technology, energy policy, transport sector etc.) scenarios applied.***Increasing consumption*** The growth of gross domestic product is commonly associated with shifts in consumption patterns, resource use and production of waste. According to OECD real GDP growth in Slovenia has annually surpassed 2% since 2014 with the latest evidence projecting that in 2017 the growth was 4.86%[[5]](#footnote-5). The amount of total municipal waste generated in Slovenia has considerably increased in the period 2013-2016 and has grown from 756,846 tonnes in 2002 to 981,687 tonnes in 2016 – an increase by 29.7%[[6]](#footnote-6). In municipal waste generated per capita per year this corresponds to a rise from 425 kg in 2002 to 476 kg in 2016[[7]](#footnote-7). The quantities of recovered waste in Slovenia are increasing in last years from 2,514,143 tonnes in 2002 to 6,238,840 in 2016[[8]](#footnote-8), however the quantities of disposed waste (although significantly reduced since 2002) have been increasing again in recent years. Waste recovery is important particularly in terms of protecting and reducing pressure on natural resources. Water resource management in Slovenia is facing multiple challenges with pressures from industry, energy and agriculture sectors. The intensification of water use has been observed since 2002 and peaking in 2014 with 125,577,489 thousand/m3 used. In the period from 2002 – 2016 the use of water in industry has grown by 35.3%. In the energy sector since 2000, final energy consumption has increased by 7.95% with 4,931,000 tonne of oil equivalent been consumed in 2016[[9]](#footnote-9) (a ~4% increase in comparison with the previous year with transport sector being the largest consumer - 39%[[10]](#footnote-10)). The growing energy demand leads to increasing risks for the stability of power system operation to meet the growing needs. One of the options to address this issue, is development of new energy infrastructure. According to a 2015 study on hydropower projects on Balkan rivers there were 181 hydropower projects planned in Slovenia and five being under construction (Schwarz, 2015) – the large number of planned projects is assumed to include small hydropower projects. This possesses increased risks for aquatic ecosystems (biodiversity, water stagnation etc.) as well as water availability as a result of increased exploitation. In 2016 there were 3,133 hectares of land being irrigated in Slovenia which is 1.3% less than in 2015[[11]](#footnote-11). However since 2009 the total irrigated territory has expanded by 114% with 1464 ha being irrigated at the time[[12]](#footnote-12). This has likely increased pressure on water supply and intensified competition with other sectors to meet the increasing demands for water. ***Intensification of agriculture***Aquatic habitats have been damaged by intensification of agriculture. The gross nitrogen balance (estimating the potential surplus of nitrogen on agricultural land) in Slovenia from 1992-2015 has significantly declined from 60,804 to 21,155 tonnes respectively. However since 2008 the levels of nitrogen surplus have remained similar[[13]](#footnote-13). This nitrogen surplus can indicate potential nitrogen losses from agriculture to the environment, affecting water quality and causing further environmental pressures to groundwater. This is particularly important for Karst systems which are very vulnerable to ground water pollution due to the relatively rapid rate of water flow and the lack of a natural filtration system[[14]](#footnote-14). Other risks from agricultural runoff include nutrient enrichment (eutrophication) of water bodies and acidification of terrestrial ecosystems.***Use of private transport and freight transport*** Transport sector has also seen significant growth in Slovenia with implications for air quality and ecosystem integrity. In the period from 2000-2010 freight transport (tonne/km) increased by 18.1%, private cars (passenger/km) by 23.9% and vehicle stock by 21.4% (OECD, 2012). Ownership of private vehicles has increased rapidly in the previous couple of decades exceeding the rate of many more economically advanced EU countries. Since 2000 the number of all passenger cars used by natural persons per 1,000 population accelerated from 435 to 523 in 2015[[15]](#footnote-15). In addition, the territory of Slovenia is crossed by some of Europe’s major south-north transit routes which carry a high volume of international road freight. These increases in the use of motorised transport in, and transit of freight by road through Slovenia lead to impacts on air quality, for example by exceeding the limit values of particles (PM10) and, in the summer, of ozone. In addition to the negative impact that polluted air has on environment, there are also significant impacts on human health. As indicated by the Institute of Public Health of the Republic of Slovenia, children are being regularly exposed to concentrations of particulates in the region of 30–40 µg PM10/m3, which is above the level recommended by the World Health Organization (20 µg PM10/m3). Being exposed to this pollutant can progress cardiovascular diseases and respiratory diseases especially with children. There are also negative effects of these pollutants for ecosystems as they become more susceptible to eutrophication and acidification. Slightly higher values of metals and nitrogen in the peripheries of bigger towns and cities as well as industrial and thermal energy plants have been recorded in moss indicating an increased risk of soil acidification[[16]](#footnote-16).Additionally, OECD in their 2012 Environmental Performance review for Slovenia has reported that urban sprawl and transport infrastructure has caused habitat fragmentation including the fragmentation of continuous forests (OECD, 2012).***Migration***Recent trends recorded in coastal areas indicate increasing pressures for the environment. In 2016 the municipalities of Koper and Izola have had positive total net migration rate. Considering the mostly positive annual rates since 2008, both municipalities have had an increase in population which is likely to also present increased pressure on the local environment[[17]](#footnote-17). For example, municipal waste generation in the municipality of Koper has risen from 442 kg/per person in 2012 to 557 kg/per person in 2015[[18]](#footnote-18). Also, both municipalities are part of the Coastal–Karst Statistical Region that has recorded increasing pressure on water supply with 4.3% increase from 2012-2016[[19]](#footnote-19). Additionally, increased net migration of foreign nationals to Slovenia was positive for the eighteenth year in a row (mostly from Bosnia and Herzegovina; other common countries of previous residence were Serbia, Kosovo, Croatia and Macedonia). In 2016, 7,006 more foreign nationals immigrated to Slovenia than emigrated from it[[20]](#footnote-20). With possible increase in migration flows to Europe from other regions would also likely add to the environmental pressures in Slovenia. ***Changes in population*** In the short term relatively slow population growth means this is unlikely to be a key driver for increase in environmental burden in Slovenia however other drivers such as increasing consumption, intensification of agriculture and use of transport are likely to lead to ongoing environmental pressures. Eurostat projections indicate that population growth in Slovenia could peak around 2030 with approx. 2,080,000 people living in the country – only a 0.8% increase from 2015. After 2030 the population is expected to decline and by 2080 it is projected that the national population would be approx. 1.9 million which is a 6% decline compared to 2015[[21]](#footnote-21). ***Outlook***Some participants of the 1st expert workshop as part of the project Influence of global megatrends on the state of environment in Slovenia indicated that environmental burden from transport and transit transport are expected to increase in Slovenia. The growth in global middle class and augmenting consumption patterns are increasing global trade and travel which is also likely to have an influence on the transport sector in Slovenia. Possible EU enlargement in East Europe and increased transit transport from growing trade could reach maximum capacities for the existing transit routes. When discussing future trends the experts also expressed the likely increase in air pollution due to large numbers of small domestic biomass firing installations which would also affect human health. Some experts also felt that there may be a possible decrease in environmental burdens when discussing long term timescales (2030-2050). They argued that this is also reflected in the Energy Concept of Slovenia and the shift will be supported by the introduction of new/sustainable technologies, increase in energy production from renewable energy sources and growth in the use of electric cars. |
| **Overview of existing policy/ strategy**  | Slovenia as a member state of the EU has to agree to common rules and standards across the policy areas and ensure its legislation is in line with EU law. Slovenia’s government is bound to exercise concern for natural environment through its membership of the EU. Sustainable development is an overarching objective for the EU, which is committed to a ‘high level of protection and improvement of the quality of the environment’.To address the issues of ensuring good environmental quality Slovenia is also bound to meet the UN Sustainable Development Goals (SDGs), especially SDG15 (life on land), SDG6 (clean water and sanitation), SDG7 (affordable and clean energy), SDG9 (industry, innovation and infrastructure), SDG11 (sustainable cities and communities), SDG12 (responsible consumption and production), SDG13 (climate action) and SDG14 (life below water).There are five goals in the Slovenian Development Strategy 2030, which, if realised, would have a mitigating effect on this implication. * “Healthy and active life” is the 1st goal which aims to reduce risk to human health from environmental pollution and climate change. It also intends to change consumer behaviour which has a negative impact on ensuring quality of life for all generations and reducing the burden on the environment;
* Objectives of the 5th goal “Economic stability” intend for Slovenia’s economic growth to be inclusive and green based on high competitiveness and innovation. This is foreseen to enable sustainable development, and reduce burden on the environment.
* “Competitive and socially responsible corporate and research sector” is the 6th Goal of Slovenian Development Strategy 2030. Among the objectives to achieve this goal is to place innovations and research in the centre of Slovenia’s development policies which should be directed towards environmentally acceptable technologies and eco-innovations. Environmental responsibilities of enterprises and research organisations will be promoted. Such policies would have positive impact on competitiveness as well as contribute to decrease in environmental burdens.
* The 8th Goal “Low-carbon circular economy” is looking to increase the material use efficiency that could contribute to decrease in resource use and extraction therefore relieving some environmental burden. Transport sector is also recognised as an important source of environmental burden under this goal – especially by greenhouse gas pollution. The strategy indicates that Slovenia will strive to implement new mobility concepts and other measures to promote sustainable mobility (e.g. e-mobility, public transport).
* “Sustainable and efficient resource management” is the 9th goal of the Strategy and is striving to increase the quality of natural resources by implementing ecosystem-based management of these resources. Other objectives include efficient management of surface and ground water, and soil, sustainable forest management, maintaining high levels of biodiversity, and sustainable agriculture.
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| **Policy gaps and needs/ vulnerabilities**  | To be discussed in the risks and opportunities workshop |

**References:**

OECD (2012), OECD Environmental Performance Reviews: Slovenia 2012, OECD Publishing, Paris.
<http://dx.doi.org/10.1787/9789264169265-en>

SURS, SI-STAT database. Last visited on 1st February, 2018:<http://pxweb.stat.si/pxweb/Database/Environment/27_environment/02_waste/01_27061_waste_removal/01_27061_waste_removal.asp>

Stevens & Bolton LLP (2013), The Study on Analysis of integrating the ELD into 11 national legal frameworks, Final Report prepared for the European Commission – DG Environment <http://ec.europa.eu/environment/legal/liability/pdf/Final%20report%20-%20ELD_annex.pdf>

Schwarz, U., 2015. Hydropower Projects on the Balkan Rivers – Update. RiverWatch & EuroNatur, 33 pp.

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| **Implication title**  | *Pressure on water quality and supply(GMT 7)* |
| **Scoping result**From workshop 1 | **Estimated likelihood***(high/low)* | **Magnitude****of effect***(High/low)* | **Timescale over which implication may occur[[22]](#footnote-22)** |
|  | High | High | long term |
| **Implication description**  | ***Implication summary***SOER 2015 (GMT 7: Intensified global competition for resources) describes how, in light of global economic growth, the accelerating increase in consumption and use of resources can increase energy demand and lead to pressures on water quality (groundwater and surface water) and supply. The potential for increased water demand and decline in water quality was identified as a potentially important issue for Slovenia during the expert workshop held in November 2017.***National trends and observations***In Slovenia surface water sources are generally used for agricultural, industrial and energy production (RES), while groundwater is generally used for drinking water. Through group discussions in the 1st workshop the experts concluded that competition for both surface and ground water resource is expected to increase as demand is likely to rise resulting from:* economic growth, expansion of middle class/changing consumption patterns on global level (and the related demand for goods and potentially larger exports), and urbanisation
* increased use of water for renewable energy sources (RES)
* increased use of water for agriculture (irrigation due to more frequent droughts)
* increase in tourist arrivals
* uncertain supply of drinking water in certain regions (Primorska, Prekmurje)

Water quality is also likely to be affected due to increased pressures from agriculture and tourism.***Related global drivers and trends***Slovenia’s growing economy[[23]](#footnote-23) is likely to use more resources as a result of changing consumption patterns and increasing energy demand. This is expected to increase pressure on local water resources and, even though Slovenia has abundant water resources, such pressures could result in tensions (perhaps in particular in specific local areas) regarding competing claims for available water (e.g. between agricultural and industrial uses). This implication will be further aggravated by the increasing global population (GMT 1 “Diverging global population trends”) bringing radical changes in consumption patterns and thus demand for resources. Increasing global economic output and global expansion of middle class are expected to contribute to accelerating global resource use / consumption (GMT 5 “Continued economic growth?”) thus increasing the prospect of intensified global trade. Slovenia’s economy is dominated by exports, in particular automotive and pharmaceutical industries which are likely to expand to meet the increasing global demand. For both industries water is the one of the major commodities used for production processes[[24]](#footnote-24) (Shukshith et al., 2016). Technological innovations (GMT 4 “Accelerating technological change”) could further raise pressures on water resource stocks if their production and/or use incorporate the use of water. However, new technologies can also result in less resource-intensive lifestyles that could relieve the pressure on water demand.A continued global shift from diffuse rural living to compact urban settlements (GMT 2: Living in an urban world) could translate into less resource-intensive lifestyles and thus alleviate demand for resources (including water) in the future. In Slovenia there may be a trade off in land-use for agriculture and urban development, as traditionally settlements have grown in valley areas that are also where the best quality agricultural land is. |
| **Summary of existing evidence**  | During the expert workshop, the implication *Pressure on water quality and supply* was assessed as both being ‘high’ in terms of likelihood and the magnitude of impacts, and that effects will be seen in the long-term (2020 – 2050).***Water quality (surface and ground)***In recent decades drinking water quality in Slovenia has improved. According to the monitoring results, groundwater (which is the main source for drinking water in Slovenia) has a good chemical status in major parts of Slovenia. To provide high quality and safe drinking water, the management of small water supply systems are the most problematic as they are periodically microbiologically polluted. Although the share of samples containing E.coli for small water supply systems have declined, in 2015 they still had the highest share of contamination (5.8%) compared to samples from medium (1.1%) and large (0.2%) size water supply systems[[25]](#footnote-25). Human health is affected to a great extent by the state of the environment, especially by clean drinking water.Although in recent history the proportion of the population whose wastewater is treated in municipal or communal treatment facilities in Slovenia has considerably increased – it is still lower if compared to other European countries largely due to the scattered nature of settlements[[26]](#footnote-26). Untreated industrial waste water adds additional pressure on surface water quality (rivers, lakes, streams) and potentially groundwater quality. The latest data for Slovenia indicate a reduction in the wastewater discharge from industry with 2016 having the least discharge in the last four years. From the 717 million m3 of wastewater that were discharged from industry in 2016, the majority of wastewater (approx 90%) was heat-polluted. From the remaining wastewater, 24 million m3  (3.3%) was treated before discharge and 44 million m3 (6.1%) was untreated before discharge[[27]](#footnote-27).***Water demand***The growth of gross domestic product is commonly associated with shifts in consumption patterns, resource use and production of waste. According to OECD the real GDP growth in Slovenia has annually surpassed 2% since 2014 with the latest evidence projecting that in 2017 the growth was 4.86%[[28]](#footnote-28).Although the purchasing power of population is expected to increase as economy grows, the number of consumers have remained relatively similar as Slovenia’s population 2009-2017 has increased by 33,533 reaching 2,065,895 people[[29]](#footnote-29). The growing global middle class is also likely to have an impacts on Slovenia’s trade policies. In 2017 Slovenia exported EUR 28.2 billion worth of commodities which is 13.1% higher than exports in 2016[[30]](#footnote-30). Exports exceeded the pre-crisis level of 2008 already in 2011 and have been growing ever since. The growing exports indicate to increasing use of resources for the production of goods including water. As indicated by Slovenia’s statistical office, the total use of water in industry for production purposes from 2002-2016 has grown by 35.6%[[31]](#footnote-31) The majority of this additional water use by industry is likely to be from surface water sources.Urbanisation has also been recognised as an important driver for increasing pressure on water supply both by the experts in the workshop and Slovenia’s contributions to SOER 2010. Although the share of urban population in the country from 2006-2016 has remained consistent[[32]](#footnote-32)the main issue for urbanisation is likely to be land use change due to construction of infrastructure (including transport) that leads to a loss or degradation of surface water resources and changes in land-uses in catchment basins. The urbanisation of coastal land is considered to be a particular issue for Slovenia[[33]](#footnote-33) and the potential for pollution of coastal waters (e.g. due to increased effluent discharge).In the northeast (Mura and Drava river basins) groundwater aquifers are under significant pressure from agriculture activities (pollution, pumping, and drainage).The major groundwater pollutants in Mura valley are nitrates, atrazine, desethyl-atrazine, trichloroethane and tetrachloroethene, most of them stemming from agriculture. Also, agricultural activities are severely affecting groundwater quality in the eastern parts of the country which are generally drier (TC Vode, 2013). A study on Climate change impacts on public drinking water supply recognised that the risk of nitrate and pesticide leaching is very high on 60% of the test area in Mura Valley and Ljubljana (CC-WaterS, 2012).Observations in the volume of water used for irrigation (generally surface water) indicate significant annual variations. Despite the considerable fluctuations in annual values and the short timescale of available data, it is evident that the water used for irrigation demonstrates a downward trend and constitutes to only 2.1% of the total consumption of water in Slovenia. Only a small fraction of agricultural land is irrigated (3,133 ha in 2016[[34]](#footnote-34)) despite the fact that approximately 60,000 ha of land area is considered suitable for irrigation systems (TC Vode, 2013). However estimations for 2015 and 2016 indicate a surge in irrigation water demand as irrigated area expanded by 36.6% from 2014-2015[[35]](#footnote-35).http://pxweb.stat.si/pxweb/temp/2700002E20182951532_18485810.gif**Figure 1: Total water used for irrigation in Slovenia (1000 m3).** Source: Statistical office of the Republic of Slovenia The growing energy demand leads to increasing risks for the stability of power system operation to meet the growing needs. Among the options to address this issue, is development of new energy infrastructure. According to a 2015 study on hydropower projects on Balkan rivers there were 181 hydropower projects planned in Slovenia and five being under construction (Schwarz, 2015) From 2000 to 2007 the actual capacity of hydroelectric stations increased by 18.4 %, a result of refurbishing and was supplemented in 2007 by new small hydroelectric stations[[36]](#footnote-36).Tourism and leisure activities can be a significant factor in water consumption at the national level. According to Gössling et al. (2012) water consumption rates are in the range of 84-2,000 litres per tourist per day, and up to 3,423 litres per bedroom per day. Slovenia’s tourism sector in 2016 recorded record numbers to date. The industry had a 12.0% (3,032,256) increase in international tourist arrivals compared to 2015, placing it above the European average. As presented in Figure 2, the total number tourist arrivals (including domestic) and their share corresponds to 4,317,504 arrivals and 11,179,879 overnight stays, which is 9.9% and 8.1% more than in 2015 respectively[[37]](#footnote-37). **Figure 2. Total number of tourist arrivals and overnight stays in Slovenia 2006-2016.**Source: Slovenian Tourist BoardAs tourism sector grows the demand for water, in particular for drinking and sanitation, is also likely to increase, which could put additional pressure on existing groundwater management strategies. It is reported that there is sufficient quantities of water on average in Slovenia. In 2016, 161.8 million m3 of water were abstracted in Slovenia, which is 1.6% less than in the previous year. Almost all water (approx. 99%) for the public water supply is abstracted from groundwater sources as surface water is predominantly used for energy production. The reliance on groundwater sources for public water supply could lead to increasing pressure on these sources as surface water abstraction declined by 34.8% compared to 2015[[38]](#footnote-38). The volume of water (m3/capita per year) abstracted for public water supply has steadily declined since 2002 and in 2016 corresponded to a fall of 12.5 %. This corresponds to similar trends for the same timescale in the volume of water supplied for households m3/capita per year (13.6% decline) and the volume of consumed water m3/ capita per year (11.7% decline)[[39]](#footnote-39). On average Slovenia is a country rich in groundwater resources however there is big regional and inter-annual variability of groundwater recharge posing a challenge to water management (Andjelov et al., 2016). Also, the difference in the amount of precipitation between areas in the west and those in the east of the country means that in some places there is regular or occasional flooding, while a few areas face a lack of water and drought[[40]](#footnote-40).During the scoping workshop experts expressed that Slovenia’s abundant and high quality water resource that is occasionally undervalued could lead to an increase in foreign investment in water extraction. The consequence of such development would be the increasing fragmentation of land ownership that could further complicate the integration of water management policies. An influx of investment could also increase the price of water thus raising profits for the foreign investors (while making water less affordable for Slovenian domestic, agricultural and industrial uses). The lobbying or other influence of public decision making by industry is common, including through formal channels such as industry associations and less formal channels. In some cases corruption may occur which can undermine or weaken political power and environmental or social protections. This could, for example, lead to pressure to privatise natural resources including water supplies.In the near future construction of irrigation systems in Slovenia will be one of the highest priorities (TC Vode, 2013). |
| **Overview of existing policy/ strategy**  | Slovenia’s government is bound to exercise concern for water through its membership of the EU and through numerous signed international treaties. The state of water quality and availability therefore is closely monitored in part through fulfilment of obligations under European directives (especially the Water Framework Directive), international conventions and the UN Sustainable Development Goals (SDGs), especially SDG6 (clean water and sanitation) and SDG14 (life below water).Water management policy in Slovenia is based on the society’s acceptance that natural resources are recognised as a public good administrated by the state. The Water Act defines water as a natural public asset. According to the Law on Water, any special use of water should be based on water right, granted by state. Water permit is needed for drinking water supply (community or private), irrigation, technological use, artificial snow, heat production, etc. Concession is granted in particular for the production of electric energy in hydroelectric power stations, for the production of beverages, for the use of mineral, thermal and thermal-mineral water in touristic resorts, for management of ports and marinas and for fish and shellfish production (TC Vode, 2013). There is one goal in the new Slovenian Development Strategy 2030, which could have a positive effect on this implication:* “Sustainable and efficient resource management” is the 9th goal of the Strategy and among the objectives includes and efficient management of surface and ground water.
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| **Policy gaps and needs/ vulnerabilities**  | Policy integration and involvement of relevant stakeholders at the state, regional and local levels are recognised to be the main problems of the existing Slovenian water management policy. The fragmentation of water management is caused by the lack of horizontal and vertical communication and cooperation (TC Vode, 2013). Additionally, short term policy making is a common practice at the state and especially local levels as strong lobbying is a part of usual business practice. |

**References:**

Andjelov, M., Mikulič, Z.,Tetzlaff, B.,Wendland, F.,Uhan, J. (2016), Groundwater recharge in Slovenia - Results of a bilateral German-Slovenian Research project. Schriften des ForschungszentrumsJülichReiheEnergie& Umwelt / Energy & Environment. 339, 138 pp.

CC-WaterS : Climate Change and Impacts on Water Supply <http://www.ccwaters.eu/downloads/CC-WaterS_Project_Monography_final.pdf>

Gössling, S., Peeters, P., Hall, C.M., Dubois, G., Ceron, J.P., Lehmann, L., and Scott, D. (2012), Tourism and water use: supply, demand, and security. An international review, Tourism Management, 33(1), 1-15

Shukshith, K.S. & Gupta, N. Vishal. (2016). Water for pharmaceutical use. International Journal of Pharmaceutical Sciences Review and Research. 36. 199-204.

Schwarz, U., 2015. Hydropower Projects on the Balkan Rivers – Update. RiverWatch&EuroNatur, 33 pp

TC Vode (2013), Market Sector Scan of Water Management of Slovenia, for the Netherlands Water Partnership / Netherlands Embassy to Slovenia

Resources and economy related implication factsheets

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| **Implications presented** | *Economic and Energy import dependence (both GMT7)*The observations of the research team further confirmed by the Slovenian Environment Agency were that the energy import dependence of Slovenia is an important factor underpinning the economic dependence of the country. Therefore, the implications are presented together in this factsheet. |
| **Implication titles** | *Economic dependence (GMT 7)* |
| **Scoping result**From workshop 1 | **Estimated likelihood***(high/low)* | **Magnitude****of effect***(High/low)* | **Timescale over which implication may occur[[41]](#footnote-41)** |
| High | High | Short, medium, and long term (for Slovenia it is an ongoing issue) |
| **Implication title** | *Energy import dependence (GMT7)* |
| **Scoping result**From workshop 1 | **Estimated likelihood***(high/low)* | **Magnitude****of effect***(High/low)* | **Timescale over which implication may occur** |
| High | High | Long term |
| **Description of the implications**  | ***Implications summary***Although *economic dependence* and *energy dependence* of Slovenia were recognised as two separate implications of GMT7 (Intensified global competition for resources; as introduced by SOER 2015) at the workshop held in Ljubljana (November, 2017) in this factsheet they are presented together. This decision is based on the observations of the project team, which were further recognised by the Slovenian Environment Agency that energy import dependence of Slovenia is an important factor in the economic dependence of the country. Thus these two implications are strongly interrelated and driven by the same or similar processes, which are described below. As recognised in the EEAs SOER 2015 GMT7 - intensified global competition for resources is driven by economic development and current consumption patterns resulting in global trends such as intensified global demand, uncertain access and price volatility of crucial resources. In Europe all these trends pose a risk to the economy as it depends on imported resources, particularly fossil fuels and metals (SOER, 2015). As identified at the workshop in Ljubljana, as an EU country with a fairly small internal market Slovenia is strongly connected to and dependent on economic developments in Europe. The national experts suggested that an important factor determining economic dependence in Slovenia is the large share of imported fossil fuel (mainly oil and gas) which also affects energy dependence and supply.***National trends and observations***During the group discussion at the workshop, the following trends and observations were emphasised by national experts: * Economic dependence of the country is identified as long term. Slovenia has a small internal market and therefore it is and will remain strongly interrelated to EU and global markets.
* Industries in Slovenia depend on imported energy, fossil fuels (mainly oil), gas, and other raw materials (minerals, metals)
* Economic dependence of Slovenia is highly affected by the energy import dependence of the country. Due to this strong interrelation, factors that might contribute to Slovenia’s energy (in)dependence, will also significantly influence the country’s economy. The energy import dependence of the country could increase due to: (1) shutting down the nuclear power plant by 2050 (although in the short-term this is not considered significant, which is reflected in the long-term time period for this implication estimated by experts at the scoping workshop); and (2) relying on the new (imported) coal powered thermoelectric plant (TEŠ)[[42]](#footnote-42) in the future which will further increase the energy supply risk. Due to these factors, experts believe the development in sustainable energy technologies, production, storage and share of renewable energy sources (RES) in the future national energy mix, and the envisaged transition to circular economy, as well as common EU energy policy will play the crucial roles in the extent to which Slovenia has economic end energy (in)dependence.
* In terms of energy and economic stability, transport was also identified as strongly related to the risk of supply and price volatility of critical resources (mainly fossil fuels, but not excluding other resources).

***Related global drivers and trends***Economic and energy dependency of countries are directly linked to increasing global use and demand of material resources (GMT7: Intensified global competition for resources). The growing demand might threaten access to crucial materials, whilst uneven geographical distribution of resources could contribute to geopolitical conflicts, subvert standards of living and aggravate price volatility. As Europe’s economy depends on imports this could have significant effects on the economic and energy stability of EU countries.The pressure on the global resource consumption, underpinning economic and energy dependence of (European) countries, could be further driven by increased global population (GMT 1: Diverging global population trends), growing global economic output and radically changed consumption patterns (GMT 5: Continued economic growth?), as well as the societal shift to urbanisation and industrial economies (GMT 2: Towards a more urban world).However, necessary mitigation and adaptation to consequences of climate change (GMT 9: Increasingly severe consequences of climate change), and fast technological innovation (GMT4: Accelerating technological change) could result in transition to more sustainable economic and consumption patterns and increase energy security (GMT 8: Growing pressures on ecosystems). Nevertheless, there are significant ecological risks (e.g. deforestation, nitrogen pollution, and freshwater scarcity) related to rapid expansion in land allocated to cultivating crops for bioenergy (GMT 7). Therefore, development of bioenergy produced from agricultural and forestry sources that do not require additional land should be encouraged (GMT 8).  |
| **Summary of existing evidence**  | Due to the strong interrelation of Slovenian economy to EU markets the experts evaluated the implication *economic dependence* to be high in likelihood and intensity, and to be present in all time-scales short, medium and long term. The related implication *energy import dependence* was identified to be high in likelihood and intensity. Although the experts agreed the implication is going to occur in long term time line, the opinions about whether energy import dependency during this time will increase or decrease were divided. Expectations of experts, predominantly based on the current objectives of Slovenia’s energy policy, were that the country will be less energy dependent. However, due to shutting down Slovenia’s nuclear power plant by 2050, and the other big power plant TEŠ 6 (Šoštanj) being coal powered, experts agreed that energy (in)dependency of the country will depend on how much RES it will have in future. This is supported by projections for 2055 when a construction of a new nuclear power plant is no longer considered as an option, and the operation of TEŠ 6 is expected to be terminated in 2053 (E3. Modelling. Energy, Economy and Environment, 2017). The capacity is predicted to be replaced by gas and solar energy, which is projected to increase energy dependency reflected in net energy import (E3. Modelling. Energy, Economy and Environment, 2017).Data from Eurostat show that in terms of economic activity, after suffering a 7.8% decrease in 2009 and fluctuating for the following 5 years, GDP of Slovenia has increased by an average of 2.6% per year since 2014.[[43]](#footnote-43) The export/import ratio reported for Slovenia in November 2017 was 99.9% which means that the country imports about the same amount of goods that it exports. In 2017 the exported goods amounted to 28,250 m €, whilst the import was 27,526 m €[[44]](#footnote-44), of which 76.7% of total exports and 80.1 % total imports was generated by trade with EU Member States. About a fifth (20.4%) of total Slovenian exports go to Germany, 11.5% to Italy, followed by Croatia (7.6%), Austria (7.6%) and France (5.7%). Goods are mostly imported in similar percentages from the same countries. This shows that Slovenian trade is heavily dependent on the EU market. Slovenian Industrial Policy (SIP; 2013) emphasises that internationalisation of business and use of the globalisation effects is becoming an increasing necessity for the country’s economy, mainly due to uncertain domestic market growth and demand. However, foreign direct investment (FDI) flows in Slovenia, which alongside the exports are another important indicator of internationalisation of the economy, have been extremely low since the 2008 crisis (over -200m € in 2009). A paper by Blăjuţ (2015) shows that between 2013-2014 Slovenia had the lowest percentage of foreign investors/companies among all 11 Central and Eastern EU countries. In 2014 the country had an unexpectedly strong tenfold FDI recovery (746m €) in comparison to a previous year (71m €). As reported by the Ministry of Economic Development and Technology (2018), after a slight decline in 2016 FDI flows are expected to resume growth and surpass 1,450 m € in 2018. In terms of economic dependence on EU, the National Reform Programme 2017-2018 reflects high reliance of the country on the European funds for strengthening the competitiveness of the businesses as well as promoting key investments. These key investments (including expansion of road and railway infrastructure, sustainable mobility, and development and implementation of RES and energy efficiency supported by EU funds) are intended to create new jobs and boost economic growth, as well as reduce Slovenia’s energy import dependence.The interrelation between economic and energy dependency as recognised by the workshop participants is also emphasised by the European Commission (EC; 2015). EC states that macroeconomic importance of energy sector in Slovenia is significantly higher than in other EU countries, in terms of the gross value added (3.0%) as well as the total employment (about 1.0%) generated by the sector. Furthermore, looking at data for 2006 to 2014, EC also reports that in comparison to EU28 Slovenia’s energy trade deficit is constantly higher, largely due to the amount of oil imports. Overall, the energy import dependency of the country in 2013 (EC, 2015) was in line with the EU average for all fuels together (about 50%). However, it was much higher for petroleum products (SI:96%; EU28:87%) and natural gas, of which was 100% imported (EU28: 65%), mainly from Russia. In 2016, energy dependence of the country was 46%, with all petroleum and gas being imported. In the structure of the total energy supplied for the same year (54% from domestic and 46% from imported energy sources) petroleum products were predominate (34%), 22% was nuclear energy, 17% RES, and about the same percentage of coal, and 10% from natural gas.[[45]](#footnote-45)The largest consumer of the energy in Slovenia is the transport sector (39% in 2016)[[46]](#footnote-46), which supports the experts’ observations expressed during the workshop that the country’s economy is highly dependent on the fossil fuel imports related to this sector. The transport sector in Slovenia has experienced considerable growth in the decade between 2000 and 2010 (OECD, 2012). The number of personal cars in the country has also significantly increased in the past decades reaching 531 registered cars per 1000 inhabitants in 2016[[47]](#footnote-47). The freight transport by road increased by nearly 3% from 2006 reaching 81.1% of total land goods transport in 2016 (measured as tonnes/km)[[48]](#footnote-48), with the remaining share carried by railway transport[[49]](#footnote-49). Additionally, road transport significantly contributes to the negative picture of the high energy intensive Slovenian economy (SIP, 2013; EC, 2015). Slovenian Industrial Policy (2013) suggests, the country should invest in green innovation and develop eco products in order to tackle the issue of low material productivity (GDP/resources used) and create a less energy intensive economy. This is further supported by the Slovenia’s Smart Specialisation Strategy (2017) aiming for production of sustainable bio-balanced materials, and supporting development of technologies for (re)use of (secondary) materials and waste, and production of energy from RES. Similarly, the national experts thought the energy import dependency and thus economic dependency could be significantly decreased by the envisaged transition of Slovenia to a circular economy and most importantly the percentage of RES in the future energy mix of the country. The overall share of RES in the gross final energy consumption has been increasing since 2006 and has reached a maximum of 22.41% in 2013, meaning Slovenia was on track to achieve the 25% target by 2020 (EC, 2015). However, the percentage of RES has since declined by 1.12% reaching 21.29%[[50]](#footnote-50) in 2016. As shown by the EC (2015) report Slovenia is some way behind the EU average in terms of low-carbon technology patent applications as well as share of public energy and environment R&D expenditure. A report from EC (2018) states that small and medium sized enterprises (SMEs) in Slovenia have low ambitions regarding energy savings as well as material and waste reduction. Only 14% of SMEs reported they will take actions towards energy efficiency, and only 10% plan to minimise waste, with similar percentage aiming to save material (11%), recycle (7%), and save water (10%; EC, 2018). This suggests that significant changes will be required if the Slovenia is to achieve its’ ambition to transit to a low-carbon economy through large-scale uptake of RES, and through this reduce the economic and energy dependence challenges the country faces.  |
| Overview of existing policy/strategy | As an EU member state and signatory to international treaties Slovenia is bound to implement the EU legislation and among others follow the UN Sustainable Development Goals (SDGs). The EU energy sector Directives (e.g. Energy Efficiency Directive, Energy efficiency of Buildings Directive, RES Directive) as well as the SDGs, in particular SDG 7 (affordable and clean energy), SDG 9 (industry, innovation, and infrastructure) and SDG 13 (climate action) could encourage the country’s efforts to increase energy efficiency, and become less energy import dependent on other countries. This would also to some degree decrease economic dependence. At national level, the most important strategic document to address the identified implications is the Slovenian Development Strategy (SDS). The implementation of the following 4 objectives of SDS would decrease the economic as well as energy import dependence:* “Economic stability” which is the 5th SDS goal, is a prerequisite for the high life quality and standard. Achieving that by supporting sustainable development, innovation and green growth to diminish the development gap between Slovenia and other countries would also strengthen economic and energy independence of the country.
* The 6th goal “Competitive and socially responsible corporate and research sector” looking to address the issue of Slovenian reduced competitiveness by putting research and innovation towards green technologies in the focus of development polices. This would encourage investments in green technologies and support the uptake of RES in Slovenia which would have positive impacts on economy and decrease energy imports.
* According to the Strategy goal 8 “Low carbon-circular economy” is a priority development objective of the entire national economy. It is envisaged to increase the energy and material use efficiency and uptake of RES, which would lead to decreased energy use and diminished sources import on which the country is currently heavily dependent. The document recognises the importance of suitable (public) transport infrastructure and mobility to support the transition to a low carbon circular economy and to close the material loop and support the logistics of sources return.
* The goal 9 “Sustainable resource management” is to ensure the protection of strategic national goods such as quality water and food, to decrease country’s vulnerability by implementing ecosystem management of natural resources.

The strategic policy documents that will further support the uptake of RES to decrease energy imports and economic dependence are Energy Concept For Slovenia (EKS-when adopted) and National Energy Efficiency Action Plan 2017-2020.  |
| **Policy gaps and needs/ vulnerabilities**  | Share of transit transport (it will be accessible with final installation of the electronic toll collecting system by DARS carried out by summer 2017) |

Note:

Slovenian policy documents included in this reference list published by The government of the Republic of Slovenia are referenced according to the name of the document

**References:**

Blăjuţ, L.P., 2015. The multinational companies investments in central and Eastern European Union. *Procedia Computer Science*, *65*, pp.1134-1139.

European Commission (EC; 2015). Towards an Energy Union, Country factsheet Slovenia

European Commission (EC; 2018). Flash Eurobarometer 456. Report. SMEs, resource efficiency and green markets

E3. Modelling. Energy, Economy and Environment (2017). Končno poročilo- priprava dolgoročnih energetskih bilanc do leta 2035 in okvirno do leta 2055. Naročinik: Ministrsto za Infrastrukturo (Final report- preparation of long-term energy balances by 2035 and indicative until 2055. Prepared for the Slovenian Ministry of Infrastructure) Available at: <http://www.energetika-portal.si/fileadmin/dokumenti/publikacije/eks/razprava_jun_2017/eks_priloga2.pdf> (Accessed 23 March 2018)

National Reform Programme 2017-2018 (2017). *Published by The government of the Republic of Slovenia*

OECD (2012). Economic and Physical Context. In: Slovenia, Towards a strategic and efficient state. *OECD Publishing*

Slovenian Development Strategy (SDS; 2017). *Published by The government of the Republic of Slovenia*

Slovenian Industrial Policy (SIP; 2013). *Published by The government of the Republic of Slovenia*

Slovenia’s Smart Specialisation Strategy S4 (2017). Government Office for Development and European Cohesion. Republic of Slovenia.

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| **Implication title**  | *Increased privatisation of natural resources (GMT 7)*Note: Discussion with experts following the workshop suggests that this implication in Slovenia is particularly a factor of insufficient governance and management of natural resources |
| **Scoping result**From workshop 1 | **Estimated likelihood***(high/low)* | **Magnitude****of effect***(High/low)* | **Timescale over which implication may occur[[51]](#footnote-51)** |
|  | High | High | Medium term |
| **Implication description**  | ***Implication summary***As described in SOER 2015 GMT7: Intensified competition for resources underpinned by global economic growth, expansion of global middle class, and technological developments will lead to increased resource extraction. Slovenia has abundant and high quality water resources. Therefore, a concern was raised among the national experts at the workshop held in Ljubljana in November 2017 that this increased global competition might lead to increased foreign investments in resource extraction and pressures for privatisation of natural resources (particularly water) in the country. ***National trends and observations***At the first workshop the experts considered the following factors might underpin the privatisation of natural resources in Slovenia: * Some natural resources (e.g. timber ,water and non-metal mineral resources) are undervalued
* On the other hand the prices of the natural resources are rising due to the changing consumption patterns and influences from global markets
* There are opportunities arising to increase profit from the exploitation of natural resources (especially water), as they might have a long term investment potential, but the system for proper resource control/management should be established first
* There are great differences in the quality of public management of natural resources
* Land, especially agricultural and open space, are under the pressure of urbanisation (e.g. infrastructure development and the spread of settlements).
* Shifts in political power

During the scoping workshop, some experts expressed that the privatisation of natural resources could be prevented by policy mechanisms. However, this opinion was opposed by other experts who felt that the shift in political power could affect the political will and legislation and thus enable the privatisation.***Related global drivers and trends***The increased privatisation of natural resources in Slovenia is strongly related to the global competition for resources (GMT7: Intensified global competition for resources). However, the implication will be further underpinned by the increasing global population (GMT 1: Diverging global population trends), global economic growth and related changes in consumption patterns (GMT 5: Continued economic growth?). There have been concerns expressed by the national experts that in light of the international trade agreements like NAFTA[[52]](#footnote-52) and CETA[[53]](#footnote-53) increased foreign investments in resource extraction might increase privatisation of abundant high quality natural (water) resources in Slovenia.  |
| **Summary of existing evidence**  | The experts at the workshop in Ljubljana evaluated this implication to be high in likelihood. Although the magnitude of the effect was also considered to be generally high, the opinions among experts were divided. Some of them thought the effect of the implication will be less significant (low to medium) as the privatisation of natural resources will be prevented by adequate policy mechanisms. However other experts considered that the privatisation has already started. The consequences were estimated to occur in a medium time frame. As stated by the experts, and also stated in the Note to the EU Trade Policy Committee (dated 14 September 2016)[[54]](#footnote-54) concerns about the privatisation of national natural water resources are related to the international trade agreements intended to ease the exportation of goods and services between countries (e.g. NAFTA and CETA) and Slovenia’s objectives for economic growth. As introduced by Slovenian development policy documents (e.g. new Slovenian Development Strategy- SDS, and Slovenian Industrial Policy-SIP) internationalisation of the national economy is critical for the country to catch up with more developed EU economies. According to Eurostat, in 2016 the GDP of Slovenia was 19,600 euro/capita which is 1.5 times lower than the EU28 average[[55]](#footnote-55). To increase competitiveness and achieve economic stability of the national economy an increase in (direct) foreign investments is considered crucial (SDS, 2017; EC, 2015; SIP, 2013). As stated by experts during the scoping workshop extraction of abundant high quality water resources in Slovenia might be an interesting long term investment for foreign corporations, which could possibly be supported by the county’s political interest for economic prosperity. This could lead to increased pressures on the country for privatisation of natural resources. According to Slovenia Environment Agency in relation to the yearly total water outflow from the country, water consumption presents a fairly small part, with annual water exploitation index (WEI) of 2% in 2014[[56]](#footnote-56). The quality of drinking water supply is considered to be adequate for 85% of population (in large and medium supply areas), whereas the quality of supply in small areas is less controlled and thus more problematic[[57]](#footnote-57). Looking into the quality of groundwater bodies, which would probably be of the highest interest for the potential investors in water extraction, nearly all of the groundwater sources in the country are estimated as “good” (with high or medium reliability). This data confirms that water sources in Slovenia are abundant and of high quality, something which might be attractive for investors. During the workshop some stakeholders stated that the privatisation of natural resources in Slovenia is already happening, however the consequences of these actions are not expressed yet. The experts have expressed that the privatisation as well as changing consumption patterns could lead to an increase in resource (i.e. water) prices in global and consequently national market, which would affect the accessibility or affordability of resources for citizens. Academic and grey literature identified in this study does not confirm the global or European water prices are increasing, whilst data on water prices in Slovenia is currently not available. In terms of access, safe drinking water is, according to data from 2015, available to 93% of Slovenian population. The number of water permits and concessions which are, according to the legislation, needed for the production of beverages, thermal/mineral water spa resorts, community or private drinking water supply, irrigation, technological use etc., increased by about 1,000 from 2014 to 2016. In total more than a half of the concessions and water permits were granted to consumers for their own drinking water supply. From the data available (on prices, concessions, and accessibility) the assumptions that the privatisation of water natural resources is already taking place is difficult to confirm. The national experts also emphasised the problem of poor public management of natural resources. In their opinion privatisation of natural resources could lead to increased fragmentation of land, which would further hinder implementation of quality resources management processes and practices. The main challenge of Slovenian water management policy is a lack of an integrated approach linking relevant policies and sectors at local, regional, and national level. Furthermore, decision making processes and implementation of water policy objectives is, at state and importantly at local levels, often dependent on sometimes very short-term political interests (TC VODE, 2013). That kind of environment cannot provide stability and creates rather unpredictable conditions for businesses. Thus, in these conditions strong lobbying and influencing public decisions through formal and informal channels are parts of usual business practice. However, as also mentioned by national experts this might sometimes weaken or undermine social and environmental protection interests and objectives and even lead to shifts in political power. Such actions could potentially lead to increased pressures for privatisation of natural resources.Despite the current lack of evidence of large-scale privatisation of natural resources, the government of Slovenia have acknowledged that the privatisation of natural resources could be a serious threat to the country, and in 2016 added water to the Constitution as a fundamental right for all. Article 70 states “water resources are public good and are primarily to be used for the water supply of the population and are in this context not a commercial commodity.” Increased privatisation of natural resources could also increase pressure on water quality and supply. Pressure on water quality and supply has been identified as a separate implication of GMT7 at the workshop in Ljubljana and is presented in a separate factsheet. |
| **Overview of existing policy/ strategy**  | As introduced on the factsheet for the implication “Pressure on water quality and supply”, water sources are addressed by EU Directives (e.g. Water Framework Directive) as well as international policies such as UN Sustainable Development Goals (SDGs; especially SGD 6: clean water and sanitation).As stated before, a message that water is a fundamental right for all and not a commercial commodity is also a part of Slovenian Constitution.In Slovenia water resources are managed by the state with the main legislative document being Water Act. Water Act also implements concessions and water permits as obligatory for several water uses. The 9th goal of Slovenian Development Strategy 2030 “Sustainable and efficient resource management” if achieved it could also contribute to prevent the privatisation of natural resources.  |
| **Policy gaps and needs/ vulnerabilities**  | Lack of integration approach connecting relevant stakeholders and sectors at all governance levels (local, regional, and national) has been recognised as the main challenge of the water management policy that could also be crucial for the protection of water as a high quality resource. Additionally, common lobbying practices within this sector create risks to influencing public decisions and undermine social and environmental interests and objectives, which could increase pressures for privatisation of natural resources.  |

**Note:**

Slovenian policy documents included in this reference list published by The government of the Republic of Slovenia are referenced according to the name of the document

**References:**

Constitution of the Republic of Slovenia (1991). *Published by The government of the Republic of Slovenia*

European Commission (EC; 2015). Towards an Energy Union, Country factsheet Slovenia

Slovenian Development Strategy (SDS; 2017). *Published by The government of the Republic of Slovenia*

Slovenian Industrial Policy (SIP; 2013). *Published by The government of the Republic of Slovenia*

TC VODE (2013). Market Sector Scan of Water Management in Slovenia

Climate related implication factsheets

|  |  |
| --- | --- |
| **Implications presented** | *Extreme weather events and Infrastructure damage (both GMT9)*Due to the strong relationship between extreme weather events and damage to infrastructure this factsheet incorporates both of these implications. |
| **Implication title**  | *Extreme weather events (flooding, droughts, winds and hail) (GMT 9)* |
| **Scoping result**From workshop 1  | **Estimated likelihood***(high/low)* | **Magnitude****of effect***(High/low)* | **Timescale over which implication may occur[[58]](#footnote-58)** |
|  | High | High | short term (increasing over time) |
| **Implication title**  | *Infrastructure damage (GMT 9)* |
| **Scoping result**From workshop 1  | **Estimated likelihood***(high/low)* | **Magnitude****of effect***(High/low)* | **Timescale over which implication may occur[[59]](#footnote-59)** |
|  | High | High | short term  |
| **Implication description**  | Note: this factsheet also incorporates the implication *‘infrastructure damage’*, which was also ranked as important by experts during the scoping workshop. These two implications are linked directly as in most cases infrastructure damage is caused by extreme weather events.The climate is already changing as a result of human activities, and over coming decades, climate change is projected to increase and so will its consequences (GMT 9: Increasingly severe consequences of climate change). The IPCC 5th Synthesis Report (2014) concluded that ongoing emissions of carbon dioxide and other greenhouse gases will contribute to an increase of the global mean surface temperature change in the next two decades by 0.3°C to 0.7°C relative to 1986–2005 (IPCC, 2014). Flooding, strong winds and droughts foreseen in Slovenia are expected to become more frequent and severe in the future, thus the magnitude of such effects is assessed as being high. Such circumstances are likely to cause infrastructure becoming more vulnerable to damage. Transportation and energy infrastructure, agricultural land and forests are among the various areas where extreme weather events are causing significant damage further leading to economic disruption.Extreme weather events and infrastructure damage were identified as potentially important issues for Slovenia’s state of the environment during the expert workshop held in Ljubljana (November 2017).***Implication summary***The experts present in the 1st workshop concluded that increasing occurrence of extreme weather events in Slovenia would constitute:* Tornado-like winds causing disruption to transport etc.
* Storms causing increased risks to human health and infrastructure
* Flooding (riverine, flash floods)

***Related global drivers and trends***Increasingly severe impacts of climate change are anticipated as GHG emissions from fossil fuel burning continue to rise[[60]](#footnote-60). These emissions are mostly driven by industrialisation of economies, accelerating global resource use / consumption (GMT 5: Continued economic growth?) and continuous increase in demand for energy. Human-induced land use changes, such as the conversion of forest to cropland or infrastructure, also account for the release of additional carbon dioxide to the atmosphere, and reduce the absorption of carbon dioxide. The continuously changing climate will increase the likelihood of more intense and frequent heatwaves and cause considerable variations in global precipitation patterns with more frequent, intense rain in some regions, droughts in others.  |
| **Summary of existing evidence**  | During the expert workshop, the implication *Extreme weather events (flooding, droughts, winds and hail)*was assessed as being ‘high’ in terms of likelihood and ‘high’ (and increasing) in terms of magnitude of impacts, and that effects will be seen in the short term (experts noted that the effects are expected to increase over time). Climate change pose one of the most serious and diverse threats to human wellbeing today with the occurrence of extreme weather events which have potentially significant costs. From 2010-2018 there have been 272 occurrences of extreme weather events (e.g. ‘gustnadoes’[[61]](#footnote-61), large hail, heavy rain, tornadoes, severe wind gusts, heavy snowfalls/snowstorms) recorded in Slovenia as reported in the European Severe Weather Database[[62]](#footnote-62). Slovenia’s contributions to the SOER 2010[[63]](#footnote-63) also recognises the increasing likelihood of extreme weather events occurrence in both intensity and frequency.Various studies and outlooks conclude that the effects of climate change will not be evenly distributed but rather some areas will be affected more severely than others. Projections indicate above-average warming in the Alpine and Mediterranean region and Southern Europe, with precipitation decrease particularly in summers. Changes in Slovenia are comparable to those in the broader Alpine region (Slovenian Government office of Growth, 2008). The interaction of three major climate systems (Continental, Alpine and sub-Mediterranean) influences the precipitation regime in Slovenia. According to the reinsurance company Munich RE the overall losses from natural hazards from 2012 – 2017 added up to 800 million dollars with losses of approximately 53 million dollars in 2017[[64]](#footnote-64).In Slovenia’s recent history there have been reports of the following extreme weather events:* Droughts
* Heavy rainfall and Flooding (riverine, flash floods)
* Tornado like winds
* Storms.

Each of these is described in more detail below.**Droughts**Data on temperatures in Slovenia indicate an increase at a rate faster than the global average with the rise in annual average temperature most evident in the last three decades.[[65]](#footnote-65).In the past decades the number of hot days has been increasing, and extremely low temperatures are no longer considered the norm. A study on development scenarios for Slovenia indicate that some areas of the country show differences in the frequency in rain showers. It reports that the number of days with precipitation above 20 mm show the tendency to increase in the Goričko and Kozjansko regions, whereas the number is declining in the coastal areas, Alpine and Dinar region (Slovenian Government office of Growth, 2008). Due to general dependence on rain fed irrigation, the agriculture sector is particularly vulnerable to short and intense summer droughts. According to Slovenian Environment Agency, the groundwater level at the end of August 2017 was low to very low in the greater part of the country. The Drought Monitoring Bulletin for southeast Europe[[66]](#footnote-66) report that in some aquifers of southeastern and southwestern Slovenia, groundwater levels at certain locations reached the lowest values on record[[67]](#footnote-67). The European Drought Observatory reported several heat waves in summer of 2017 which hit major agricultural areas in Slovenia with negative effects especially on grain maize and sugar beet[[68]](#footnote-68). With agricultural drought going back to March 2017, Slovenian Environment Agency reported worse conditions over June and July (see Figure 1). Most affected regions by drought were the northeastern and southern half of Slovenia where maize was completely stopped in growth and little or no discharge was recorded in several rivers.[[69]](#footnote-69)Figure 1: 3-month overview of SPI index**Heavy rainfall and floods**The spatial variability of precipitation is high – annual precipitation varies from 1100 mm in the coastal parts of river basins to more than 3500 mm in the Julian Alps[[70]](#footnote-70).The geomorphological structure of most of the river basins in Slovenia (i.e. relatively steep slopes and/or impermeable bedrock) makes flash floods the prevailing type of floods along the majority of Slovenian watercourses (Trobec, 2017). Komac, et al. (2008) estimates that more than one eighth of the entire Slovenian territory is threatened by potential flash flooding. In terms of damage caused, flooding falls immediately after droughts and hail events at the top of the list of natural disasters in Slovenia (Zorn, et al.2011). There is a prevailing opinion in the country that floods are increasingly frequent and violent while induced by the large media visibility and significant physical damage to infrastructure (Trobec, 2017). This is supported by analysis of river discharge rates which suggest that after 1996 there are increasingly frequent high water events, leading to riverine floods in flood-prone areas (Kobold, 2011). Furthermore, the discharge peaks are increasingly approaching historical records and occasionally exceeding them in certain catchments which is particularly true for small watercourses (Trobec, 2017). A recent EEA report highlights a study on economic and health risks from river floods in Europe. While using a high climate change scenario the study concludes that Slovenia is among the countries projected to have the strongest increase in flood risk based on expected annual population affected (EEA, 2017).In contrast, Frantar, et al. (2008) argue that the existing long term evidence does not point to a statistically significant increase in flood risk. Additionally Šraj, et al. (2016) found a statistically significant increasing trend of 10- year return period discharges in only 5% of studied gauging stations. This study also argues that the generation of river runoff is a complex process, which depends on multiple factors and concludes that no clear pattern of river discharge can be detected in Slovenia. Local characteristics, such as land-use changes, urbanisation, dam construction, and river training works, have an important impact on the analysed trends of river discharge (Šraj et al. 2016).The peer-reviewed literature suggests that the most frequent and severe floods mainly occur in spring and autumn (Mikoš, et al., 2004), but also in summer, when it is flash flooding that is typically recorded (Trobec, 2017). Furthermore, in different parts of the country seasonal flash flooding occurs at a varying frequency. Trobec (2016), for example, notes that autumnal flash floods occur across most of the country, while summer flash floods occur primarily in the East, where to a greater extent one can already see the influence of continental climatic factors.In September 2007 Slovenia witnessed one of the most severe meteoro-hydrological natural disasters on record with up to 350–400 mm of rainfall in 12 hours These heavy rains in some municipalities in the Northern, North-Western and North-Eastern Slovenia led to floods, landslides, movement of debris, etc. and caused damage to a number of buildings, infrastructure and agricultural land (Zanon et al., 2010).Changes in precipitation can fundamentally alter environmental conditions as climate influences the landscape, flora and fauna, availability of water resources and their quality, and determine natural capacity of the environment to bear the burden of pollution and eliminate or degrade pollutants.In the existing outlook studies precipitation data manifests a high degree of ambiguity in the future periods, but simulations agree on a general trend pointing to less precipitation in the summer. A study on climate change impacts on availability and safety of public drinking water indicated trends in the direction of longer duration of dry spells (increasing risk of prolonged droughts) and greater maximum daily rainfall (increasing risk of floods). It concluded that there is no significant summer trend and a strong autumn trend in the direction of greater maximum daily rainfall.[[71]](#footnote-71) **Winds** Wind conditions in Slovenia are determined by its geographical position east of the Alps and in the vicinity of the Mediterranean Sea. Bora is the strongest wind in Slovenia with high velocity as it can increase or decrease 10-fold within a moment. Regions with the strongest bora winds are found in the south-western parts of Slovenia (Slovene Littoral) including the city of Koper with its climate being dominated by the bora wind[[72]](#footnote-72). In January 2017 hurricane strong bora winds were reported in western Slovenia with gusts reaching up to 187 km/h[[73]](#footnote-73). **Storms**Ice storms (sleet) are reported to take place every few years, especially in the southwest of Slovenia. A strong ice storm which causes considerable economic damage occurs on average every 50 years, while smaller storms are much more frequent[[74]](#footnote-74).Storms are also common over the summer period with strong winds and occasionally large pieces of hail causing risks to human health and infrastructure[[75]](#footnote-75). The number of days with thunderstorms shows a tendency to increase mainly in the East of Slovenia and a decline in the prevailing part of the South Slovenia (Slovenian Government office of Growth, 2008). According to estimations, in recent history, extreme weather conditions in particular, have brought the rise of mean sea level along the Slovenian coast. Available data indicates that over the past twenty years, the sea level along the Slovenian and Adriatic coast has been rising at a rate surpassing European and global trends. Such ongoing trends could lead to daily flooding of low-lying urban areas along the coast by the end of the century if infrastructure is not adapted accordingly[[76]](#footnote-76). **Infrastructure damage**Extreme weather events and infrastructure damage are closely connected to one another because what happens in the natural environment is often causing harm to society. Infrastructure damage is considered as a direct damage which occurs during the disaster itself (e.g., damaged buildings, road/rail and energy infrastructure, destroyed crops etc.). ***Damage from storms*** At the end of January and at the beginning of February 2014, severe and long-lasting freezing rain affected a major part of Slovenia. It caused considerable damage to forests and forest roads, as well as energy infrastructure. The most affected regions were without electrical power for up to ten days. There was also severe damage to railway infrastructure – in particular the connection between Ljubljana and the coastal city of Koper. The storm had damaged the pylons of power lines and for more than a year only diesel locomotives maintained rail transport from and to the Port of Koper (Markosek et al. 2015). Furthermore, the Forest Service of Slovenia reported that the storm had damaged more than half a million hectares of forest. Seven million cubic meters of timber had to be felled, while 660 hectares of forest were planned to be cut down completely to plant new trees instead[[77]](#footnote-77). The total damage to forests and forest roads, power and railway infrastructure and the economy was estimated to be 400 million EUR (Markosek et al. 2015).According to OECD the costs of road and rail infrastructure maintenance has significantly increased for Slovenia from 2000-2015. In this period the road infrastructure maintenance has inflated by 59.4% and rail maintenance by 1471.4%[[78]](#footnote-78).***Damage from floods***In November 2012 more than 100 municipalities in Slovenia were affected by floods with total damage exceeding 200 million Euros. As a result these floods caused damage agricultural areas, industry, civil engineering works (transport infrastructure, distribution piping, water facilities, etc.), water courses and buildings[[79]](#footnote-79).***Damage from droughts*** Agricultural drought is causing lost or heavily reduced maize crops, grassland, severely affected were also fruit and olive trees as well as vine. |
| **Overview of existing policy/ strategy**  | In 2016 the Strategic Framework for Climate Change Adaptation which provides a strategic framework and guidelines for integrating adaptation to climate change into policies, measures and actions to a greater extent in Slovenia. The main objective of this framework is to reduce Slovenia’s exposure, sensitivity and vulnerability to climate change impacts and increase the climate resilience and adaptive capacity of society. Under the conditions of timely and complete implementation of sectoral policies (which are mostly derived from mutually agreed European policies), the adaptation process in Slovenia is expected to run largely automatically and without any major additional costs. Key European directives relevant to these implications include the Water Framework Directive, Floods Directive and the EU Adaptation Strategy.To mitigate the occurrence of extreme weather events and damage to infrastructure such events cause, Slovenia is bound to meet the UN Sustainable Development Goals (SDGs), especially SDG13 (climate action).Additionally, the new Slovenian Development Strategy 2030 includes two goals, which are closely linked to this implication:* “Sustainable and efficient resource management” is the 9th goal of the Strategy and recognises the importance of high quality natural resources (water, food, timber etc.) for ensuring a higher level of self-sufficiency. This goal acknowledges the negative impacts of climate change on food systems noting the dependency of food production on weather conditions. Considering the close interlinkages between natural resource management and weather conditions it is likely that the implication *Extreme weather events (flooding, droughts, winds and hail)* will have some influence on the success of achieving this goal.
* “Safe and globally responsible Slovenia” is the 11th goal of the Strategy with one of the measures to achieve this target being “to promote prevention and capacity building for the comprehensive management of natural and other hazards”.
 |
| **Policy gaps and needs/ vulnerabilities**  | * Flood risk assessment including climate change impacts
* Drought risk/vulnerability assessment including climate change impacts
* Climate scenarios for winds (only precipitation and temperature available so far[[80]](#footnote-80))
* Vulnerability assessment for infrastructure
* Improved assessment of climate impacts in SEA and EIA
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**References:**

EEA, 2017. Climate change adaptation and disaster risk reduction in Europe Enhancing coherence of the knowledge base, policies and practices. EEA Report No 15/2017

Kobold, M. 2011. Comparison of floods in September 2010 with registered historic flood events. Ujma 25, 48–56. (in Slovene with English abstract)

Komac, B., Natek, K., Zorn, M. 2008. Geografski vidiki poplav v Sloveniji. Založba ZRC, Ljubljana, 180 pp. (in Slovene with English abstract)

Markosek, J.: Severe freezing rain in Slovenia, The European Forecaster, Newsletter, 38–42. Available at:  http: //www.euroforecaster.org/latenews/meteosi.pdf

Mikoš, M., Brilly, M., Ribičič, M. 2004. Floods and Landslides in Slovenia. Acta hydrotechnica 22, 113– 133.

Mojca Šraj, Matevž Menih & Nejc Bezak (2016) Climate variability impact assessment on the flood risk in Slovenia, Physical Geography, 37:1, 73-87, DOI: 10.1080/02723646.2016.1155389

Slovenian Government office of Growth, 2008. Development Scenarios for Slovenia to 2035: Trends and opportunities in the times of climate change. Composed by Scenario Development. Available at: <https://circabc.europa.eu/webdav/CircaBC/MARE/steccostclimat/Library/country_information/slovenia/Development%20scenarios%20for%20Slovenia%20to%202035.pdf>

Trobec, T. 2017. Frequency and seasonality of flash floods in Slovenia. Geographica Pannonica. 21. 198-211. 10.5937/gp21-16074.

Trobec, T. 2016. Spatio-temporal distribution of flash floods in Slovenia. Dela 46, 21–39.

Zanon, F., et al. 2010. Hydrological analysis of a flash flood across a climatic and geologic gradient: The September 18, 2007 event in Western Slovenia. J. Hydrol., doi:10.1016/j.jhydrol.2010.08.020

Zorn, M., Komac, B. 2011. Damage caused by natural disasters in Slovenia and globally between 1995 and 2010. Acta geographica Slovenica 51, 7–41.

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| --- | --- |
| **Implication title**  | *Food security* *(related to GMT 9: Increasingly severe consequences of climate change)* |
| **Scoping result**From workshop 1 | **Estimated likelihood***(high/low)* | **Magnitude****of effect***(High/low)* | **Timescale over which implication may occur[[81]](#footnote-81)** |
| High | Low | Short term (low magnitude) |
| High | Medium/long term (some present aspects will significantly increase with time) |
| **Implication description**  | ***Implication summary***Acknowledged in SOER 2015, *GMT9: Increasingly severe consequences of climate change*, is largely caused by human activities such as burning of fossil fuels, agriculture and deforestation. Climate projections indicate that in coming decades these activities will induce harm to ecosystems, increase negative impacts on global agriculture, and progressively threaten global food security. National experts at the workshop held in Ljubljana in November 2017, also recognised food security as an implication that might occur and affect Slovenia in future. ***National trends and observations***According to experts at the workshop the following factors are potentially influential for food security in Slovenia: * Food security will largely depend on the global (food) market
* Developments in the global market will affect the domestic food prices
* Increase in the occurrence of extreme weather events and related damage to crops which in turn will impact the food quality and variety as well as agricultural production, and availability of food for livestock
* Additional investments in chemical (e.g. plant protection products) and physical (e.g. anti-frost windmills) measures for crop protection due to extreme weather conditions.
* Increase in biofuel production and subsequent change in the use of agricultural land
* Abandonment of agricultural land
* Opportunities arising from possible extension of growing season and more sustainable production of qualitative food
* Opportunities arising from possibilities of stockbreeding on high altitude grasslands, (which are less suitable for crop growth) such as production of high quality milk products and increased income from the land that would usually be overgrown by shrubs.

Increasing pressures on food security in Slovenia could have further negative implications for human health. Negative consequences for biodiversity were also mentioned by the national experts as they predicted trade-offs between biodiversity and securing sufficient amounts of food. For example, the options to transit to extensive, organic or ecological farming could be limited as food productivity in these forms of agriculture is generally lower.***Related global drivers and trends***Future food security in Slovenia could be at a high risk due to the increasing occurrence of extreme weather events related to climate change (GMT 9: Increasingly severe consequences of climate change) such as hail storms, flooding, droughts, and long-lasting heat waves. The impacts of climate change are anticipated to become more severe as greenhouse gas emissions continue to rise[[82]](#footnote-82). Emissions are mostly underpinned by industrialisation (GMT 5: Continued economic growth?) and increasing global consumption of resources that leads to increased global competition for natural resources (GMT 7: Intensified global competition for resources). Together with the dependency on European and other regional markets this is likely to further affect food security in Slovenia. Climate change mitigation measures, and rapid technological innovation (GMT 4: Accelerating technological change), coupled with the increased resource consumption (GMT 7) are leading to and encouraging the uptake of alternative energy sources such as biofuels. However, increasing production of biofuels could further aggravate the risks related to food security due to the competition for land to cultivate suitable crops. This was also recognised by national experts as a potential issue for Slovenia at the workshop in Ljubljana. Meanwhile, confronting climate change impacts and ecosystem degradation (GMT 8: Growing pressure on ecosystems), could lead society to more sustainable patterns of food production and consumption, which the Slovenian national experts identified as an opportunity for the country.  |
| **Summary of existing evidence**  | During the expert workshop, the implication *Food security* was assessed as being ‘high’ in terms of likelihood. However, opinions about the time of the occurrence of the implication as well as the magnitude of its effect were divided. Some experts considered that the effects of the implication (e.g. volatility and increase of food prices) are already present and will become more severe with time. Others reasoned that the effects of the implication are not present yet, and although they may occur in the future their magnitude will be low. Climate change and related food security risk are becoming an increasingly important topic in Slovenia as evidence shows that in the past few years the production of crops in the country has been strongly affected by the occurrence of extreme weather events. As reported by the Agricultural Institute of Slovenia (2017) the continuing trend of the changing weather conditions has also strongly affected crop yields in 2017. The warm autumn in 2016 saw above average temperatures, whilst winter was colder than usual. Both seasons were marked by below average precipitation levels. Due to very warm and sunny weather in March 2017, the vegetation period started early. This was followed by an abrupt drop in temperatures and severe frost in May, which most affected fruit trees and grapevines across the country. The growth of agricultural products and the subsequent yields were further affected by early drought, above average summer temperatures, five heat waves with interim cooling, and low rainfall (Agricultural Institute of Slovenia, 2017). The need for investments and better knowledge to protect fruit from spring frost and secure production (especially in the valleys of Primorska region) was recognised by the national authorities as early as 2006 (Ministry of Agriculture, Forest and Food, 2006). The damaging effects of extreme weather conditions in Slovenia are further reflected in the (newly) established state financial funds, aid, and subsidies scheme designated to support the affected farmers and beekeepers and those who want to invest in climate adaptation measures (Agricultural Institute of Slovenia, 2017). In 2017, 6,761 agricultural holdings applied for the state financial aid for 348,527 ha of land. Although, the number of holdings applying for aid in 2017 was roughly the same in comparison to 2016, there was a 2% increase in the damaged land. That resulted in payments to farmers of 31.7 million EUR, which is 9% more than a year before (Agricultural Institute of Slovenia, 2017). Extreme weather events were identified as a separate implication of GMT9 at the workshop in Ljubljana. This is further explored in a separate factsheet titled *Extreme weather events and Infrastructure damage* which includes some reflections on agriculture.The following statistics, presented by the Slovenian Statistics Office (SORS, 2016) for the period from 2006 to 2015, could further support the concerns related to food security as indicated by the national experts at the workshop:* the area of arable land per capita has decreased by 6%
* the area of cereals per capita has decreased by 2 %
* the number of agricultural holdings (majority of which are family farms) in this period has declined by 7% from 75,340 in 2007 to 70,063 (2016)
* the utilised agricultural area per capita has declined by 5%.

Slovenia has also traditionally been, and continues to be a net importer of food, as it does not meet its own national demand for agricultural products (SORS, 2014). As reported in 2016 the level of self-sufficiency (showing the percentage of its own consumption needs that the country meets) was the lowest for vegetable (42%), fresh fruit (44%), and potato (55%; SORS, 2017). However, in comparison to 2013, the level of self-sufficiency in 2016 for potato has risen by nearly 10% and same for vegetables (SORS, 2014; 2016). Nevertheless, despite the relatively low rates some experts still believe that Slovenia has enough arable land and water resources that it could reverse the negative trend and significantly increase its self-sufficiency by 2030 (Plut, 2012).In the light of climate change, Slovenia is acknowledging the importance of resilient food systems by prioritising self-sufficiency, regulation of the environmental effects in agriculture, traceability and local use of agricultural products (SORS, 2016).  |
| **Overview of existing policy/ strategy**  | The Strategic Framework for Climate Change Adaptation (Ministry of Environment and Spatial Planning of the Republic of Slovenia, 2016) provides a strategic framework, objectives and guidelines for integration of climate change impacts into policies and practice in Slovenia on national, regional and local level. As stated, the main objective of this framework is to reduce Slovenia’s exposure, sensitivity and vulnerability to climate change impacts and increase the climate resilience and adaptive capacity of society. The document complements the activities taken by the EU in shape of the Common Agricultural Policy (CAP) which recognises that sustainable agriculture is key for sustainable economic development. To mitigate the occurrence of extreme weather events and damage to agriculture, Slovenia needs to meet the UN Sustainable Development Goals (SDGs), especially SDG13 (climate action).Additionally, the 9th goal of the new Slovenian Development Strategy 2030 (SDS; 2017) “Sustainable and efficient resource management” recognises the importance of food as a high quality domestic resource for ensuring a higher level of self-sufficiency. It also acknowledges the negative impacts of climate change on food systems emphasising the dependency of food production on weather conditions.  |
| **Policy gaps and needs/ vulnerabilities**  | To be discussed in the risks/opportunities workshop |

**Note:**

Slovenian policy documents included in this reference list published by The Government of the Republic of Slovenia are referenced according to the name of the document

**References:**

Agricultural Institute of Slovenia (2017). Prva ocean stanja v kmetijstvu 2017 (The first etstimate of the situation in agriculture 2017). Available at: <http://www.kis.si/f/docs/Porocila_o_stanju_v_kmetijstvu_OEK/Jesensko_ZP_2017.pdf> (Accessed 9 March 2018)

Statistical office of the Republic of Slovenia (SORS; 2014). Nekaj ščepcev o hrani (A few pinches about food). Available at: <http://www.stat.si/statweb/File/DocSysFile/5650> (Accessed 9 March 2018)

Statistical office of the Republic of Slovenia (SORS; 2016). Climate is changing, food and agriculture should too. Available at: <http://www.stat.si/StatWeb/en/News/Index/6257> (Accessed 9 March 2018)

Statistical office of the Republic of Slovenia (SORS; 2017). Najnižja stopnja samooskrbe v bilancah zelenjave, svežega sadja in krompirja (The lowest levels of self-sufficiency in the balance-sheets of vegetables, fresh fruit and potato). Available at: <http://www.stat.si/StatWeb/News/Index/6733> (Accessed 9 March 2018) Plut, D.,

Plut, D. (2012). Prehranska varnost sveta in Slovenije. *Dela*, (38), pp.5-23.

Slovenian Development Strategy (SDS; 2017). *Published by The government of the Republic of Slovenia*

Ministry of Environment and Spatial Planning of the Republic of Slovenia (2016). Strategic Framework for Climate Change Adaptation

Ministry of Agriculture, Forestry and food (2006). Zaščita pred spomladansko pozebo (Protection against the spring frost). Available at: <http://www.mkgp.gov.si/fileadmin/mkgp.gov.si/pageuploads/publikacije/Namakanje/10_Zascita_pred_spomladansko_pozebo.pdf> (Accessed 15 March 2018)

1. Initial suggestions of risks and opportunities for the state of environment in Slovenia

The results from the scoping assessment in Session 2 of the first workshop and the information reviewed and presented in the implication factsheets presented in Section 3 have been used to identify some initial potential risks and opportunities that may arise from these implications.

This tentative list is presented in Table 3 below, and is intended to provide some initial ideas and to spark discussion at the second workshop in Ljubljana and therefore should not be considered exhaustive.

**Table 3 Initial identification of risks and opportunities resulting from each implication**

| **Implication**  | **Initially identified risks** | **Initially identified opportunities**  |
| --- | --- | --- |
| **Environmental pressures cluster** |
| Increased privatisation of natural resources | * increase in resource (i.e. water) prices in global and consequently national market
 | * foreign investments from privatisation invested into areas reducing environmental pressures
 |
| Increasing environmental burden | * Cause significant losses to ecosystem services in Slovenia
* Damage to / loss of traditional rural livelihoods (forestry, hunting, small-holdings)
* Damage to tourism
 |  |
| **Resources and economy cluster** |
| Economic and Energy import dependence | * Dependence on critical resources could have impacts on economic development and living standards.
* Possibly increase pressure on local natural resources and add to the growing volume of imported resources to Slovenia.
* Increasing dependence on trade and insecure access to resources could result in tensions regarding competing claims over resource stocks or indirectly as a result of restricted trade flows.
* Changes in supply and/or price affect the existing industries in Slovenia
 | * Incentive for the government and private sector to invest in research and innovation aimed at using existing resources more efficiently and accessing / extracting new resources (where available) in Slovenia
* invest in green innovation and develop eco products
 |
| Pressure on water quality and supply | * Technological innovations add pressures on water overexploitation by increasing hydropower generation in Slovenia
 | * More efficient and economically viable use of renewable resources from technological innovations
* incentives for private and public investment in exploiting renewable energy sources (RES) and energy efficiency measures as national energy demand, lack of diverse energy mix and the significant dependence on oil and gas imports may be considered vulnerabilities
 |
| **Climate cluster** |
| Extreme weather events and Infrastructure damage | * Alteration of ecosystems (e.g. soil erosion, desertification)
* Disruption of food production and water supply (e.g. water shortages, land use change, agricultural land abandonment, damage to crops),
* Damage to infrastructure and settlements.
 |  |
| Food security  | * Negative impact on yields and increased food demand could leave Slovenia vulnerable to ensure sufficient and affordable food from local production
* Increased food prices that would affect food affordability for safe, healthy and nutritious products
* Limited land available for agriculture due to droughts and soil erosion
* Flood damages resulting in physical, economic, social and environmental costs
 |  |

1. <http://vensim.com/> [↑](#footnote-ref-1)
2. *Short term (to 2020); medium term (2020–2030); long term (2030–2050)* [↑](#footnote-ref-2)
3. *Short term (to 2020); medium term (2020–2030); long term (2030–2050)* [↑](#footnote-ref-3)
4. According to Pew Research Center analysis of data from the World Bank PovcalNet database – in 2011, 85% of Slovenia’s population had middle ($10.01-20 daily) or upper-middle ($20.01-50 daily) income. [↑](#footnote-ref-4)
5. <https://data.oecd.org/gdp/real-gdp-forecast.htm> [↑](#footnote-ref-5)
6. <http://pxweb.stat.si/pxweb/Dialog/varval.asp?ma=2706101E&ti=&path=../Database/Environment/27_environment/02_waste/01_27061_waste_removal/&lang=1> [↑](#footnote-ref-6)
7. <http://pxweb.stat.si/pxweb/Dialog/varval.asp?ma=3268902E&ti=&path=../Database/Environment/32_sustainable_development/10_balance_modesty/05_32689_natural_resources/&lang=1> [↑](#footnote-ref-7)
8. <http://pxweb.stat.si/pxweb/Dialog/varval.asp?ma=2706312E&ti=&path=../Database/Environment/27_environment/02_waste/02_27063_production_waste/&lang=1> [↑](#footnote-ref-8)
9. <http://pxweb.stat.si/pxweb/Dialog/varval.asp?ma=1817902E&ti=&path=../Database/Environment/18_energy/01_18179_balance_indicators/&lang=1> [↑](#footnote-ref-9)
10. <http://www.stat.si/StatWeb/en/News/Index/7001> [↑](#footnote-ref-10)
11. <http://www.stat.si/StatWeb/en/News/Index/6679> [↑](#footnote-ref-11)
12. <http://pxweb.stat.si/pxweb/Dialog/varval.asp?ma=1530402E&ti=&path=../Database/Environment/15_agriculture_fishing/07_consumption/05_15304_irrigation/&lang=1> [↑](#footnote-ref-12)
13. <http://pxweb.stat.si/pxweb/Dialog/varval.asp?ma=1529210E&ti=&path=../Database/Environment/15_agriculture_fishing/10_15292_agri_environm/&lang=1> [↑](#footnote-ref-13)
14. <http://online.sfsu.edu/jerry/geog810/1999/Perry.html> [↑](#footnote-ref-14)
15. <http://kazalci.arso.gov.si/print?ind_id=756&lang_id=94> [↑](#footnote-ref-15)
16. <http://www.arso.gov.si/en/soer/air_pollution.html> [↑](#footnote-ref-16)
17. [http://gis.stat.si/?id=t131&idl=t384&tag=2614&cba=-13.8,-2.1,-2,-0.1,0,1.9,2,3.9000000000000004,4,48.9&c=feedde,fdbe85,fd8d3c,e6550d,a63603&o=0.6799999999999999&lang=en&t=terrain&z=8&lat=46.14563925179147&lng=15.003473869140652#](http://gis.stat.si/?id=t131&idl=t384&tag=2614&cba=-13.8,-2.1,-2,-0.1,0,1.9,2,3.9000000000000004,4,48.9&c=feedde,fdbe85,fd8d3c,e6550d,a63603&o=0.6799999999999999&lang=en&t=terrain&z=8&lat=46.14563925179147&lng=15.003473869140652) [↑](#footnote-ref-17)
18. <http://gis.stat.si/?id=t131&idl=t346&tag=3169&cba=-35.9,-5.1,-5,-0.1,0,4.9,5,9.9,10,40.7&c=ffffd4,fed98e,fe9929,d95f0e,993404&o=0.62&lang=en&t=terrain&z=8&lat=46.14278481583059&lng=15.008716789062532> [↑](#footnote-ref-18)
19. <http://pxweb.stat.si/pxweb/Dialog/varval.asp?ma=2750105E&ti=&path=../Database/Environment/27_environment/03_27193_water/01_27501_public_water_supply/&lang=1> [↑](#footnote-ref-19)
20. <http://www.stat.si/StatWeb/en/News/Index/6750> [↑](#footnote-ref-20)
21. <http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-projections-/database> [↑](#footnote-ref-21)
22. *Short term (to 2020); medium term (2020–2030); long term (2030–2050)* [↑](#footnote-ref-22)
23. <https://data.oecd.org/gdp/real-gdp-forecast.htm#indicator-chart> [↑](#footnote-ref-23)
24. <https://www.automotiveworld.com/analysis/water-water-everywhere-vehicle-manufacturing/> [↑](#footnote-ref-24)
25. <http://pxweb.stat.si/pxweb/Dialog/varval.asp?ma=3268604E&ti=&path=../Database/Environment/32_sustainable_development/05_well_being/05_32686_quality_nat_resources/&lang=1> [↑](#footnote-ref-25)
26. <http://www.arso.gov.si/en/soer/freshwater.html> [↑](#footnote-ref-26)
27. <http://www.stat.si/StatWeb/en/News/Index/6859> [↑](#footnote-ref-27)
28. <https://data.oecd.org/gdp/real-gdp-forecast.htm> [↑](#footnote-ref-28)
29. <http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_gind&lang=en> [↑](#footnote-ref-29)
30. <http://www.stat.si/StatWeb/en/News/Index/7227> [↑](#footnote-ref-30)
31. <http://pxweb.stat.si/pxweb/Dialog/varval.asp?ma=2750310E&ti=&path=../Database/Environment/27_environment/03_27193_water/03_27503_business_entities/&lang=1> [↑](#footnote-ref-31)
32. <https://www.statista.com/statistics/455925/urbanization-in-slovenia/> [↑](#footnote-ref-32)
33. <http://www.arso.gov.si/en/soer/freshwater.html> [↑](#footnote-ref-33)
34. <http://www.stat.si/StatWeb/en/News/Index/6679> [↑](#footnote-ref-34)
35. <http://pxweb.stat.si/pxweb/Dialog/varval.asp?ma=2722207E&ti=&path=../Database/Environment/27_environment/03_27193_water/04_27222_irrigation/&lang=1> [↑](#footnote-ref-35)
36. <http://www.arso.gov.si/en/soer/freshwater.html> [↑](#footnote-ref-36)
37. <https://www.slovenia.info/en/business/research-and-analysis/slovenian-tourism-in-numbers> [↑](#footnote-ref-37)
38. <http://www.stat.si/StatWeb/en/News/Index/7014> [↑](#footnote-ref-38)
39. <http://pxweb.stat.si/pxweb/Dialog/varval.asp?ma=2700002E&ti=&path=../Database/Environment/27_environment/01_27000_indicators/&lang=1> [↑](#footnote-ref-39)
40. <http://www.arso.gov.si/en/soer/freshwater.html> [↑](#footnote-ref-40)
41. *Short term (to 2020); medium term (2020–2030); long term (2030–2050)* [↑](#footnote-ref-41)
42. TEŠ- Thermal Power Plant Šoštanj [↑](#footnote-ref-42)
43. [http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Real\_GDP\_growth,\_2006-2016\_(%25\_change\_compared\_with\_the\_previous\_year;\_%25\_per\_annum)\_YB17.png](http://ec.europa.eu/eurostat/statistics-explained/index.php/File%3AReal_GDP_growth%2C_2006-2016_%28%25_change_compared_with_the_previous_year;_%25_per_annum)_YB17.png) [↑](#footnote-ref-43)
44. <http://www.stat.si/StatWeb/en/News/Index/7227> [↑](#footnote-ref-44)
45. <http://www.stat.si/StatWeb/en/News/Index/6672> [↑](#footnote-ref-45)
46. <http://www.stat.si/StatWeb/en/News/Index/7001> [↑](#footnote-ref-46)
47. <http://pxweb.stat.si/pxweb/Dialog/varval.asp?ma=2221103s&ti=&path=../Database/Ekonomsko/22_transport/01_22211_transport_panoge/&lang=2> [↑](#footnote-ref-47)
48. <http://pxweb.stat.si/pxweb/Dialog/Saveshow.asp> [↑](#footnote-ref-48)
49. <http://kos.arso.gov.si/en/content/volume-and-structure-freight-transport> [↑](#footnote-ref-49)
50. <http://pxweb.stat.si/pxweb/Dialog/Saveshow.asp> [↑](#footnote-ref-50)
51. *Short term (to 2020); medium term (2020–2030); long term (2030–2050)* [↑](#footnote-ref-51)
52. NAFTA-North American Trade Agreement [↑](#footnote-ref-52)
53. CETA- new trade agreement between EU and Canada [↑](#footnote-ref-53)
54. Note for the attention of the Trade Policy Committee. Subject: Questions of Slovenia relating to provisions on water in CEFTA (14 September 2016) [↑](#footnote-ref-54)
55. http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tec00001&plugin=1 [↑](#footnote-ref-55)
56. http://kazalci.arso.gov.si/?data=indicator&ind\_id=761&lang\_id=94 [↑](#footnote-ref-56)
57. <http://kazalci.arso.gov.si/?data=indicator&ind_id=827&lang_id=94>

\* http://kos.arso.gov.si/en/content/land-cover-and-land-use-0 [↑](#footnote-ref-57)
58. *Short term (to 2020); medium term (2020–2030); long term (2030–2050)* [↑](#footnote-ref-58)
59. *Short term (to 2020); medium term (2020–2030); long term (2030–2050)* [↑](#footnote-ref-59)
60. <https://www.carbonbrief.org/analysis-global-co2-emissions-set-to-rise-2-percent-in-2017-following-three-year-plateau> [↑](#footnote-ref-60)
61. <http://forecast.weather.gov/glossary.php?word=GUSTNADO> [↑](#footnote-ref-61)
62. <http://www.eswd.eu/cgi-bin/eswd.cgi> [↑](#footnote-ref-62)
63. <http://www.arso.gov.si/en/soer/> [↑](#footnote-ref-63)
64. [http://natcatservice.munichre.com/(selection:country)?filter=eyJ5ZWFyRnJvbSI6MjAxMiwieWVhclRvIjoyMDE3fQ%3D%3D&type=3](http://natcatservice.munichre.com/%28selection%3Acountry%29?filter=eyJ5ZWFyRnJvbSI6MjAxMiwieWVhclRvIjoyMDE3fQ%3D%3D&type=3) [↑](#footnote-ref-64)
65. http://kos.arso.gov.si/en/content/precipitation-and-temperatures-2 [↑](#footnote-ref-65)
66. An output from the Drought Management Centre for South-eastern Europe projectin the framework of the Transnational Cooperation Programme [↑](#footnote-ref-66)
67. <http://www.dmcsee.org/uploads/file/427_dmcsee_bulletin_august2017.pdf> [↑](#footnote-ref-67)
68. <https://ec.europa.eu/jrc/sites/jrcsh/files/jrc-mars-bulletin-vol25-no9.pdf> [↑](#footnote-ref-68)
69. <http://www.dmcsee.org/uploads/file/426_dmcsee_bulletin_july2017.pdf> [↑](#footnote-ref-69)
70. <http://www.arso.gov.si/en/soer/alps.html> [↑](#footnote-ref-70)
71. <http://ccwaters.eu/downloads/WP3_Final_Report_version_12.2010.pdf> [↑](#footnote-ref-71)
72. <http://www.arso.gov.si/en/Weather/climate/Wind.pdf> [↑](#footnote-ref-72)
73. <http://www.severe-weather.eu/news/hurricane-force-bora-winds-in-nw-croatia-w-slovenia-and-extreme-ne-italy-jan-18-2017/> [↑](#footnote-ref-73)
74. <http://www.rtvslo.si/news-in-english/ice-storms-are-not-rare-in-slovenia/330696> [↑](#footnote-ref-74)
75. <http://www.sloveniatimes.com/storms-wreak-havoc-in-eastern-slovenia> [↑](#footnote-ref-75)
76. <http://kos.arso.gov.si/en/content/sea-level-4> [↑](#footnote-ref-76)
77. <http://www.rtvslo.si/news-in-english/ice-storms-are-not-rare-in-slovenia/330696> [↑](#footnote-ref-77)
78. <https://data.oecd.org/transport/infrastructure-maintenance.htm> [↑](#footnote-ref-78)
79. <http://www.vlada.si/en/media_room/government_press_releases/press_release/article/36th_government_session_the_first_report_on_the_floods_that_occurred_in_slovenia_between_4_and_7_no/> [↑](#footnote-ref-79)
80. <http://meteo.arso.gov.si/met/sl/climate/change/> [↑](#footnote-ref-80)
81. *Short term (to 2020); medium term (2020–2030); long term (2030–2050)* [↑](#footnote-ref-81)
82. https://www.carbonbrief.org/analysis-global-co2-emissions-set-to-rise-2-percent-in-2017-following-three-year-plateau [↑](#footnote-ref-82)