ETC/ICM Technical Report 2/2018

Water Use in the Western Balkans: regional outlooks and global megatrends

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European Environment Agency
European Topic Centre on Inland, Coastal and Marine Waters

Cover photo:
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Layout/editing:
Miluše Rollerová/Claudia Theilmann

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ISBN:
978-3-944280-61-5

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Reference to the report
White, O., Sadauskis, R., Sheate, W., Papadopoulou, L., 2018, Water Use in the Western Balkans: regional outlooks and global megatrends, ed. Künitzer, A., ETC/ICM Technical Report 2/2018, Magdeburg: European Topic Centre on inland, coastal and marine waters, 130 pp.

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Acknowledgements

This report has been prepared through the contributions of a large number of experts and project partners, reflecting the participatory nature of the methodology used. We are particularly grateful to:

The EEA for their assistance in supporting workshop administration, providing presentations during workshops and supporting the workshops through their participation. In particular the support of Anita Pirc-Velkavrh and Lorenzo Benini at the project workshops is recognised.

The ETC/ICM, and in particular Anita Künitzer of Helmholtz Centre for Environmental Research GmbH – UFZ for her guidance and review of key project documents and materials, support during project workshops and coordination of the contract.

TC Vode (working as part of the ETC/ICM): Lidija Globevnik, Gašper Šubelj, Luka Snoj for their assistance in both project workshops as facilitators and in coordinating the venue and hosting of participants in Ljubljana for the first project workshop.

The Serbian EPA for their gracious hosting of the second project workshop in Belgrade, and for making all participants feel so welcome.

All of the regional and other invited experts who provided input through their active participation in the project workshops. These contributions provide the core of the project outcomes and are a central aspect of the findings included in this report.

We are also very grateful to those regional experts who provided additional information and sources following our request as part of the review of regional evidence. We are grateful for the specific contributions from the following experts:

- Dr Tarik Kupusović, Director of Hydro-Engineering Institute Sarajevo, HEIS (Bosnia & Herzegovina)
- Dr. Arben Luzati, Head of Health and Environment Department at Institute of Public Health (Albania)
- Milorad Jovičić, Serbian Environmental Protection Agency (Serbia)
- David Furlan, Sl Consult (Croatia)
- Viktor Simončič, Vikos (Croatia)
- Ana Mišurović, Centre for Ecotoxicological Research of Montenegro (Montenegro)

Abbreviations

CEP:	Collingwood Environmental Planning
EEA:	European Environment Agency
Eionet:	European Environment Information and Observation Network
ETC/ICM:	European Topic Centre on Inland, Coastal and Marine waters
GMT:	Global Megatrend
IPA:	Instrument for Pre-Accession Assistance
NGO:	Non-Governmental Organisation
NRC FLIS:	National Reference Centre for Forward Looking Information and Services
RES:	Renewable Energy Sources
SOER:	European Environment – State and Outlook Report
WEF nexus:	Water Energy Food nexus

Summary

Introduction to the project

In 2016 the European Environment Information and Observation Network (Eionet) of national experts in forward looking information and services (NRC FLIS) collaborated with the support of the Swiss Federal Office for the Environment and the European Environment Agency (EEA) to develop and publish a methodological toolkit for understanding the impacts of global megatrends (GMTs) at the national level (EEA/Eionet, 2017), and to contribute to the EEA's assessment of GMTs at the European scale. The preparation of this methodological toolkit was informed by a number of country pilot studies undertaken by members of the Eionet NRC FLIS to test and apply the method.

In September 2016 the EEA requested the expert support of the European Topic Centre on Inland, Coastal and Marine Waters (ETC/ICM)[1] consortium partners to adapt and apply the methodological toolkit as part of a project intended to build on work under the project *'Security implications of Future Water Use in Western Balkans: Challenge of hydropower development'* that was completed in 2013[2].

Responding to this call, in November 2016 the project '*Water Use in the Western Balkans: regional outlooks and global megatrends'*[3] was launched with three main tasks: 1) to adapt and apply the methodological toolkit to identify GMT implications for the Western Balkans region; 2) to develop scenarios related to the outlook for water and climate change vulnerability in the region; 3) web-publication of the results. The project ran from November 2016 – November 2017. Consultants Collingwood Environmental Planning Ltd[4] (CEP), who have expertise related to global megatrends[5] and the assessment of their implications, supported the ETC in delivering Task 1 of this project. This summary, prepared by CEP, relates only to the work to adapt and apply the methodological toolkit for the identification of GMT implications for the Western Balkans region.

Objectives and added value of the study on GMT implications for the Western Balkans

The objectives of the work related to Task 1 on the regional implications of GMTs were to:

- adapt and apply the methodology 'Mapping Europe's Future: understanding the impacts of global megatrends at the national level'[6] to a regional case study for the Western Balkans;
- identify and collate existing evidence related to long-term trends and outlooks in environmental issues in the Western Balkans, and how these relate to global trends;
- engage experts and other key stakeholders from Western Balkans countries in the process of understanding regional GMT implications, seeking to enhance national capacity;
- provide the basis for contributions to EEA European Environment State and Outlook Report (SOER) 2020, as well as supporting national state of environment reporting and policy development;
- engage with ongoing national pilot GMT implications case studies under the NRC FLIS to share experiences and knowledge; and,
- follow a thematic focus on water in relation to energy and food trade-offs (nexus approach).

[1] This request was made in the enhanced cooperation under the Instrument for Pre-Accession Assistance (IPA) project agreed between EEA and DG Environment for the period 2016-2018

[2] Western Balkan service contract no__3550/R0/B2012/EEA_55215

[3] Project reference EEA/PAN/16/002

[4] http://www.cep.co.uk/

[5] In this project the focus will be on global megatrends analysed by the EEA in their State of Environment Reporting (SOER 2015), see: http://www.eea.europa.eu/soer#tab-global-megatrends

[6] https://www.eea.europa.eu/publications/mapping-europes-environmental-future-understanding

The methodology adopted was centred on participation and the input of regional experts, through two project workshops focussed on: scoping implications in April 2017; risks and opportunities in September 2017. Requests for feedback and information were also sought through emails to regional experts and the project pages on Eionet.

The key added value of the approach for Western Balkans countries has been:

- Providing opportunities for regional experts to meet and exchange knowledge and expertise, including with experts in different technical and policy fields.
- Enabling the identification and prioritisation of ways in which the Western Balkans region may be influenced now and in future by global drivers and trends (GMT implications).
- Bringing together existing evidence (reporting, indicators etc.) from regional sources related to the prioritised implications, including some national insights and preparing factsheets to present this information. This information is published as part of the final reporting on this project and is available for use by experts in the region.
- Facilitating discussion about regional and national responses to long-term risks and opportunities from global drivers of change affecting the region, which can be used as part of national and regional long-term strategic planning.

It is also intended that the outcomes of the study will be used as input to the EEA's forthcoming SOER due to be published in 2020, which will include reflections on the implications of GMTs for Europe, European countries and regions.

Materials developed through the project

In addition to the value added for experts who have participated in the study, and the value of holding regional workshops for sharing knowledge and expertise, a large number of materials have been developed through the project work which can also be of value to experts in the region. All materials are available through the Eionet[7]:

- Note on understanding the water-energy-food nexus and the use of a nexus approach.
- Note on regional environmental issues and vulnerabilities related to water, energy and food, based on a literature review of approximately 70 sources.
- Mind maps and storylines (created using Vensim[8] software) to illustrate how GMT drivers and trends may be influencing environmental issues in the region.
- Implication 'factsheets' based on in-depth review of evidence in the region, describing the 11 priority implications identified by experts in the scoping workshop:
    - Pollution affecting soil and water quality including from pollutants with uncertain effects
    - Direct pressure on biodiversity and ecosystems
    - Increased costs of waste water treatment
    - Potential transgression of ecosystem tipping points
    - Uncertain access to critical resources
    - Insecurity and conflict linked to resource competition
    - Supply and price volatility for critical resources
    - Risks for global food security
    - Demand (need) for increased renewables and efficiency
    - Extreme weather events (droughts/ changes in precipitation / heatwaves)
    - Floods (coastal, river and urban)

[7] https://forum.eionet.europa.eu/eea-west-balkans-cooperation-interest-group/library/etc-inland-coastal-and-marine-waters-activities-wb/2016-2017_west-balkan-project-gmt/

[8] http://vensim.com/ (free download available for public research use)

- Background note for the workshop on risks, opportunities and policy needs summarising the implication factsheets and initial risk and opportunities to aid workshop discussions.
- Workshop records for the scoping workshop and risks, opportunities and policy needs workshops.

Applying the GMT implications method toolkit

The methodology used for this project followed the process described in the methodological toolkit and adapted them to the needs of a regional study. This involved five steps, as described in the table 0.1 below.

A central aspect of the methodology was the participation of regional experts in two regional workshops. More than 20 experts participated in each workshop. Experts were invited through the Eionet, and included national experts (NRCs) for: Land use and spatial planning; Water quality and ecological status; Water quantity; State of environment (SOE); Soil and agriculture; Land cover; Forward looking information and services (FLIS). Other experts included those from national ministries of spatial planning and infrastructure, experts in public health and hydrological engineering, as well as experts from universities and research institutes with regional knowledge.

Table 0.1: Five steps of the GMT implications method toolkit

	In Step 1, the agreed focus of the study was on water in the context of energy and food trade-offs (nexus approach). To adapt the method to a regional study, a literature review was completed on regional issues related to the nexus.
	In Step 2 the consultant team prepared detailed mind-maps of how GMTs may connect to regional nexus issues, and these formed the basis of discussions in the scoping workshop, at which regional implications were described.
	For 11 priority GMT implications selected at the scoping workshop in Step 3 desk based research was completed and evidence requested from experts. This evidence was compiled into factsheets on each implication.
	The key activity in Step 4 was a workshop on risks and opportunities, policy gaps and needs related to each priority GMT implication using the evidence collected in Step 3 as a basis for assessment of risks and opportunities.
	In Step 5 all outcomes of the study were brought together in a final report describing the method used, summarising the outputs and including recommendations and conclusions.

Study findings: GMT implications and responses in Western Balkans

The preliminary research and scoping stage led to a decision by the project team to focus the assessment and therefore workshop discussions on four of the 11 GMTs analysed by the EEA in SOER

2015: GMT 7: Intensified global competition for resources[9]; GMT 8: Growing pressure on ecosystems[10]; GMT 9: Increasingly severe consequences of climate change[11]; and GMT 10: Increasing environmental pollution[12]. This was to manage the volume of information for the workshops and due to these GMTs appearing to have the most direct relevance to and potential links with regional water-energy-food issues as identified through the literature review.

Scoping of implications

At the scoping workshop (Ljubljana, April 2017) 25 specific potential GMT implications for water, energy and food were identified, including: increasing uncertainty of access to resources and associated supply and price volatility and the potential for conflict over resource competition; direct and indirect pressures on biodiversity and ecosystems for example due to land-use changes, water availability and pollution; and, climate change impacts, in particular floods and droughts, which already afflict the region and are expected to become more frequent and severe.

Box 0.1: Effects of climate change and other socio-economic drivers on water availability

The effects of climate change and other socio-economic drivers on water availability in the region were explored separately through Task 2 of the project.

The results of this scenario modelling activity correlate well with the implications (and subsequent risks and opportunities) identified through the qualitative expert-led process followed in Task 1, in particular that over the medium- to long-term water availability is likely to be reduced in all scenarios, due to a combination of climate and socio-economic drivers.

A separate report for Task 2 of the project has been developed (Globevnik et al., 2018) and is available at:

http://icm.eionet.europa.eu/ETC_Reports/OutlookOnWaterAndClimateChangeVulnerabilityInTheWesternBalkans

Following a qualitative scoping assessment of each implication likelihood, significance and expected timeframe, 12 implications were selected by participants as being of most importance for further consideration. These are listed in Table 0.2.

Table 0.2: Implications prioritised through scoping

GMT 'driving' the implications	Implications prioritised as 'important'	Timescale over which implication may occur[13]	Regional nexus issues potentially affected
GMT7 Intensified global competition for resources	Uncertain access to critical resources	Medium and long term	The experts noted that the implication may in particular lead to pressures on land uses (e.g. changes due to increased resource extraction in region) and deforestation.
	Insecurity and conflict linked to resource competition	Short term / medium term / long term	Land use changes and regional geopolitical instability were discussed as issues related to resource competition. Opportunities for

[9] https://www.eea.europa.eu/soer-2015/global/competition

[10] https://www.eea.europa.eu/soer-2015/global/ecosystems

[11] https://www.eea.europa.eu/soer-2015/global/climate

[12] https://www.eea.europa.eu/soer-2015/global/pollution

[13] Short term (to 2020); medium term (2020–2030); long term (2030–2050)

GMT 'driving' the implications	Implications prioritised as 'important'	Timescale over which implication may occur[13]	Regional nexus issues potentially affected
			increased renewables production were also noted.
	Demand (need) for increased renewables and efficiency	Medium and long term	Experts expressed that there are opportunities to increase renewables production to meet energy demand. However, over-exploitation of water resources and possible regional geopolitical instability could result from increased renewables production (esp. hydropower). Economic risks due to import dependency were also noted.
	Supply and price volatility for critical resources	Medium term	Volatility of prices and supply for resources used in the region can exacerbate other resource issues.
GMT8 Growing pressures on ecosystems	Potential transgression of ecosystem tipping points	Medium and long term	An uncertain implication, but with potentially critical impacts. The vulnerability of regional ecosystems (e.g. Karst) was noted.
GMT9 Increasingly severe consequences of climate change	Droughts/ changes in precipitation	Short term (already being seen)	Water shortages / human health / reduced hydropower production and land use changes were noted as issues that may be exacerbated by this implication
	Floods (coastal, river and urban)	Short term (already being seen)	It was noted that diffuse pollution, damage to soil/ crops/ forests and infrastructure are likely repercussions.
	Extreme weather, including heatwaves	Short term (already being seen)	Damage to crops/ forests and infrastructure were noted linking with this implication
	Risks for global food security affecting food/ agriculture in region	Short term	An uncertain implication as effects depends on how agriculture and land-use is managed. Opportunities for the region could lead from the high quality of agricultural land, and the availability of water providing an opportunity for Europe to diversify food production in new areas (e.g. not only Spain). However also a risk if not managed by region.
GMT10 Increasing environmental pollution	Increased costs of waste water treatment	Short term	The experts noted that already limited budgets for waste water treatment in the region would be further pressured. It was also noted that this implication will exacerbate regional issues including inadequate waste water management and deteriorating/ insufficient infrastructure.
	Pollution affecting soil	Short term	Risk of contamination of Karst system

GMT 'driving' the implications	Implications prioritised as 'important'	Timescale over which implication may occur[13]	Regional nexus issues potentially affected
	and water quality including from pollutants with uncertain effects		and increased surface water contamination (from industry) were noted by experts as regional issues that may be of particular importance.
	Direct pressure on biodiversity and ecosystems	Medium to long term	Participants unsure how strongly global pressure on biodiversity from pollution will be felt in the region due to limited monitoring. However risks felt to be important due to vulnerability of regional ecosystems and importance of natural environment e.g. for tourism.

Following the scoping workshop, regional evidence was collated and reviewed for all priority implications and implication factsheets developed for each setting out for each implication: the title of the implication; short implication description; summary of identified evidence/ information about how the implication may be having effects/ have effects in future in the region; description of key gaps and known shortcomings in the data/evidence; overview of existing policies and strategies that are relevant to the implication; overview of any key policy gaps and needs/ vulnerabilities.

In preparing the implication factsheets the implications were 'clustered' in three groups: biodiversity and ecosystem related; resource use and supply related; and, climate change related.

In preparing for the workshop on risks and opportunities, it became clear that the volume of information was, again, likely to be too much for discussions in a one-day workshop. It was therefore decided to select two implications from each cluster for assessment of risks and opportunities, policy gaps and needs:

- **Biodiversity and ecosystems cluster:**
  - Pollution affecting soil and water, including from pollutants with uncertain effects
  - Increased costs of waste water treatment
- **Resource use and supply cluster:**
  - Insecurity and conflict linked to resource competition
  - Demand (need) for increased renewables and efficiency
- **Climate cluster:**
  - Extreme weather events and droughts (e.g. changes in precipitation/ heatwaves)
  - Floods (coastal, river and urban)

Risks and opportunities

During the workshop on risks and opportunities, policy gaps and needs (Belgrade, September 2017) the regional evidence related to each of the six selected implications, as listed above, was discussed by experts, and through these discussions potential risks and opportunities for the region or national environment and environmental policy were identified. In total the experts noted 27 specific risks and 20 opportunities, which were then assessed using criteria related to the likelihood (of the risk or opportunity occurring) and magnitude (of the risk or opportunity should it occur).

Most of the risks and opportunities noted by experts relate directly or indirectly to resource management and the pressures global drivers and trends are expected to exert on regional resources. In particular the need to balance different uses of water resources in the region was identified, as well as to ensure that the regions' energy supply is managed in a way that preserves

the natural environment (e.g. from illegal logging and deforestation, or damage due to changed river flows) while ensuring increasing regional demands for energy can be met. Agriculture is also important in the region, and the transition from small scale farming to a more intensive approach, potentially to meet changing demands for food in the region and for export, due to the increasing global demand for food, is a critical risk and potential opportunity. Agriculture is reliant on effective water management and supply, and is also a key driver of environmental pollution (e.g. due to the use of fertilisers and pesticides). Many resources in the region require effective transboundary management, for example river basins transcend national borders meaning changes upstream (e.g. for hydro-power generation, or pollution from mining and agriculture) will often have impacts outside the originating country. The potential for conflict over resource management was noted by many experts during the workshops, and is felt to be an increasing risk in the context of climate change and other global drivers and trends (e.g. resource competition, changing consumption patterns).

Looking across the risks and opportunities identified some themes recur across the different GMT implication clusters.

In relation to the risks identified

- Financial risks, related to a lack of investment or insufficient funds to adequately respond to known or emerging environmental issues driven by global changes. External (foreign) investment, for example in the agricultural sector was identified as a risk (e.g. due to agricultural intensification leading to environmental damage and habitat loss, erosion of traditional livelihoods) but also a potential opportunity (e.g. job creation, regeneration of deprived rural areas).
- Policy and regulatory risks, typically associated with poor enforcement of existing targets and standards or a lack of policy coherence (e.g. between water and energy, and across the region).
- Changing consumption patterns and land-uses (e.g. food crops for biogas, illegal logging for fuel), increasing environmental pressures and the need for adequate regulatory frameworks and planning. The economic development of the region was also considered to be leading to an increase in social and economic inequality.

In relation to the opportunities identified

- A key opportunity relevant to most implications is the need for increased transboundary cooperation in the region. This reflects the transboundary nature of many of the implications and topics discussed such as water supply/ use, floods and energy.
- Opportunities associated with new technologies were also recognised, for example developing and applying technologies to reduce pollution associated with agriculture, and to improve waste water management and treatment.
- Although also noted as a risk, the opportunity to attract additional funding to the region to address specific needs was also identified in relation to multiple implications (e.g. water quality monitoring and treatment, investment in agriculture, increased tourism).

Potential regional responses

Due to limited time available during the workshop, experts were invited to agree on one risk and one opportunity from each implication to discuss in terms of gaps and needs in terms of policy and other responses (e.g. enhanced regional cooperation). The risks and opportunities considered are presented in Table 0.3.

Table 0.3: Risks and opportunities considered for policy needs

Risks (and timeframe[14])	Opportunities (and timeframe)
Biodiversity cluster	
Increased costs of waste water treatment	
Not enough financing – issues left untreated (e.g. pollution from mining); timeframe: short-term[15]	EU funding of waste water treatment; International funding; timeframe: short term[16]
Pollution affecting soil & water, including from pollutants with uncertain effects	
Further increased pollution due to intensification of agriculture/ industry (privatisation, foreign investment); timeframe: medium term to long term	Policy improvement; timeframe: long term
	Funding in general; timeframe: short term
Resource cluster	
Demand (need) for increased renewables and efficiency	
Inadequate spatial planning & strategic impact assessment; timeframe: short term	Improved waste management (biogas from waste); timeframe: short term
Insecurity and conflict linked to resource competition	
Conflict about water use – water supply; hydro-power plants (access to and using of drinking water); timeframe: short term	Increased regional cooperation; timeframe: short term
Climate cluster	
Implication: Extreme events – droughts, precipitation changes, heatwaves	
Water shortages – trade-offs: irrigation, drinking water, hydro; timeframe: medium term to long term	Cross-sector integrated water management; timeframe: short term[17]
Implication: Floods (coastal, river, urban)	
Soil erosion/ landslides; timeframe: short term to medium term **for river floods – l**ong term **for coastal floods**	Improve technologies for flood/ water management (transfer, implementation, development); timeframe: short term to medium term **for river floods – l**ong term **for coastal floods**

During the workshop, experts considered what existing policy, strategy or cooperation is there in the region or their country and what shortcomings are apparent in the existing policy responses. Experts were also invited to discuss and note town any key opportunities for new transboundary regional cooperation.

Looking across the identification of policy gaps and needs in the different GMT implication clusters a number of key themes are apparent:

[14] Short term (to 2020); medium term (2020–2030); long term (2030–2050)

[15] No time frame noted: based on timeframe of implication

[16] No time frame noted: based on timeframe of implication

[17] No timeframe noted: based on timeframe of implication

- The lack of transboundary/institutional cooperation in relation to water management and associated trade-offs (e.g. water for energy, drinking, agriculture). Insufficient and weak cooperation between sectors such as energy and agriculture was also highlighted as an important gap for water management.
- Need for/ opportunities to access funding (national/ EU/ private) to improve water management was identified in relation to many of the risks and opportunities (either to help manage risks or to exploit opportunities), however it was felt that institutions (public and private) in the region often lack funds and are not necessarily well equipped to access potential funding sources.
- Policy enforcement and policy coherence were both discussed as policy needs that require attention in the region. Although relevant policy and goals often exist for environmental issues, there is insufficient capacity to implement or enforce policy and regulations. It was also noted that a lack of horizontal (across sectors) and vertical (within sectors) policy harmonisation is causing conflicts between exiting legislation. Some experts also noted that policy enforcement would benefit from corruption being actively addressed where it exists.

In relation to the opportunities for transboundary cooperation identified to address these gaps/ needs:

- The opportunity for sharing best practices as well as applying the principles of twinning (e.g. twinning projects) with neighbouring countries within and outside the region could improve the bilateral and multilateral cooperation on transboundary issues.
- Applying for international funding to address waste water treatment, especially considering the existing relations between experts in the region that could apply for common trans-boundary projects (perhaps funded by the EU).
- There is an opportunity to increase fines for violations of existing regulations as experts indicated that currently in the region it can be cheaper to pay fines than respect legislation in particular for water pollution/ management.

Overall reflections and recommendations

Responding to GMT implications in the Western Balkans; reflections for policy-makers

This 12-month study into the potential implications of GMTs in the Western Balkans region has drawn on the knowledge of a range of regional experts in environmental, resource, infrastructure and related research, planning and policy, together with the collection and review of available evidence (literature, indicators) on the status and outlook for regional environmental issues related to water, energy and food. The method applied was designed to be participatory in nature, and used a systematic approach to make use of the available evidence to discuss and prioritise potential impacts on water, energy and food in the Western Balkans region based on the knowledge and judgement of regional experts.

The outcomes summarised in the sections above are quite diverse, but illustrate some of the key ways in which the environment of the region is being, and will in future be, affected by global drivers and trends. They indicate that there is a need for environmental and other policy makers in the region to:

- Consider the long-term outlooks for water availability in their country (and the region) when developing policy and strategy across a range of policy spheres e.g.: agriculture and food; land-use and spatial planning; mining; energy production; manufacturing. Trade-offs and risks associated with competing demands for water in the region, including the potential for conflict, were consistently identified by regional experts.
- The increasingly severe consequences of climate change are likely to exacerbate all regional long-term environmental challenges around the water-energy-food nexus. Climate change scenario based modelling under Task 2 of the project predicts significantly reduced water

availability in all regional catchments in the long-term (scenarios considered periods 2031–2040 and 2061–2090) due to climate and socio-economic changes, which will pose real challenges for energy generation (especially hydro), food production and other water uses (e.g. industry) with associated trade-offs in water use becoming more difficult to manage.

- The global demands on certain resources are expected to change dramatically to 2030 and beyond, affecting availability and price. Regional institutions/ policy makers should consider undertaking modelling or other research into the resource implications of different policy or strategic options, in particular exploring current supply and demand characteristics in the context of medium and long term global and regional socio-economic changes. Examples could include:
    - Considering what the long-term water needs of investment strategies related to agricultural land-use or energy production would be, and compare these to existing knowledge on likely future water availability (e.g. from scenario studies such as that completed in Task 2 of this project).
    - The supply and price of some key material resources (e.g. critical resources, fossil fuels) are uncertain in the long-term, and considering the needs of different industry or infrastructure planning decisions to seek 'insulation' from future resource supply risks could help build regional economic resilience.
- Assess and plan for, as far as is possible, trade-offs related to investment, planning and other decisions. In particular water is a shared regional resource, with vital significance for the economy (e.g. hydro-generation, agriculture) but also for health and wellbeing of the population and for the natural environment. Some resources and ecosystems in the region are particularly vulnerable, e.g. shallow aquifers, karst.
- Work with institutions across individual policy areas, both in planning more coherent policy, but also in helping to identify and consider key trade-offs, support enforcement of existing regulations and standards, and to draw on knowledge and expertise from across disciplines. For example where energy production and industrial development are proposed in the same area, using combined modelling of water demand/ supply could help understand and manage potential future water-use conflicts by being explicit about trade-offs and identify where supply may not be adequate to meet demand. A relatively simple practical step could be to seek further regional and cross-sectoral workshops and meetings (e.g. bringing national agencies or ministries with responsibility for water, energy and agriculture together to discuss and explore common challenges and opportunities for cooperation).
- Agree on and seek to manage (as far as possible) potential future changes in the agricultural sector, in particular foreign investment and intensification of agricultural production in some areas. Recognising this can bring economic benefits for the region, there are also risks related to environmental pollution, ecosystem damage, loss of traditional rural lifestyles and the need to ensure the financial benefits of such investment are kept within the region.

Practical next steps

The reflections above provide some broad considerations for policy and decision makers in the region arising from the study into GMT implications. Some specific practical next steps that experts who participated in the project and others in the region could consider include:

- The outcomes of this study represent a set of implications and associated risks and opportunities together with a summary of regional evidence and potential policy responses. Experts in the region are invited to use the evidence (e.g. implication factsheets; risk and opportunity assessment outcomes) in their own work, and to build on these.
- Experts can also consider the medium- to long-term risks and opportunities identified to help frame their own thinking and work in environmental reporting (e.g. national state of environment reports) and other strategic activities.

- Aspects of the approach used for this study could be adopted by policy makers in the region, for example to supplement existing approaches used for national for state of environment (SoE) assessment and reporting. This could include: making better use of existing indicators, for example bringing selected indicators together in the form of thematic/ sector overviews; framing SoE reporting around emerging issues and global (or regional) drivers to provide for an outlook aspect and consider future policy needs; make use of participatory approaches in regional policy discussions, which this project has illustrated can provide valuable insights and knowledge co-creation; make use of novel assessment approaches, including mind-maps and causal chains (or systems approaches), to help understand and communicate the complex relations and trade-offs in many environmental policy areas.
- Many interesting and valuable exchanges were apparent during the workshops, and experts from different countries and areas of knowledge discussed common challenges, risks and opportunities. To build on this exchange of ideas, regional experts involved in the study could continue to share experiences and hold follow-up discussions around the topics and themes emerging from this study. This could be in the context of other projects they may be involved in (e.g. inviting experts met through the GMT implication workshops to meetings under other projects), or by making use of existing networks to maintain connections and exchange.
- Some specific data and knowledge gaps were identified in the evidence review conducted during the study, and these were reported in the implication factsheets. Key gaps include a lack of effective environmental monitoring in some countries in the region e.g. water quality, the health of natural environments/ ecosystems; as well as limited environmental outlooks in the region to support longer-term decision making. There may be opportunities for institutions in the region to identify and source funding to improve the regional knowledge-base for example through European Commission research projects.
- Some experts felt that there are opportunities for learning and exchange from good practice (e.g. in relation to policy development, enforcement, environmental management) in other regional countries and neighbouring countries. It was suggested that government agencies and ministries could seek out opportunities for twinning or exchange on regional risks and opportunities related to GMTs (and wider environmental issues).

Lessons learned in applying the methodological toolkit

In applying the method to a regional study, the project successfully engaged many experts in discussion and led to identification of implications, risks and opportunities for the Western Balkans. However, the scale and complexity of the connected GMT drivers, trends and possible implications meant decisions had to be made at each step to limit the scope in order to keep volume of information manageable: from 11 GMTs analysed by the EEA, 4 were selected for discussion in the scoping workshop; from 12 prioritised implications identified through scoping, 6 were carried forward for discussion in the workshop on risks and opportunities; and from 27 specific risks and 20 specific opportunities assessed by experts it was only possible to discuss 6 risks and 6 opportunities in relation to potential responses. Without extending the time and resource for such studies and the workshops (e.g. participants in the workshops held in this project suggested that 2 or even 3 day workshops would be required for more detailed discussions), for future studies at national or regional level, it will be important to agree a clear and narrow scope or focus, or to accept that the study may need to address a small number of high-level implications in limited detail.

Global megatrends represent a new concept to many experts, and the terminology used can be difficult to engage with. Therefore it is important to demonstrate the GMT concept with examples, and provide context that explains what they are and that they are used in various sectors as a means of structuring thinking about key drivers and trends that may influence a particular sector, country or issue.

Specifically for a regional study it was challenging to decide on the appropriate level of detail and evidence to include. While the project was intended to include 'national insights', in practice the project team found that for specific environmental issues there is often either too little information (e.g. due to limited number of regional studies), or the picture becomes overwhelming due to very detailed national monitoring data or reporting. Preparing a complete regional picture of a GMT implication based on existing national indicators and outlooks is simply not possible, so it is recommended that future studies develop illustrative descriptions from which wider conclusions can be inferred as was the intention in this study.

The methodological toolkit proposed the discussion of *policy* gaps and needs. However, during the workshop on risks and opportunities it became clear that a broader focus was required: *responses*. Responding to the risks and opportunities associated with GMT implications may include policy changes, but can also involve other types of response e.g.: more joint working; better enforcement of existing policy; identification of long-term knowledge needs.

Other practical lessons from applying the method include:

- The workshops were very successful, with lively discussion and exchange and outputs generated as expected. However, such workshops require considerable planning and preparation, as well as hands-on facilitation to guide group discussions, keep notes and complete worksheets, as well as to collate and compile a workshop record. In this study a minimum of four facilitators were used in each workshop. It is also clear that a good knowledge of the methodology as described in the toolkit is important for all involved in workshop planning and facilitation.
- For participatory workshops to be run as planned, requires appropriate meeting spaces. For example, space is required for small-group discussions, space to hang posters, flip-chart paper and other information, and a lay-out of tables and chairs that encourages discussion and exchange. Class-room or conference room style arrangements are not effective or suitable for meetings to break-out in small groups.
- The ideal number of participants for the type of workshops used in this study appears to be 20 people maximum. Larger groups are possible, but make the sharing of views and perspectives in full plenary more difficult, and also implies larger break-out groups which can be harder to facilitate (e.g. to ensure all voices are heard).
- An approach that successfully adopted in group discussions during the workshop on risks and opportunities was to encourage experts to consider the topic or issue individually to begin with, before bringing all individual perspectives together to seek consensus and a group opinion. This provided a means of ensuring all experts feel able to contribute, and can help address e.g. issues such as experts working in a second or third language, or not feeling confident due to discussion addressing topics outside their area of expertise.

1 Introduction and background

1.1 Introduction to this report

This report is one of the final outputs of the project *Water Use in the Western Balkans: regional outlooks and global megatrends*. Specifically it is the final report for Task 1 on the project which focussed on the identification of implications of global megatrends (GMTs) in the Western Balkans region[18]. More information on the project is provided in sub-section 1.2 below.

This report brings together all of the main outputs from the work completed under Task 1, and in particular provides and overview of two workshops held as part of the project and related background research. Following this introduction this report sets out:

- An overview of the methodology used and how it was applied to the case of a regional study in the Western Balkans (Section 2)
- A description of the outcomes of the project scoping workshop, while led to the identification of implications of global megatrends in the region (Section 3)
- A short summary of regional evidence collected through the project on the extent to which the identified global megatrend implications may already be seen in the region and related outlooks where available (Section 4)
- A description of the outcomes of the project workshop on risks and opportunities of the identified global megatrend implications, and related policy needs (Section 5)
- Finally the report summarises the key outcomes and presents some reflections on key messages from the study and lessons learned (Section 6).

Various annexes are also included which provide additional background materials relevant to different sections of the report.

1.2 Background and objectives

1.2.1 Background

In September 2016 European Environment Agency (EEA) requested the expert support of the European Topic Centre on Inland, Coastal and Marine Waters (ETC/ICM) consortium partners in the enhanced cooperation under the Instrument for Pre-Accession Assistance (IPA) project agreed between EEA and DG Environment for the period 2016–2018. The EEA asked the ETC to build on work under the project *'Security implications of Future Water Use in Western Balkans: Challenge of hydropower development'* that was completed in 2013[19]. This previous work provided an exploratory analysis of possible security implications of water use development in the region, and served as the basis for the assessment of different scenarios that helped identify risks for the achievement of a vision of how hydropower should be managed in the region.

Responding to this call, in November 2016 the project '*Water Use in the Western Balkans: regional outlooks and global megatrends'* (project reference EEA/PAN/16/002) was launched. Consultants Collingwood Environmental Planning (CEP), who have expertise related to global megatrends[20] and the assessment of their implications, supported the ETC in delivering this project.

[18] Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Montenegro, Serbia and Kosovo (as defined by United Nations Security Council Resolution 1244 of 10 June 1999)

[19] Western Balkan service contract no__3550/R0/B2012/EEA_55215

[20] In this project the focus will be on global megatrends analysed by the EEA in their State of Environment Reporting (SOER 2015), see: http://www.eea.europa.eu/soer#tab-global-megatrends

1.2.2 Objectives

The three main objectives of the project were:

1) To improve forward-looking analyses by considering the implications of GMTs on the Western Balkans region together with national insights.
2) To prepare an ETC technical paper on security implications for water related issues in the Western Balkans.
3) To disseminate the results and knowledge achieved, including through web-based publication.

Each objective was delivered through a specific task:

Related to objective 1, Task 1 focussed on Western Balkans regional GMT implications. The specific objectives of Task 1 were to:

- adapt and apply the methodology *'Mapping Europe's Future: understanding the impacts of global megatrends at the national level'*[21] to a regional case for the Western Balkans, including some national insights;
- identify and collate existing evidence related to long-term trends and outlooks in environmental issues in the Western Balkans, and how these relate to / are influenced by global trends;
- engage experts and other key stakeholders from Western Balkans countries in the process of understanding regional GMT implications, seeking to enhance national capacity wherever possible;
- provide the basis for contributions to EEA SOER 2020, as well as supporting national state of environment reporting and policy development / assessment;
- engage with ongoing national pilot GMT implications case studies under the NRC FLIS to share experiences and knowledge; and,
- follow a thematic focus on water in relation to energy and food trade-offs (nexus approach).

Related to Objective 2, Task 2 focussed on preparing outlooks on water and climate change vulnerability in Western Balkan, with the specific objective to

- Develop an ETC/ICM technical report building on previous work in 2013 and 2014, with the focus on the whole Western Balkans region and to include four scenarios. The paper aims to present observed events (e.g. hydrological extreme events such as regional floods in May 2014) as well as future and projected trends in water availability (e.g. droughts and floods).

Related to Objective 3, Task 3 of the project has supported web publication of some of the results from the project in a user-friendly format, with the specific objectives to:

- disseminate project results for wider use experts and interested public
- promote use of forward-looking information for policy and (national) state of environment reporting
- support capacity building.

1.2.3 Value-added of the project

The methodology adopted was centred on participation and the input of regional experts, through two project workshops focussed on: scoping implications in April 2017; risks and opportunities in September 2017. Requests for feedback and information were also sought through emails to regional experts and the project pages on Eionet.

The key value added of the approach for Western Balkans countries has been:

[21] https://www.eea.europa.eu/publications/mapping-europes-environmental-future-understanding

- Providing opportunities for regional experts to meet and exchange knowledge and expertise, including with experts in different technical and policy fields.
- Enabling the identification and prioritisation of ways in which the Western Balkans region may be influenced now and in future by global drivers and trends (GMT implications).
- Bringing together existing evidence (reporting, indicators etc.) from regional sources related to the prioritised implications, including some national insights and preparing factsheets to present this information. This information is published as part of the final reporting on this project and is available for use by experts in the region.
- Facilitating discussion about regional and national responses to long-term risks and opportunities from global drivers of change affecting the region, which can be used as part of national and regional long-term strategic planning.

It is also intended that the outcomes of the study will be used as input to the EEA's forthcoming SOER due to be published in 2020, which will include reflections on the implications of GMTs for Europe, European countries and regions.

In addition to the value added for experts who have participated in the study, and the value of holding regional workshops for sharing knowledge and expertise, a large number of materials have been developed through the project work which can also be of value to experts in the region. All materials are available through the Eionet[22]:

- Note on understanding the water-energy-food nexus and the use of a nexus approach.
- Note on regional environmental issues and vulnerabilities related to water, energy and food, based on a literature review of approximately 70 sources.
- Mind maps and storylines (created using Vensim[23] software) to illustrate how GMT drivers and trends may be influencing environmental issues in the region.
- Implication 'factsheets' based on in-depth review of evidence in the region, describing the 11 priority implications identified by experts in the scoping workshop:
    - Pollution affecting soil and water quality including from pollutants with uncertain effects
    - Direct pressure on biodiversity and ecosystems
    - Increased costs of waste water treatment
    - Potential transgression of ecosystem tipping points
    - Uncertain access to critical resources
    - Insecurity and conflict linked to resource competition
    - Supply and price volatility for critical resources
    - Risks for global food security
    - Demand (need) for increased renewables and efficiency
    - Extreme weather events (droughts/ changes in precipitation/ heatwaves)
    - Floods (coastal, river and urban)
- Background note for the workshop on risks, opportunities and policy needs summarising the implication factsheets and initial risk and opportunities to aid workshop discussions.
- Workshop records for the scoping workshop and risks, opportunities and policy needs workshops.

1.2.4 How this report relates to the overall project

As noted, this report represents the final output of project Task 1: Western Balkans regional GMT implications. In this task a methodology *'Mapping Europe's Future: understanding the impacts of*

[22] https://forum.eionet.europa.eu/eea-west-balkans-cooperation-interest-group/library/etc-inland-coastal-and-marine-waters-activities-wb/2016-2017_west-balkan-project-gmt/

[23] http://vensim.com/ (free download available for public research use)

global megatrends at the national level'[24] was adapted and implemented to a regional case for the Western Balkans. Section 2 of this report describes the methodology used and how it was adapted to the regional study in the Western Balkans. A separate report has been prepared in Task 2 of the project.

[24] The methodology was developed by the Swiss Federal Office for the Environment with the support of CEP. The methodology was developed collaboratively with the Eionet NRC FLIS and will be published by the EEA

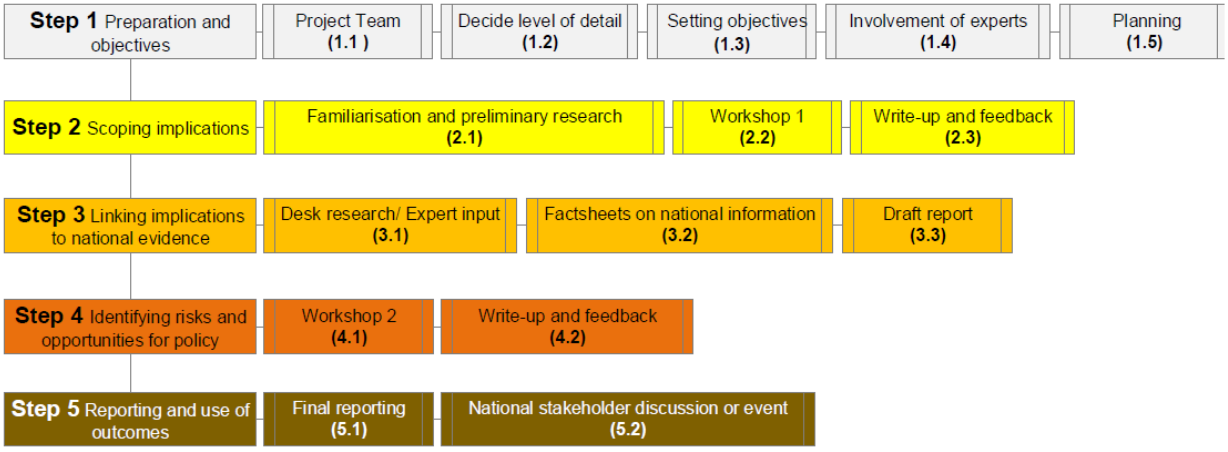
2 Methodology and process

2.1 Introduction

This section presents a brief outline of the methods and processes that have been followed to adapt and apply the methodological toolkit *"Mapping Europe's environmental future: understanding the impacts of global megatrends at the national level"* to develop knowledge on possible GMT implications for the Western Balkans, the risks and opportunities they may represent and potential policy responses to these risks and opportunities.

Guided by the steps as set out in the method toolkit (outlined in Figure 2.1), the method was adapted to meet the needs of the regional study, for example reflecting the focus of this particular study, carrying out a review of literature and preparing a background note on regional vulnerabilities and issues around the water-energy-food nexus in the region during Step 2.1: Familiarisation and preliminary research.

Figure 2.1: Mapping Europe's environmental future – process flow chart



The process of adapting the method tool kit was carried out by following the steps presented in Figure 2.1 in a sequential manner, which is also reflected in the structure of this report.

Step 1 included the decision on project objectives (assessing potential 'GMT implications' and related risks and opportunities and reflecting on potential policy gaps and needs for the Western Balkans) and the focus (water in relation to energy and food trade-offs) that were set out in the project proposal.

From the outset the activities under **Step 2**, considered existing research and regional evidence on trends and issues related to water, energy and food in the Western Balkans. This information alongside an overview of key drivers and trends from the EEA GMTs formed the knowledge base for a small workshop for regional experts to discuss, identify and prioritise an initial list of potential GMT implications for the region. In preparation for this workshop to facilitate these discussions – a set of outputs were produced including, mind-maps, storylines and background notes; these are presented in more detail in Section 3. Following the event, a workshop record was prepared and circulated to participants for providing comments.

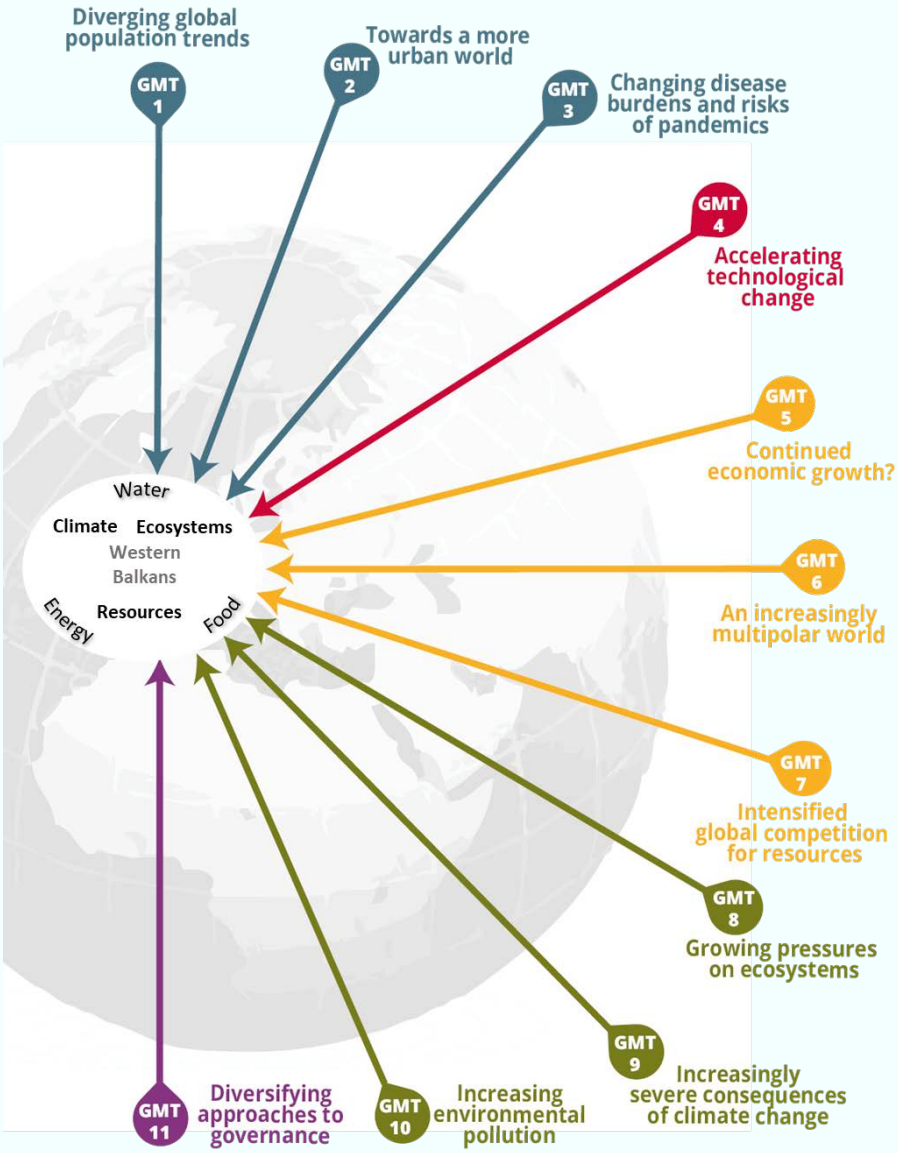
Activities within **Step 3** were based on the outcomes Steps 1 and 2 by further reviewing regional evidence and information related to the GMT implications identified through the scoping workshop in order to prepare implication 'factsheets'. These factsheets defined the implications in more detail illustrating the existing evidence and possible effects they might be having in the region. A more detailed description on the extended review and factsheet preparation can be found in Section 4.

In **Step 4** the prioritised implications from the scoping workshop (Step 2) and the additional evidence collected and presented in the implication factsheets (Step 3) were used as the platform for discussions in a second regional workshop. Largely the same group of experts from the scoping workshop were present to discuss the risks and opportunities as well as potential policy and other response needs that may arise from the implications identified. Following this second workshop a record of the outcomes was prepared and circulated to participants.

This report is the outcomes of **Step 5** which includes the development of a final project report (this report) which provides an overview of the process, workshop discussions and outcomes of the project.

Box 2.1: What are global megatrends?

The EEA SOER 2015 defines global megatrends (GMTs) as 'large-scale, high impact and often interdependent social, economic, political, environmental or technological changes' that can have decisive and critical implications. The megatrends analysed in the EEA SOER 2015 provide a research- and expert-judgement-based perspective on how interrelated and connected global drivers and trends are likely to evolve over time. The EEA SOER 2015 assessment of GMTs analyses 11 megatrends that are considered to be of key importance to Europe's long-term environmental outlook.



EEA's Global Megatrends:

1. Diverging global population trends
2. Living in an urban world
3. Changing disease burden and risks of pandemics
4. Accelerating technological change;
5. Continued economic growth?
6. An increasingly multipolar world
7. Intensified global competition for resources
8. Growing pressures on ecosystems
9. Increasingly severe consequences of climate change
10. Increasing environmental pollution load
11. Diversifying approaches to governance

2.2 Research methods

A combination of approaches and methods were applied to adopt the methodological toolkit *"Mapping Europe's environmental future: understanding the impacts of global megatrends at the national level"* and meet the aims of this study. Table 2.1 provides a summary of the methods applied within each step of the methodology and these are further discussed in the subsequent chapters.

Table 2.1: overview of methods used during the project

Method	Description	Relevant steps in the methodology
Literature review	A two tier literature review was undertaken to identify key issues in the Western Balkan region. Firstly a long list of sources was compiled thought to be relevant for this study focusing on the water-energy-food nexus but including socio-economic implications or contributing trends identified (e.g. increased migration flow). Secondly a more detailed review took place (70 documents reviewed) to identify key issues in the Western Balkan region around the water-energy-food nexus. The results of the literature review (issues identified) were summarised in a spreadsheet. This literature formed the basis for the preparation of a background note and the materials used during the scoping workshop (Step 2, as well as providing the initial evidence base used in preparing the implication factsheets (Step 3).	Step 2 and Step 3
Internal brainstorming	An internal half-day brainstorming/ sense-making session was held among the CEP team to bring together knowledge on GMTs, the GMT methodology (part of the previous EEA study) and the regional issues emerging from the literature review. Options on linking and visualising these connections were discussed, the key dilemma being a top-down or bottom-up approach to understanding and visualising links. A mixed approach was chosen that worked well as it allowed the team to: ▪ identify regional issues and their implications (bottom-up) – objective, emerging from literature ▪ identify GMTs considered to be relevant including relevant drivers and global trends based on the GMT assessment	Step 2

Method	Description	Relevant steps in the methodology
	report (top-down) – implies some subjectivity/ judgement based expertise ▪ Link the outputs of the two approaches; regional implications and global trends.	
Evidence summaries (notes)	Several outputs were produced resulting from the review of literature to be used as background material for scoping workshop: ▪ A note on the regional issues related to Water, Energy and Food in Western Balkans region. ▪ A note on the 'water-energy-food' nexus (WEF nexus) and its use to frame the thinking around implications of global megatrends in the Western Balkans. ▪ A note on priority implication factsheets following a more detailed review of literature and inputs received from participants. These factsheets were used as background material for second expert workshop on risks and opportunities.	Step 2 and Step 4
Mind mapping	Mind maps were created by clustering variables (regional issues, GMT drivers & trends, implications) and visualising interactions with arrows – using Vensim software[25]. The direction of the arrows represented moving from GMTs to regional issues. Interactions between GMT's and their implications, though recognised, were not presented for simplicity. Three overarching mind maps were drafted for each of the nexus areas (See Annex 1). These mind maps formed a key basis for the discussions held during the scoping workshop	Step 2
Visual storylines	Visual storylines (causal diagrams) were also developed using Vensim and were visual representations of plausible connections/ relationships between the drivers and trends of each GMT and regional issues. These visual storylines formed a key basis for the discussions held during the scoping workshop, and were used as part of the working sessions (see Section 3)	Step 2
Facilitation notes	Detailed workshop working session facilitation notes were prepared for partners in the project who were working on separate tasks but were not directly involved in the development of these sessions. These partners provided assistance in the facilitation of both workshops using guidance notes as key references for facilitating the sessions.	Step 2 and Step 4
Direct request to participants for regional information	Following the scoping workshop and the identification of priority GMT implications additional information and sources regarding these implications were requested to regional experts using e-mail correspondence that could add to the list of previously identified sources.	Step 3

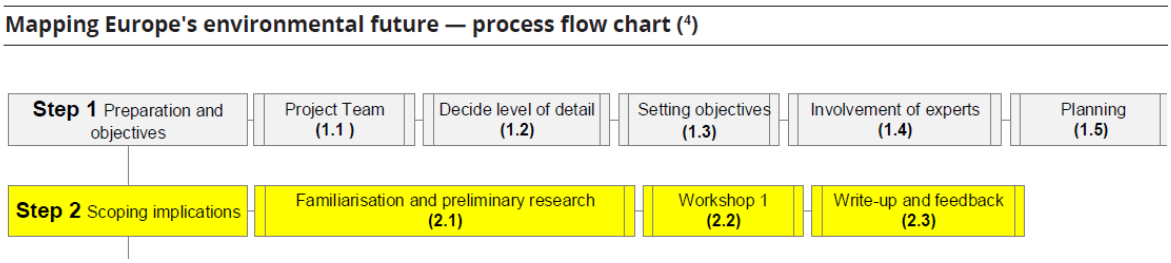
[25] http://vensim.com/ (free download available for public research use)

3 Scoping of GMT implications in the Western Balkans region

3.1 Introduction

This section provides an overview of the processes and methods applied for scoping GMT implications in Western Balkans with a focus on the water-energy-food nexus. The scoping is the 2nd step as outlined in the method toolkit (see Figure 3.1) and follows the activities from Step 1 as described in Section 2.1

Figure 3.1: Mapping Europe's environmental future – process flow chart (Steps 1 and 2)



The primary aim of this step was to complete preliminary research to ensure a broad understanding of the water-energy-food issues in the region linking to GMTs. This was followed by a workshop that included experts from the region to discuss how the GMTs might impact the region resulting in a shortlist of key implications being important to consider further. Finally the workshop outcomes were summarised and presented in a workshop record that was shared with the participants for comments.

This section presents a summary of the workshop outcomes; a full record of the workshop including details of participants, each workshop session, background materials and all outcomes is available through the Eionet forum[26].

3.2 Familiarisation and preliminary research

A background paper summarising existing evidence on trends and issues related to water-energy-food in the Western Balkans region was prepared following a review of regional literature. The majority of sources were studies and reports on the region from public institutions and international organisations. Other relevant sources include academic literature and national sources/information (e.g. national state of environment reporting).

The initial review was summarised in an Excel spreadsheet which also indicated:

- relevance of the findings/ issues identified to each of the six Western Balkan countries[27]
- relevance to the specific nexus areas – water, energy, food
- use (or not) of foresight approaches used in the study
- potential opportunities linked to the issue(s)
- drivers identified to be contributing/ leading to the issue(s)

Two background documents were drafted as background for the scoping workshop:

[26] https://forum.eionet.europa.eu/eea-west-balkans-cooperation-interest-group/library/etc-inland-coastal-and-marine-waters-activities-wb/2016-2017_west-balkan-project-gmt/2017_1st-workshop-gmt-west-balkan-region-1

[27] Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Montenegro, Serbia and Kosovo (as defined by United Nations Security Council Resolution 1244 of 10 June 1999).

- A note setting out what is understood by the 'water-energy-food' nexus, the 'nexus approach' and the value of applying the approach in the context of the Western Balkans study. This note summarised descriptions and definitions around the nexus approach and current understanding of what the 'water-energy-food' nexus (WEF nexus) is, as well as how it can be used to frame thinking around implications of global megatrends in the Western Balkans.
- A background note providing an overview of trends and issues related to water, energy and food in the Western Balkans. This note was based on a review of approximately 70 documents identified through a literature search for reports and studies covering the environment, water, energy and/or food in the Western Balkans region. Existing studies and reports included those published by national and European public institutions, NGOs and international organisations and research projects / academic studies.

The regional issues identified in the literature review and presented in the background note were clustered in broader themes e.g. water management issues, energy consumption/production issues etc. (for the purposes of mapping) by looking across the outputs of the literature review (spreadsheet). Three 'mind maps' were created (one for each nexus area – water, energy & food) by clustering the different groups of variables (regional issues, GMT drivers & trends, implications) and visualising interactions between these with arrows – using Vensim software (see Annex 1). The purpose of these mind maps was to help understand and illustrate plausible relationships and connections between global drivers and trends (identified in the EEA SOER global megatrends) and regional water-energy-food nexus issues based on the findings of the literature review.

Looking across the three mind maps four GMTs were identified that judged to have the most links/ connections to regional nexus issues:

- GMT 7: Intensified global competition for resources
- GMT 8: Growing pressure on ecosystems
- GMT 9: Increasingly severe consequences of climate change
- GMT 10: Increasing environmental pollution

Those formed the basis for the development of visual storylines (See Annex 2). Vensim software was again used to introduce both top down (contextual drivers, GMT drivers, global trends, implications) and bottom up (Nexus area, Regional issues around Nexus, regional observations) categories to visually represent the plausible connections/ relationships between the different clusters of variables that would form the basis for discussions for the Workshop participants to comment on and draw additional links/variables.

Instructions for facilitators were provided before the start of the workshop to be used as key references for facilitating the sessions.

3.3 Workshop 1: Scoping of GMT implications

A one-day workshop was held between afternoon of 10th and morning of 11th April 2017 in Ljubljana, Slovenia to discuss the potential implications of global megatrends for the Western Balkans region.

The workshop provided an opportunity to bring together regional experts to discuss initial project outputs as outlined in sub-section 3.2. The primary aim was to engage regional experts in a scoping exercise intended to identify and prioritise GMT implications felt to be most relevant to and likely to have strongest effects in the Western Balkans region, particularly in consideration of the water-food-energy nexus.

The workshop objectives were to:

- Discuss in an open manner how the megatrends, as described by the EEA, might impact on the Western Balkans region focussing on water, food and energy.
- Generate workshop outcomes (see sub-section 3.4) as the first step in a process of analysing the impacts of GMTs on the Western Balkans region.
- Provide a space for experts to share their knowledge and expertise.

The workshop was a participative event, with experts contributing through facilitated working and plenary sessions:

- Working session 1 – in a carousel exercise using the provided storylines (See Annex 2) working groups discussed and recorded the most important relationships between GMTs and regional issues and highlighted those regional issues that are being potentially most influenced by the GMT in question. Thinking about these relationships and issues working groups then selected key GMT implications in relation to water, energy and food nexus in the Western Balkans.
- Working session 2 – for each implication identified in working session 1 through a facilitated carousel exercise, participants considered the likelihood, magnitude and timescales of effects to inform the prioritisation of the implications.
- Working session 3 – to further link GMTs to regional outlooks and scenarios the workshop facilitators and an invited academic expert presented two studies exploring water management scenarios (projects MARS and Globaqua) and discussed the opportunities to apply/tweak such methodologies in the context of this project.
- Reflections and next steps – workshop facilitators provided closing reflections and elaborated on further developments resulting from the outcomes of the workshop.

3.4 Workshop outcomes

Brief overviews are provided for each of the outcomes in sub-sections 3.4.1 and 3.4.2 below. The full workshop record for the scoping workshop is available through the Eionet Forum[28]. The full record includes more details on the workshop approach, all completed worksheets and details of each working session and outcomes. The sub-sections below summarise the outcomes from the two main working sessions:

- A long-list of potential regional implications of global megatrends, based on expert judgement and a review of initial scoping work completed (by the project team) before the workshop (sub-section 3.4.1)
- The outcomes of an initial assessment of the potential key implications, considering likelihood, extent and time-frames (sub-section 3.4.2).

3.4.1 Potential regional implications of global megatrends

As noted in Section 3.3, the experts, working in small groups discussed the visual storylines and using their expert knowledge of the region and the available evidence highlighted key relationships between global drivers and trends and regional issues related to the water-energy-food nexus. These relationships or connections were then used to define specific implications that the global drivers and trends from each GMT examined may be having for these regional issues. Detailed worksheets were completed by each working group, and a summary of the GMT implications identified by the experts and considered to have the greatest potential influence in the region is presented in Table 3.1.

[28] https://forum.eionet.europa.eu/eea-west-balkans-cooperation-interest-group/library/etc-inland-coastal-and-marine-waters-activities-wb/2016-2017_west-balkan-project-gmt/2017_1st-workshop-gmt-west-balkan-region-1

Table 3.1: Summary of GMT implications identified by workshop participants

GMT	Identified GMT implications in the Western Balkans region	Regional issues implications considered most likely to affect
GMT 7: Intensified global competition for resources	Uncertain access to critical resources	Soil erosion/ Deforestation/ land use change[29] Increasing energy production from renewables Regional geopolitical instability/ transboundary sources Over-exploitation of water resources – agriculture, hydropower[30]
	Insecurity and conflict linked to resource competition	
	Open market [global market]	
	Risk of supply and price volatility for critical resources	
	Economic risks due to import dependency (e.g. fossil fuels)	
	Projected global doubling of resource use (leading to competition, availability and price consequences in the region)	
	Need for increased renewables and efficiency	
GMT 8: Growing pressure on ecosystems	Loss of ecosystem services	Increasing demand for food[31] Pressure on biodiversity Physical modification of water resources (e.g. dams)
	Increased migration flows	
	Displacement of people through loss of livelihoods and conflict	
	Challenges for socio-economic development	
	Increased pressure on ecosystems	
	Reduced ability to draw on (make use of) global natural resources	
	Potential transgression of ecosystem thresholds/ tipping points	
GMT 9: Increasingly severe consequences of climate change	Droughts/ changes in precipitation	Damage to crops, forests[32] – including through soil erosion Water shortages (Re)mobilisation of pollutants/ salts (diffuse pollution) Infrastructure damage (also impacts on human health) Land use change
	Extreme weather events (storms, heatwaves)	
	Risks of global food security	
	Lifestyle changes	
	Coastal flooding	
	River and urban flooding	
GMT 10: Increasing environmental pollution	Pollution affecting soil and water quality including from pollutants with uncertain effects	Limited/no groundwater monitoring Inadequate waste water management and infrastructure[33] Increased surface water contamination from industry Pressure on biodiversity (including reduction in crop quality) Risk of contamination of Karst system
	Emergence of pollutants with uncertain effects	
	Acidification of terrestrial and freshwater ecosystems	
	Increased costs of waste water treatment	
	Direct pressure on biodiversity and ecosystems	

[29] Key geography: Slovenia
[30] Key geography: Macedonia, Montenegro, Albania
[31] Some disagreement between groups – suggested alternative: Food security and/or availability/abandonment of agricultural land.
[32] Key geography: Macedonia
[33] Key geography: Macedonia and Serbia

3.4.2 *Scoping of identified implications*

In working session 2 worksheets were completed by the participants which provided a template for assessing the potential key implications, considering the likelihood that the implication may occur, the magnitude of effects of the implication should it occur and the expected time-frame over which the implication is expected to emerge. In this initial qualitative scoping a two-level scoring was used for the likelihood and magnitude: High/Low, and experts were invited to consider three time-frames: short term (to 2020); medium term (2020–2030); long term (2030–2050). Table 3.2 presents the results of this scoping exercise for all implications identified.

Table 3.2: Scoping of identified implications

GMT	Implications	Estimated likelihood (high/ low)	Magnitude of effect (High/ low)	Timescale over which implication may occur[34]
GMT 7	Uncertain access to critical resources	High	Uncertain[35]	Medium and long term
	Insecurity and conflict linked to resource competition	High	High	Short/ medium/ long term
	Demand (need) for increased renewables and efficiency	High	Uncertain	Medium and long term
	Supply and price volatility for critical resources	High	High	Medium term
GMT 8	Reduced ability to make use of global natural resources	Low	Low	Short term
		Medium	High	Medium term
		High	Medium	Long term
	Potential transgression of ecosystem tipping points	Low	Low	Short term
		High	High	Medium term
		Medium	Medium	Long term
	Loss of ecosystem services	Low	Low	Short term
		Low	Low	Medium term
		Medium	Medium	Long term
	Increasing migration flows	High	Low	Short term
		Medium	Medium	Medium term
		Low	Medium	Long term
	Displacement of people through loss of livelihoods	Low	Low	Short term
		Low	Low	Medium term
		Medium	Medium	Long term
	Challenges for socio-economic development	Low	Low-medium	Short term
		Medium	High	Medium term
		High	Medium	Long term

[34] Short term (to 2020); medium term (2020–2030); long term (2030–2050)

[35] Low- High Depending on resource

GMT	Implications	Estimated likelihood (high/ low)	Magnitude of effect (High/ low)	Timescale over which implication may occur[34]
GMT 9	Droughts/ changes in precipitation	High	High (and growing)	Short term (already seen)
	Floods (coastal, river and urban)	High	High	Short term (already seen)
	Extreme weather/ heatwaves	High	High	Short term (already seen)
	Risks for global food security	High/ uncertain[36]	Uncertain	Short term
GMT 10	Increased costs of waste water treatment	High	High	Short term
	Pollution affecting soil and water quality including from pollutants with uncertain effects	High	High	Short term
	Direct pressure on biodiversity and ecosystems	High	Uncertain	Medium to long term
	Acidification of terrestrial and freshwater ecosystems	Medium to low	Medium to low	Medium term

The use of a traffic light system was used to facilitate the prioritisation of key implications for additional research following the workshop. The short-listing of implications followed the proposed method as indicated in the method toolkit on "*Understanding the impacts of global megatrends at the national level",* and the implications assessed were given a ranking where:

- Rank 1 was assigned to implications with high likelihood and magnitude or if there is considerable uncertainty assessing these criteria. Such implications were considered important and should be selected in the first instance for further review.
- Rank 2 was assigned to implications with high (medium) likelihood/ low (medium) magnitude or low (medium) likelihood/ high (medium) magnitude. These implications were considered of potential importance for further consideration.
- Rank 3 was assigned to implications with low likelihood and 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 4. These implications are presented in Table 3.3.

Table 3.3: Rank 1 implications – judged as important to consider further

Implications	GMT
Uncertain access to critical resources	GMT7 Intensified global competition for resources
Insecurity and conflict linked to resource competition	

[36] Effects will depend on regional response

Implications	GMT
Demand (need) for increased renewables and efficiency	
Supply and price volatility for critical resources	
Potential transgression of ecosystem tipping points	GMT8 Growing pressures on ecosystems
Droughts/ changes in precipitation	GMT9 Increasingly severe consequences of climate change
Floods (coastal, river and urban)	
Extreme weather/ heatwaves	
Risks for global food security	
Increased costs of waste water treatment	GMT10 Increasing environmental pollution
Pollution affecting soil and water quality including from pollutants with uncertain effects	
Direct pressure on biodiversity and ecosystems	

The implications ranked potentially important to consider further applying the principles from the tool kit are presented in Table 3.4.

Table 3.4: Rank 2 implications – judged potentially important to consider further

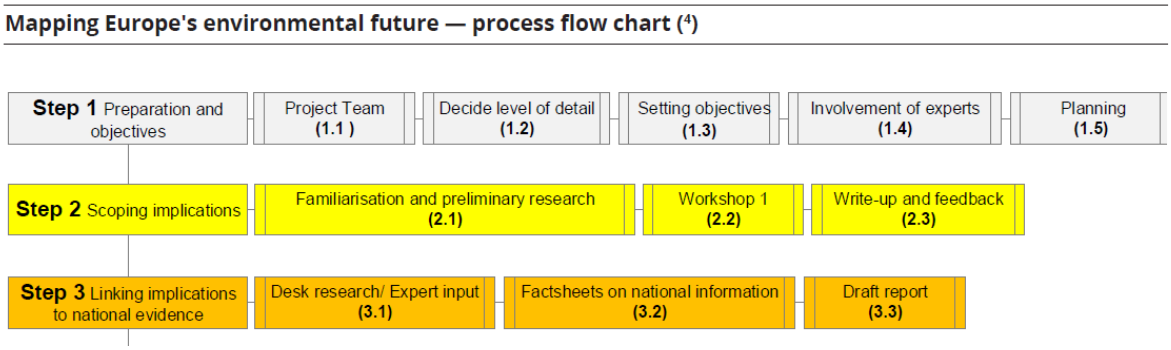
Implications	GMT
Reduced ability to make use of global natural resources	GMT8 Growing pressures on ecosystems
Loss of ecosystem services	
Increasing migration flows	
Displacement of people through loss of livelihoods	
Challenges for socio-economic development	
Acidification of terrestrial and freshwater ecosystems	GMT10 Increasing environmental pollution

4 Linking implications to evidence in the region

4.1 Introduction

This section provides an overview of the processes applied for linking implications to regional evidence. This is the third step as outlined in the method toolkit (see Figure 4.1) and follows the activities from Steps 1 and 2 as described in Sections 2 and 3.

Figure 4.1: Mapping Europe's environmental future - process flow chart (Steps 1, 2 & 3)



The activities under this step included extended research and a request for information from regional experts on the prioritised implications (outcome of Step 2). This was followed-up by the preparation of implication factsheets to be used in Workshop 2 (Step 4) to discuss the risk and opportunities from the prioritised GMT implications.

4.2 Implication factsheets

As noted in Section 3, at the scoping workshop 12 implications were assessed as 'important to consider further' (Rank 1) and carried forward to Step 3 for further research.

In preparation for the second regional expert workshop a 'factsheets' was prepared for each implication, drawing on a review of the original list of 70 documents identified in the preliminary research phase of the project, information provided by experts following an email request for evidence, and an additional review of literature identified through a focussed search for reports, data or indicators related to each of these implications. The review of existing evidence in particular focussed on historical and current regional/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. Studies and reports reviewed included those published by national and European public institutions, NGOs and international organisations and research projects/ academic studies.

Each of the factsheets included:

- the 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 regional 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 the region;
- a description of key gaps and known shortcomings in the data/ evidence;
- an overview of existing policies and strategies that are relevant to the implication;
- an overview of any key policy gaps and needs/ vulnerabilities.

Due to the regional nature of this project it was difficult to complete the factsheet information on gaps and needs in relation to data, as well as existing policy and policy gaps and needs. There is a heterogeneous policy landscape in the Western Balkans region, with each country having unique sets of policy conditions in place. Existing policies/ strategies and corresponding policy gaps and needs/vulnerabilities were discussed and explored during the second regional expert workshop, as described in Section 5 below.

Altogether 11 factsheets were prepared as two implications were subsequently merged considering their similar nature (droughts/ changes in precipitation and extreme weather/ heatwaves). Following the completion of factsheets, these were clustered in three thematic categories: biodiversity and ecosystems related implications; resource use and supply related implications; and climate change related implications. Each of the 11 implications factsheets is included in Annex 3.

During the preparation for the second project workshop a decision was made that it would be necessary to limit the range and number of implications to be discussed, and six implication factsheets were selected to be presented in more detail at the workshop and to form the basis for workshop activities. The decision to select these implications was based on:

- The evidence review suggested that implications in some cases (e.g. in the biodiversity and ecosystems cluster) are strongly related
- In some cases implications represent a 'cascade' of effects (e.g. in relation to environmental pollution and resource supply/ use), and it was decided to select implications at the 'top' of such cascades
- There was recognition that it would not be possible to discuss all implications in the time available for discussion
- To have a balance of implications across the three clusters

The shortlisted factsheets under the thematic clusters are:

- Biodiversity and ecosystems cluster:
  - Pollution affecting soil and water, including from pollutants with uncertain effects
  - Increased costs of waste water treatment
- Resource use and supply cluster:
  - Insecurity and conflict linked to resource competition
  - Demand (need) for increased renewables and efficiency
- Climate cluster:
  - Droughts/ changes in precipitation/ extreme weather/ heatwaves
  - Floods (coastal, river and urban)

The following subsections provide a brief overview of the six factsheets that were discussed in detail in the second project workshop.

4.2.1 Biodiversity and ecosystems cluster

Pollution affecting soil and water quality including from pollutants with uncertain effects

"Pollution affecting soil and water quality including from pollutants with uncertain effects" was one of the implications selected under the biodiversity and ecosystems cluster. The implication is defined by an increase in the use of chemicals in industry and agriculture in the region (such as pesticides and fertilisers used as a result of agricultural intensification) and from these sources the release of an increasingly complex mix of chemical pollutants into the environment, which have interrelated and uncertain effects for biodiversity and ecosystems. This is potentially exacerbated by the fact that countries in the region share many river basins and water resources, the vulnerability of certain

ecosystems and water resources in the region (e.g. karst[37]; shallow aquifers), together with limited monitoring and data available for water and soil quality or pollution.

A notable issue for the preparation of the factsheet was that much of the data available for the region appeared to be quite out of date, with trends available generally up to 2010 only.

Based on the available evidence water quality varies significantly across the region, with waste water from urban areas and industry polluting the lower reaches of several rivers, while many rivers and lakes in mountainous areas remain pristine. However, mining, industry and agriculture are key sources of pollution of water and soil in the region.

Mining across the region is a source of water pollution, for example heavy metal spills from mine tailings. In a report from 2003 the World Bank noted that *'there are several toxic waste storage facilities located on tributaries to the Danube, many of which pose a severe threat to the surrounding human population and the environment. Mining accidents and mine-induced water pollution are issues of serious concern in the SEE region … the failure of mine tailings storage facilities can have devastating consequences.'* (World Bank, 2003).

Limited information is available on the use of industrial chemicals; however data on trade between the EU and the region indicate a 16.7% increase in imports of chemicals and related products to the region between 2006–2016 (EC, 2016).

Agricultural run-off is a problem for many parts of the region, especially nitrogen pollution of groundwater and surface water bodies (EEA, 2010). Diffuse pollution from agriculture is also identified as a 'significant pressure' with cross border impacts in the Danube River Basin Management Plan (2015), cited in JRC (2015).

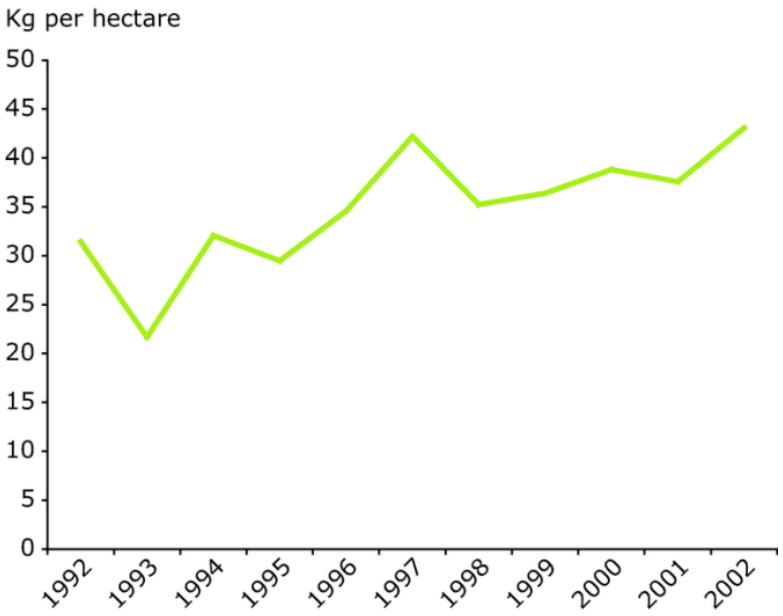
Data for the period 1992–2002 showed that the use of agricultural chemicals in the region had grown (see Figure 4.2), and in 2010, EEA concluded that the use of agricultural chemicals in the region 'could be expected to grow in coming years', threatening water quality as well as biodiversity (EEA, 2010).

Evidence on the prevention of soil degradation is limited due to a lack of comprehensive data, however there are countries in the region, e.g. Serbia, that have adopted a list of indicators for soil degradation risk assessment (Serbian Environmental Protection Agency, 2015).

Pollution of groundwater is a particular concern as it is an important source of drinking water in many countries (e.g. Serbia obtains 60% of drinking water from groundwater), and many aquifers in the region are relatively shallow and therefore at risk of pollution (EEA, 2010). Wastewater treatment in the region is often poor or non-existent, with data for the period 2001 – 2008 showing that less than 20% of the population were connected to wastewater treatment in most countries (see Figure 4.3) (EEA, Zoi, 2012). In addition, a lack of finance for investment and maintenance is a common problem (EEA, 2010).

[37] In karsts, groundwater flow is rapid and highly vulnerable to pollution; karsts also host rare and endemic species of fauna (World Bank 2003)

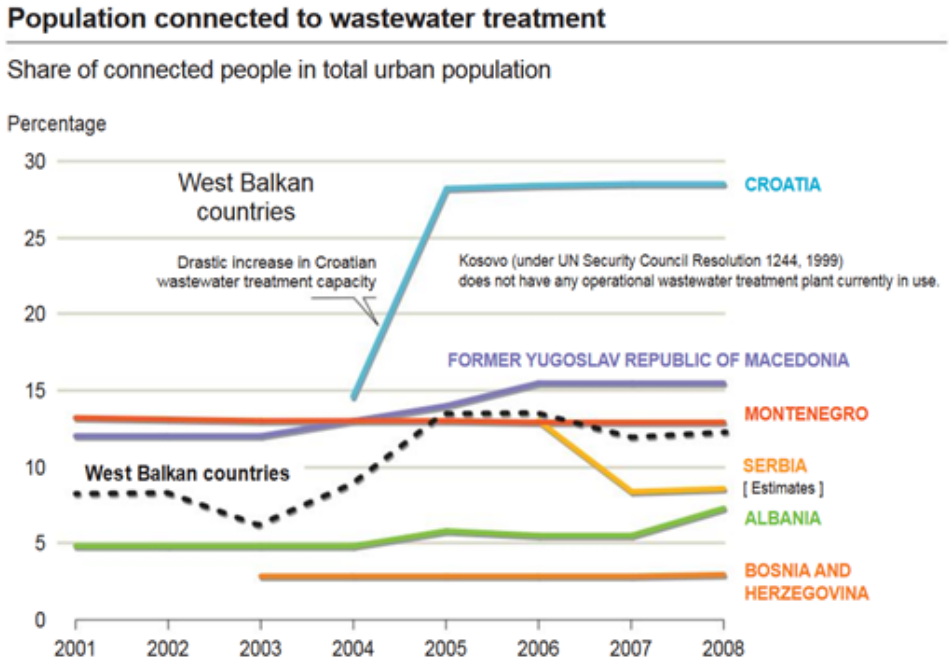
Figure 4.2: Fertiliser input per hectare in the Western Balkans (1992–2002)



Source: Figure 4.4 in EEA (2010) Environmental trends and perspectives in the Western Balkans

The lack of wastewater treatment means that the discharge of wastewater is a major source of pollution for both surface and groundwater sources (World Bank (2003), see also Figure 4.3.

Figure 4.3: Population connected to wastewater treatment in Western Balkans countries



Source: EEA, Zoi Environment Network, 2012. West Balkan Environmental Core Set of Indicators 2012

Specific data gaps noted include:

- No data related to chemical use or pollution. In particular no regional information was identified related to chemicals with uncertain effects / PBTs
- EEA (2010) noted that 'forward-looking indicators of water pollution have not been identified for the region'.
- Lack of data or other information relating to soil quality.

Increased costs of waste water treatment

The other implication selected under this cluster was *"Increased costs of waste water treatmen*t". The cost of removing nutrients from wastewater (especially nitrogen and phosphorous associated with agricultural use) is identified in SOER 2015 (GMT 10: Increasing environmental pollution load) as a key factor in the trend of increased release of nutrients into the environment.

In the Western Balkans, current evidence suggests that the use of fertiliser and other agricultural chemicals is likely to increase in coming years, and this is likely to increase the costs of wastewater treatment in the region. As inadequate monitoring and treatment/ management of wastewater is already recognised as a factor in the region, increased costs of wastewater treatment may be expected to exacerbate this situation. This was identified as a potentially important issue for the Western Balkans region during the expert workshop held in Slovenia (April 2017).

A report on environmental trends and perspectives in the Western Balkans (EEA, 2010) notes that freshwater quality varies significantly across the region, and while water 'quality is good in many mountain streams and in upper reaches of rivers, wastewater from urban areas and industry has polluted the lower courses of several rivers, such as the Sava River in Serbia and the Sitnica River in Kosovo'.

The same report also notes that while a high share of the population in the region has access to safe drinking water, a smaller share is connected to sewerage systems, and 'wastewater treatment is poor or non-existent in many urban and industrial areas', and that for some countries a lack of financing 'hinders improvements for these water services'.

Wastewater treatment in the region is often poor or non-existent, with data for the period 2001 – 2008 showing that less than 20% of the population were connected to wastewater treatment in most countries (see figure below) (EEA, Zoi, 2012).

The management of wastewater is of particular importance in the region, given the transboundary nature of many water resources (e.g. shared river basins/ catchments).

In addition the EEA 2010 report identified that (note that these data are from before 2010 so may be outdated now):

- In Serbia, many large industrial facilities are located at the outskirts of urban areas and discharge their wastewater directly into rivers with little treatment. Wastewater treatment plants served only 16 % of the country's population (data from 2005).
- Albania has one working wastewater treatment plant.
- In Bosnia and Herzegovina, 90 % of wastewater is reportedly released without treatment.
- In Kosovo under UN Security Council Resolution 1244/99, there is no wastewater treatment and less than a third of the population has access to a sewer system. It was reported in 2010 that a treatment plant has been constructed in Kosovo, but was not at the time in operation (KEPA, 2015).

The lack of wastewater treatment means that the discharge of wastewater is a major source of pollution for both surface and groundwater sources (World Bank, 2003). Looking ahead the report concludes that 'countries in the region face a major challenge in terms of improving drinking water and wastewater treatment services' (e.g. to meet EU requirements).

During the expert workshop held in April 2017, it was also noted that much of the water infrastructure in the region is quite old and of deteriorating quality, meaning that there may be increased need for investment in infrastructure just to maintain current levels of water management and treatment.

The global megatrend implication foresees the costs of wastewater treatment increasing in coming decades, which is likely to make meeting the cost of ensuring adequate wastewater treatment even harder for countries in the region.

An EEA report (2010) reviewed the availability of environmental indicators and outlooks for the region and identified that it was not possible to assess past or future trends for topics including: urban wastewater treatment and gross nutrient balance (an indicator of potential surplus of nitrogen on agricultural land), thus highlighting the need for improved quality of these indicators.

4.2.2 Resource use and supply cluster

Insecurity and conflict linked to resource competition

The implication *"Insecurity and conflict linked to resource competition"* is characterised how, in light of increasing global competition for resources, attempts to secure access to resources (either through extraction or trade) can increase regional tensions and lead to insecurity and conflict. The potential for increased regional insecurity and conflict linked to resource competition was identified as a potentially important issue for the Western Balkans during the 1st regional expert workshop.

The growing economies of the region (World Bank, 2017b) are likely to use more resources — both renewable biological resources and non-renewable stocks of minerals, metals and fossil fuels. This is expected to increase pressure on local natural resources and add to the growing volume of imported resources (DG TRADE, 2017) to the region. Increasing dependence on trade and insecure access to regional resources could result in tensions regarding competing claims over resource stocks or indirectly as a result of restricted trade flows.

This implication may 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 insecurity and conflict concerning resources.

The World Bank has estimated that between 2013 and 2016, the average poverty rates for Albania, FYR Macedonia, Montenegro, and Serbia declined by close to 2 percentage points. This is estimated to have lifted approximately 240,000 people out of poverty. Decreased poverty rates may suggest that more people in these countries have access to financial resources enabling increased consumption. Data from the World Bank also indicate a positive Growth Outlook for the region – from 2.2% Real GDP growth in 2015 to 3.6% in 2018 as domestic demand rises (World Bank, 2017b). GDP growth is generally associated with increased use of resources and energy. SOER 2015 notes that the global use of material resources has increased ten-fold since 1900 and is expected to double again between 2010 and 2030.

As demand grows, there is increasing competition for resources between water, energy, agriculture, livestock, forestry, mining, transport and other sectors with unpredictable impacts for the environment.

Amongst renewable resources, water is perhaps the most strategically important resource in the region. Competition for water is expected to increase as demand is likely to rise resulting from implications of climate change (Adelphi, 2013). Water use in agriculture is expected to increase as crops will require more water due to hotter, drier, longer summers (UNDP, 2013, Custovic et al.

2012) leading to an increase in number and size of irrigated areas. In Kosovo between 2001 and 2012 the extent of irrigated areas has increased by approximately 3000 ha (KEPA, 2015).

Over-exploitation of water resources has been identified as significant pressure from the electricity generation sector (JRC, 2014), and such pressures may increase in the near future.

Transboundary water management is considered sometimes to be weak in the Western Balkans with low political prioritisation, insufficient institutional capacity, limited information exchange and joint monitoring (UNEP, 2015; GIWEH, 2011; GEF TWAP, 2016). This is a major risk for the region in the light of potential conflict linked to water quality, availability and competition in the future. Countries like Serbia receive a significant proportion of their freshwater resources as external inflow. According to Eurostat indicators – the long-term average of external inflow from neighbouring territories in renewable freshwater resources for Serbia corresponds to 92.7 % (Eurostat, 2015).

There are common synergies and trade-offs in competing uses of water and land use in the region that could increase tensions over their use among different sectors such as hydropower generation, agriculture, drinking water, tourism, fish-farming, etc. One area of tension could be water infrastructure projects, producing hydropower and providing water storage for irrigation and urban uses, which might impact downstream agro-ecological systems with social implications, such as resettlements. Similarly, growing bioenergy may help improve energy supply and generate employment opportunities, but it may also result in increased competition for land and water resources with impacts on local food security (FAO, 2014).

Future insecurities from resource competition in the region might soar resulting from weak growth in the EU and post-Brexit uncertainties. The resulting political (and policy) uncertainty and instability could see the reduction in global trade growth (World Bank, 2017b). Such outcome would increasingly complicate the relations with trading partners and cause more stiff competition for imported resources.

The region has strong trade and investment links with the EU, as it is the regions' main trade partner (over 76% of the region's total trade) (DG TRADE, 2017). Any future uncertainties surrounding resource imports from EU could significantly impact the competitive outlook between the countries.

Demand (need) for increased renewables and efficiency

The second implication selected for this cluster *"Demand (need) for increased renewables and efficiency"* is discussed in the context of SOER 2015 GMT 7. Intensified global competition for resources, which describes how a projected doubling of global resource use by 2030, and increased energy consumption by a third by 2035, will lead to increased risk of global supply and price volatility for resources. The already increasing energy demand, lack of diverse energy mix and the significant dependence on oil and gas imports may be considered vulnerabilities for the Western Balkans and lead to strong incentives for private and public investment in exploiting renewable energy sources (RES) and energy efficiency measures. Moreover, global technological innovations could also lead to more efficient and economically viable use of renewable resources, including in the region, but could also add to the pressures on water overexploitation by increasing hydropower generation as part of the RES portfolio.

According to the Director for the Western Balkans at the Directorate-General for European Neighbourhood Policy and Enlargement Negotiations of the European Commission, the energy demand in the region is increasing, often in an unsustainable fashion adding that: *'the Western Balkans should focus on reducing demand and improving energy efficiency'* (Western Balkans Investment Framework, 2016). Nonetheless the future energy supply mix is a major uncertainty for the whole region (EEA, 2010). In many parts of Western Balkans, power generation is dominated by either fossil fuel sources (notably through coal power plants) or by hydropower generation (Politis et al. 2016; Softič et al. 2012). The lack of diversity in energy supply sources, especially in countries that

are highly dependent on hydropower, means exposure to a higher risk to climate change and possible water scarcity in summer periods. The risks for water availability could be further exacerbated by water exploitation as a result of energy strategies that foresee building new hydropower and nuclear plants (EEA, 2010).

Although for most of the countries in the region energy dependency from imports is moderate, i.e. between 35–50% most countries are import dependent in terms of oil and gas (76% – 100% being imported) – and demand volumes are increasing (IEA, 2008). This leads to threats for energy security and would require diversification of energy mix to minimise the risks from potential restrictions to supply and/or price volatility of imports in the future.

Except hydropower, other RES are at a relatively early stage of development in the region (Politis et al. 2016): they are less exploited, with relatively few incentives and regulations for their full exploitation (Karakosta et al., 2012).

This presents a clear need for promotion of development and use of hydro-energy potential, across environmental, integrated water management, energy policy and market domains as recognised from the expert consultation in particular in the context of Bosnia & Herzegovina. The cost of RES remains an issue as some are generally higher than conventional energy sources. However, RES investments will continue for those countries that have instituted policies to derive a significant percentage of their total gross energy consumption from RES in the short to medium term. Also, prices are projected to decline with technical improvements, innovations, economies of scale and government incentives[38].

The extended literature review for this implication recognised the following data needs:

- Information on international disputes regarding access to resources, and regional tensions/ conflicts related to resource competition
- Resource consumption trends.

4.2.3 Climate cluster

Droughts/ changes in precipitation/ extreme weather/ heatwaves

The first implication *"Droughts/ changes in precipitation/ extreme weather/ heatwaves"* selected in this cluster is defined by the projected increase of climate change including 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).

In the Western Balkans, climate change impacts are expected to bring (and are already leading to):

- An increase in extreme events, including summer heat waves and droughts.
- A reduction in precipitation in the summer months, and thus reduced water availability (e.g. for agriculture, hydropower) and reduced water levels in rivers, streams and lakes.

Impacts of such climate-related changes include 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), and damage to infrastructure and settlements.

Among the consequences of higher mean surface temperatures are more frequent and severe droughts. The IPCC scenarios of climate change suggest that Western Balkans are likely to

[38] http://www.balkaneconomicforum.org/wp/balkan-energy-strategies/

experience more frequent and prolonged droughts and wildfires (IPCC, 2012) in the upcoming decades and leading up to 2100. In the Western Balkans, droughts tend to result in significant economic losses, particularly in the agriculture, energy and water sectors (UNDP, 2016). For example in 2012 Serbia experienced its driest year in the last 25 years, which had significant effects on Serbia's agricultural production (UNDP 2016). An outlook study by EEA projects that the coastal and southern regions of the Western Balkans will experience significant changes in annual mean temperature and a reduction in precipitation, influencing drought, wildfires and overall water security (EEA, 2015).

Studies in the Mediterranean basin, including the Balkans, record recent negative annual trends in precipitation, where the decrease from 1950 to 2002 was greater than 50 mm per year (García-Ruiz et al., 2011). According to estimates in the IPCC 4th Assessment Report (IPPC, 2007), the total water run-off in southern Europe could decrease by up to 23 % in the 2020s and by up to 37 % in the next 50 years (although the specific impacts in the Western Balkans may vary) (EEA, 2010). Additionally, all countries in the Western Balkans with the exception of Bosnia and Herzegovina are expected to endure water stress, which is likely to increase by at least 10% (UNDP, 2016) because of rising demand for water partly due to higher water abstraction for irrigation.

Changes in precipitation affect the equilibrium of the soil. In Southern Europe, soil water content is projected to decline, saturation conditions and drainage will be increasingly rare and restricted to periods in winter and spring. Albania already suffers from desertification as 25 % of the country is affected by soil erosion (UNEP, 2011) while wind erosion, is a significant risk in Serbia as larger regions of the country is exposed to it and could be amplified due to extended drought periods (Custovic et al., 2012).

Heatwaves contribute significantly to and often accompany droughts and wild fires. Milder forms of heatwave occur regularly in the Western Balkans (2002, 2003, 2004 and 2007), whereas extreme heatwaves are rare (UNDP, 2016). According to IPCC, it is highly likely that the future will bring heatwaves of higher frequency and duration than previously observed (IPCC, 2013) in the region.

The projected regional changes in precipitation are likely to reduce the suitability of rain fed agricultural production and increase water demand for crop irrigation – particularly in the summer: already about 49 % of Albania's cropped land is irrigated (EEA, 2010). However, the projected decline in total runoff and groundwater resources in the Mediterranean area suggests that there is limited capacity for increased irrigation in the region (Olesen et al., 2011).

A large proportion of farms in the Western Balkans comprise of smallholdings which is considered to make them less resilient to drought, extreme weather events (cold spells, frost and heatwaves), fires, extreme precipitation, land degradation, topsoil erosion and flooding (UNDP, 2016). Such consequences together with competing demands for land use may lead to agricultural land abandonment and land use change, such as has been seen in Kosovo where agricultural lands decreased from 31.3% of Kosovo's territory in 2002 to 27.8% in 2012 (EEA, 2015).

A regional study on the effects of climate change for Western Balkans agriculture foresees some positive effects, such as for the yields and quality of winter crops as a result of increased temperatures in spring and summer and extended growing period. Areas suitable for fruit and grape production are likely to expand with the reduced likelihood of extremely cold winters and late spring frosts. However, the picture is mixed as spring crops are also likely to be affected by high temperatures and water shortages during the summer months and are may therefore experience notable decrease in yield across the region. It is expected that the losses in yields in Southern Europe will range from 10 to 30% (Custovic, et al., 2012).

Experts at the workshop held in Slovenia in April 2017 identified the necessity for a regional response through enhanced cooperation on transboundary water management. Improved water

management in upstream agricultural areas could mitigate adverse impacts downstream and groundwater recharge could be targeted in areas with poor water-holding soils (Kløve et al., 2011).

Extreme weather events may threaten all types of energy infrastructure, with the associated increase of production and maintenance costs. Events such as the 2014 low pressure cyclone bringing strong winds and rain in South-Eastern Europe could become a more frequent occurrence. The damage in Bosnia and Herzegovina, and Serbia resulted in the loss of tens of thousands of homes, agricultural land, schools, hospitals and businesses leaving thousands of people without electricity, with other critical infrastructure (road networks, energy infrastructure etc.) damaged or destroyed. The estimated total economic impact of the disaster reached 2.04 billion Euros or fifteen per cent of gross domestic product for Bosnia and Herzegovina (UNDP, 2016).

Improvement of the monitoring and forecasting system for droughts was recognised as an essential area for improving data availability.

Floods (coastal, river, urban)

The other implications factsheet "Floods" is characterised by increasing greenhouse gas emissions from fossil fuel burning, and also other activities including deforestation and agricultural changes, substantially contributing to global mean sea-level rise and changes in the frequency and intensity of precipitation.

In recent years the Western Balkans has already been affected by severe floods and without adequate adaptive measures, countries in the region are expected to endure substantial increase in flood damages resulting in physical, economic, social and environmental costs.

Floods are the most recurring natural hazard in the Western Balkans as they occur in almost all river basins in the region (UNDP, 2016; Macedonian Environmental Information Center, 2014; KEPA, 2015, Sutton et al., 2013). Recent years have seen Western Balkans being affected by severe floods (2014 in Bosnia and Herzegovina, and Serbia; 2009, 2010, 2015 in Albania and former Yugoslav Republic of Macedonia) that have caused extensive damage to agricultural land, power and water utilities and communications and transport infrastructure (UNDP, 2016, Luzati, 2015). Outlooks by EEA project that the north-eastern part of the region will likely experience increased levels of rainfall and therefore increased intensity of floods (EEA, 2015).

The extent and severity of soil erosion is expected to increase over the next century as intense precipitation and flooding increase flow of underground waters causing widespread landslides. This can further induce pollution of waterways and reduce functioning of reservoirs and irrigation infrastructure (Custovic et al. 2012; Hristov, 2014).

Crop damage from floods is particularly problematic in the spring period when flooding in the region can delay or prevent planting of summer crops. Furthermore when it occurs, late summer flooding in Western Balkans can see an entire year's growth destroyed and prevent farmers from timely harvesting. Less serious flood events can still reduce productivity through water-logging of roots (Hristov, 2014).

Coastal flood risk will increasingly become a key challenge for the coastal cities in the region as port facilities, and other infrastructure become increasingly vulnerable to significant damage. A scenario study completed as part of Albania's Second National Communication to the Conference of Parties under the UNFCCC projected that its coastal floodplain area will increase from 55.61 (avg. min) in 2025 to 57.19 (avg. min) in 2100 (Ministry of Environment, Forestry and Water Administration, 2009). Such circumstances are likely to increase the maintenance and production costs for energy infrastructure that is located in territory vulnerable to flooding (UNEP, 2015). Sea-level rise could also result in increased salinity in estuaries and coastal aquifers as salts are remobilised from increased storm flooding (Ministry of Environment, Forestry and Water Administration, 2009).

Improvement of hydro meteorological data collection was recognised as an essential area for improving data availability for this implication.

5 Identification of risks and opportunities and related policy needs

5.1 Introduction

This section is based primarily on the outcomes of the second project workshop, held in Belgrade, Serbia on 7th and 8th September 2017, which focussed on discussion of risks and opportunities for the Western Balkans region arising from the GMT implications. The section sets out briefly how the workshop was set up and run, and then summarises the key outcomes from the workshop, including identified policy gaps and needs in the region related to GMT implications.

This section provides a summary of the workshop outcomes, a full record of the workshop including details of participants, each workshop session, background materials and all outcomes is available through the Eionet Forum[39].

5.2 Workshop 2: Assessment of risks and opportunities, policy gaps and needs

The second project workshop was intended to provide an opportunity to bring together regional experts to discuss the risks and opportunities for the Western Balkans region and countries arising from GMT implications felt to be most relevant to and likely to have strongest effects in the region (as summarised in Section 3. The workshop also included discussion of potential policy gaps and needs related to GMT implications. As the second workshop during the project, this was an opportunity for regional experts to follow-up on the discussions held in the first workshop April 2017. The majority of participants in the second workshop also participated in the scoping workshop.

The objectives of the workshop were to:

- Provide an opportunity to reflect on available evidence on whether or not GMTs will have implications for the Western Balkans region, and when these implications may occur;
- Identify the risks and opportunities posed by the GMTs for the Western Balkans region in the short, medium and long term;
- Assess the likelihood and magnitude of these risks and opportunities in the region; and,
- Consider the extent to which current policy and strategic planning in the region (and Western Balkan countries) is “fit for the long-term”, and what gaps there may be with regard to managing risks and maximising opportunities.

The workshop was organised as a participative event, with experts contributing their knowledge through facilitated working and plenary sessions:

- **Working session 1** – Identifying risks and opportunities – in this session small groups of experts discussed the presented evidence related to regional GMT implications and discussed what risks and opportunities the implications may pose for the region or countries.
- **Working session 2** – Outlook on water and climate change vulnerability in the Western Balkans – in this session the outcomes of scenarios on future water availability in the region were presented and participants invited to discuss. This working session represented part of the work for project Task 2: *Outlook on water and climate change vulnerability in Western Balkans* and is not therefore summarised in this report.
- **Working session 3 –** Assessment of risks and opportunities – this session involved group working to assess the risks and opportunities identified in working session 1 for their expected magnitude and likelihood.

[39] https://forum.eionet.europa.eu/eea-west-balkans-cooperation-interest-group/library/etc-inland-coastal-and-marine-waters-activities-wb/2016-2017_west-balkan-project-gmt/2017_2nd-workshop-gmt-west-balkan-region

- **Working session 4 –** Policy gaps and needs – in the final working session experts reflected on the risks and opportunities assessed as being most significant in working session 3 and discussed the need for new or amended responses (e.g. through national policy, or transboundary cooperation etc.).
- **Reflections and next steps** – workshop facilitators provided closing reflections and elaborated on next steps using the outcomes of the workshop.

5.3 Workshop outcomes

Sub-section 5.3 presents the outcomes of the workshop and corresponds to the working sessions held. The working sessions were designed to provide a progression through risks and opportunity identification (5.3.1), assessment (5.3.2) and response in the form of policy gaps and needs (5.3.3). As noted the starting point for the discussions at this workshop were the scoping outcomes (identified GMT implications – see Section 3) and the regional evidence collated (GMT implication factsheets – see Section 4).

5.3.1 Identified risks and opportunities

In the first working session, experts considered the evidence presented on each of the GMT implications and discussed what specific risks and opportunities for the region may arise from the implications. In considering risks and opportunities, experts were invited to consider whether specific sectors, groups in society or geographic areas may be affected by the implications, and the time-frame over which the risks or opportunities were expected to occur.

The outcome of this working session was completed worksheets setting out risks and opportunities for each GMT implication. In total 27 specific risks and 20 opportunities were identified by participants. An overview of all risks and opportunities identified is presented in Tables 5.1, 5.2 and 5.3 below. The worksheets are included in Annex 4.

Photo: © Milkos Marton

The risks particularly identified on water availability and trade-offs correlate with the findings of scenario work on water availability in the region as part of Task 2 (see box below).

Box 5.1: Water and climate change outlooks in the region

A report on "Outlook on Water and Climate Change Vulnerability in the Western Balkans" has also been prepared as an output of the project *Water Use in the Western Balkans: regional outlooks and global megatrends*. This is the final report for Task 2 of the project that focused on developing scenarios and hydrological models of water availability. The review of regional sources and expert cooperation resulted in the development of 4 scenarios across 12 representative catchments in the region. Indicated results present land use change in the short term (2031-2040) being the dominant factor in determining water availability whereas in long term (2061-2090), this is attributed to climate change intensity with discharges almost always being lower in long-term future.

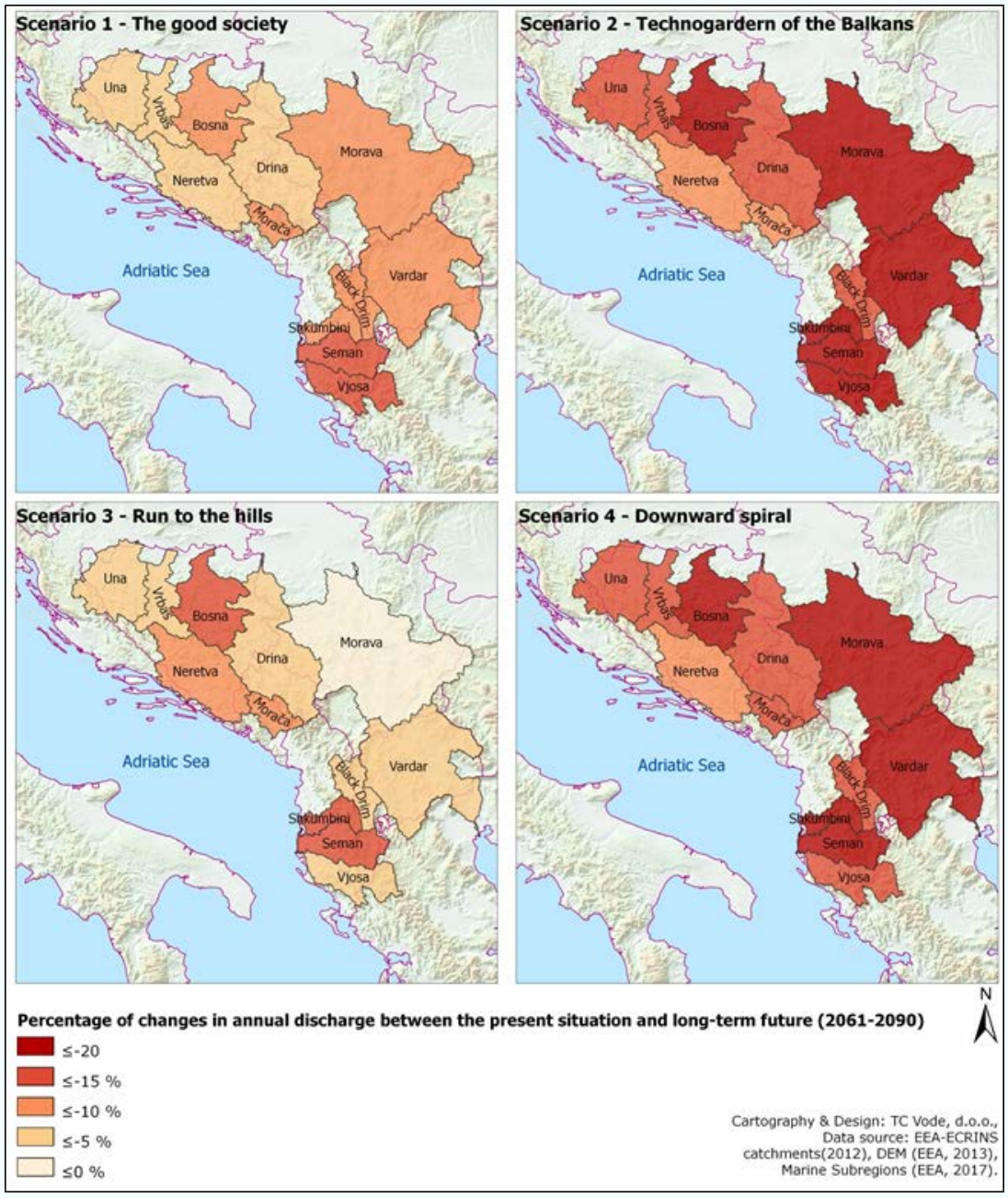


Table 5.1: Risks and opportunities for the Western Balkans region from identified GMT implications: biodiversity and ecosystems cluster

Risks	Who may be affected?	Opportunities	Who may be affected?
Implication: Increased costs of waste water treatment			
Not enough financing – issue left untreated (mining)	Population and environment in regions of development (urbanisation)	EU funding of waste water treatment; International funding	-
EU (and other international institutions) not helping – as it becomes too expensive	Government-level; Local communities	To apply more efficient technologies	-
Risks to safe drinking water	General population in urban areas	Using waste water for irrigation (if treated) - only if bacteria is cleared first	-
Implication: Pollution affecting soil and water, including from pollutants with uncertain effects			
Further increased pollution due to intensification of agriculture/industry (privatisation, foreign investment)	Local communities downstream	Policy improvement	Government level
Food production/ quality	Population in the region/ farmers selling such food	Funding in general	Government level
Low monitoring, especially for new/ unknown chemicals; Slow policy response (or not at all); implementation gap	Population in the region	Developing / applying technologies	Population in local communities
Health risks: drinking water, also in combination with lowering water quantity – less water has less self-purification ability	General population (especially low income population); focused to agricultural areas and industrial areas	Rising (investments) incentives for organic farming	Local communities that take advantage
Increasing cost to deal with pollution (especially costly issues e.g. mining; also trans-boundary cascading effect – polluted Ibar river flowing from Kosovo to Serbia)	Government; Infrastructure management		
Adopting EU policy without consideration: higher threshold than current national law	-		

Table 5.2: Risks and opportunities for the Western Balkans region from identified GMT implications: resource use and supply cluster

Risks	Who may be affected?	Opportunities	Who may be affected?
'Resources' cluster			
Implication: Demand (need) for increased renewables and efficiency			
Negative impact on biodiversity	Biodiversity – fish population (hydro-power plants affecting fish migration)	Improved waste management (biogas from waste)	Agriculture; Environment (waste management)
Overuse of resource	Biodiversity	Develop tourism sector	Economy
Using food (crops) for biogas	Local communities; Transboundary areas		
Lack of adequate monitoring praxis (if RES grows continuously)	Agriculture and other sectors; Population; Tourism		
Inadequate spatial planning & strategic impact assessment	Transboundary areas; Biodiversity; Protected areas		
Implication: Insecurity and conflict linked to resource competition			
Increased poverty – vulnerable population	Rural areas	Enforcement of regulation	Life quality
Conflict about water use – water supply; hydro-power plants (access to and using of drinking water – shortage)	Population; Energy sector	Increased regional cooperation	Economies of the countries in the region
Illegal cutting (logging) even in protected areas	Forests; biodiversity; pollution; soil erosion	Improved resource management & raising knowledge about resources	
Growing social inequality	Population – no middle class	Foreign investment in agricultural land	Local communities; population
Land grabbing	Local communities; population		

Table 5.3: Risks and opportunities for the Western Balkans region from identified GMT implications: Climate cluster

Risks	Who may be affected?	Opportunities	Who may be affected?
Climate cluster			
Implication: Extreme events – droughts, precipitation changes, heatwaves			
Forest fires	Villages/ rural/ Coastal areas/ Transitional forests	Cross-sector integrated water management	-
Crop failure (drought)	Dryland crops/ Agriculture sector/ Consumers	Extreme events as triggers of change	-
Water shortages – trade-offs: irrigation, drinking water, hydro	All water using sectors	New crops/ crops in new areas	-
Public health – heatwaves/ allergies/ alien species	Vulnerable groups in society	Increase in Tourism	-
Implication: Floods (coastal, river, urban)			
Damage to infrastructure	Coastal settlements (flooded houses) Water infrastructure (old machinery)	Wetland, riparian ecosystems	-
Drinking water supply	Water utilities depending on local governance	Water shortage	-
Pollution (connected with low flows)	Agriculture, groundwater, riverine ecosystems	Improve technologies (transfer, implementation, development)	-
Soil erosion/ landslides	Settlements (especially semi-legal); Agriculture		

5.3.2 Assessment of risks and opportunities

The next step in the workshop was to carry out a qualitative assessment of each identified risk and opportunity using assessment criteria (see Annex 5) and worksheets provided. Participants were invited to discuss in small groups each individual risk and opportunity and provide an assessment score (high, medium, low) for the likelihood (of the risk or opportunity occurring) and magnitude (of the risk or opportunity should it occur). The completed assessment of each risk and opportunity is presented in Annex 6.

During the workshop it became clear that there was insufficient time to discuss the potential policy gaps and needs associated with all of the risks and opportunities. As a result, participants were invited to identify one risk and one opportunity from each GMT implication to be discussed in terms of policy gaps and needs. The assessment of these selected risks and opportunities is summarised in Table 5.4, below. Where a '–' mark is included in the table this indicates that no notes were added to the worksheet by the group.

Looking across the risks and opportunities identified by experts during the workshop, there are some themes that appear to recur across the different GMT implication clusters. In relation to the risks identified:

- Financial risks, related to a lack of investment or insufficient funds to adequately respond to known or emerging environmental issues. External (foreign) investment, for example in the agricultural sector was identified as a risk as well as a potential opportunity.
- Policy and regulatory risks, typically associated with poor enforcement or a lack of policy coherence (within topics, e.g. water, and across the region).
- Changing habits, consumption patterns and land-uses, increasing environmental pressures, resource use and the need for adequate regulatory frameworks and planning. The economic development of the region was also considered to be leading to an increase in social and economic inequality.

In relation to the opportunities identified:

- A key opportunity is also reflected in the policy needs (see sub-section 5.3.3), and is that in relation to most implications the need for increased transboundary cooperation in the region was identified. This reflects the transboundary nature of many of the implications and topics discussed such as water supply / use, floods and energy.
- The opportunities associated with new technologies were also recognised, for example developing and applying technologies to reduce pollution associated with agriculture, and to improve waste water management and treatment.
- Although also noted as a risk, the opportunity to attract additional funding to the region to address specific needs was also identified in relation to multiple implications (e.g. water quality monitoring and treatment, investment in agriculture, increased tourism).

Table 5.4: Assessment of key risks and opportunities for the Western Balkans region from identified GMT implications: Climate cluster

Risks	Timeframe	Overall assessment	Opportunities	Timeframe	Overall assessment
Biodiversity cluster					
Increased costs of waste water treatment					
Not enough financing – issue left untreated (mining)	-	High	EU funding of waste water treatment; International funding	-	High
Pollution affecting soil & water, including from pollutants with uncertain effects					
Further increased pollution due to intensification of agriculture/industry (privatisation, foreign investment)	Medium term (2020–2030) to Long term (2030–2050)	Medium/ High	Policy improvement	Long term (2030–2050)	Medium/ High
			Funding in general	Short term (to 2020)	High
Resource cluster					
Demand (need) for increased renewables and efficiency					
Inadequate spatial planning & strategic impact assessment	Short term (to 2020)	High	Improved waste management (biogas from waste)	Short term (to 2020)	Medium
Insecurity and conflict linked to resource competition					
Conflict about water use – water supply; hydro-power plants (access to and using of drinking water – shortage)	Short term (to 2020)	High	Increased regional cooperation	Short term (to 2020)	High
Climate cluster					
Implication: Extreme events – droughts, precipitation changes, heatwaves					
Water shortages – trade-offs: irrigation, drinking water, hydro	Medium term (2020–2030) to Long term (2030–2050)	High	Cross-sector integrated water management	-	Medium
Implication: Floods (coastal, river, urban)					

Risks	Timeframe	Overall assessment	Opportunities	Timeframe	Overall assessment
Soil erosion/ landslides	Short term (to 2020) to Medium term (2020–2030) **for river floods** Long term (2030–2050) **for coastal floods**	Low	Improve technologies (transfer, implementation, development)	Short term (to 2020) to Medium term (2020–2030) **for river floods** Long term (2030–2050) **for coastal floods**	Medium

5.3.3 Identified policy gaps and needs

Following the assessment of risks and opportunities and selection of specific risks and opportunities to be considered in terms of policy gaps and needs, these were discussed in small groups using a worksheet provided. Each group was invited to consider: what existing policy, strategy or cooperation is there in the region (or the country of individual experts); and what gaps and needs are apparent in the existing policy responses. Experts were also invited to discuss and note town any key opportunities for new transboundary regional cooperation. In some group discussions it was noted that the term 'policy' somewhat narrowed the focus of discussion, and that 'responses' may be a better term to use to guide discussions as this could include a wider range of types of response to the risks and opportunities.

A summary of the outcomes of the discussion of policy gaps and needs is included in Table 5.5. It should be noted that due to time constraints, not all risks and opportunities were discussed in detail and where a '–' mark is included this indicates that no notes were added to the worksheet by the group. The completed worksheets are included in Annex 7.

Photo: © Anita Künitzer

Looking across the identification of policy gaps and needs in the different GMT implication clusters a number of key themes are apparent:

- The lack of transboundary/institutional cooperation was broadly recognised among experts as national government bodies often lack regional cooperation particularly when it comes to water management. Insufficient and weak cooperation between sectors (agriculture, energy etc.) was also highlighted as an important gap for water management. The need for preparing successful bids for international funding on water management in the region is another priority that requires a better organisation of institutions that successfully apply for funding. Finally, by recognising the lack of continuity in transboundary projects the experts indicated a gap in transboundary cooperation.

- Need for/opportunities to access funding (national/ EU/ private) to improve water management (e.g. subsidies) was identified in relation to many of the risks and opportunities (either to help manage risks or to exploit opportunities, however it was felt that institutions (public and private) in the region often lack funds and are not necessarily well equipped to access potential funding sources.
- Policy enforcement and policy coherence were both discussed as policy needs that require attention in the region, and a view expressed by many experts was that there is in fact often relevant policy and goals for environmental issues, but that there is not the capacity to implement or enforce policy and regulations. It was also noted that a lack of both horizontal and vertical policy harmonisation is causing conflicts between exiting legislations. Unclear and split jurisdiction often leads to a lack of knowledge/ awareness of how a policy is being implemented, thus requiring improved supervision across the policy areas. Some experts also noted that policy enforcement would benefit from corruption being actively addressed where it exists.

In relation to the opportunities for transboundary cooperation identified to address these gaps/needs:

- The opportunity for sharing best practices as well as applying the principles of twinning (e.g. twinning projects) with neighbour countries could improve the bilateral and multilateral cooperation of transboundary regions.
- Applying for international funding to address waste water treatment – especially considering the existing relations between experts in the region that could apply for common trans-boundary projects funded by the EU.
- There is an opportunity to increase fines for violations of existing regulations as experts indicated that currently in the region it is cheaper to pay fines than respect legislation in particular for water management (e.g. water use – water supply).

Table 5.5: Summary of policy gaps and needs and opportunities for transboundary cooperation

Risks	Policy gaps and needs	Opportunities for transboundary cooperation	Opportunities	Policy gaps and needs	Opportunities for transboundary cooperation
Biodiversity cluster					
Increased costs of waste water treatment					
Not enough financing – issue left untreated (mining)	Organisation of institutions to prepare good projects which would win funds Financial contribution is often problematic, should be linked with economic strategies Separated between different institutions (ministries)	West Balkan project (by the old ETC, 2011) identified waste water treatment plants in the region	EU funding of waste water treatment; International funding	Lack of transboundary cooperation	(Expert) relations between experts in the region that can apply for common trans-boundary projects funded by the EU
Pollution affecting soil & water, including from pollutants with uncertain effects					
Further increased pollution due to intensification of agriculture/ industry (privatisation, foreign investment)	Tools (technology of monitoring); law enforcement Updated registries of pollutants needed (agriculture; industry) Validation of data needed (e.g. E-PRTR reporting), especially industrial pollution Investments into monitoring process	New reporting software will be used (E-PRTR), but only for big companies	Policy improvement/ Funding in general	-	Use of public pressure (NGO activities) Sharing best practices within the region There is twinning, but not with neighbour countries
Resource cluster					
Demand (need) for increased renewables and efficiency					
Inadequate spatial planning & strategic impact assessment	Weak municipal administration – often are waiting on national level to delegate. Unclear and split jurisdiction (overlap of responsibilities) Conflict between existing legislation – lack of harmonisation both horizontally and vertically	Harmonisation of strategies (transport sector, energy sector)/ Bilateral and multilateral cooperation of transboundary regions (transboundary catchment areas) Opportunity to establish RES hubs – particular country	Improved waste management (biogas from waste)	Lack of funds & capacity to implement EU legislation – experts writing strategies, but sometimes there is no capacity to implement these. When the strategies expire – little	IPA funds being used for waste water management Twinning projects

Risks	Policy gaps and needs	Opportunities for transboundary cooperation	Opportunities	Policy gaps and needs	Opportunities for transboundary cooperation
		becoming a hub on use of a particular renewable (for example Bosnia & Herzegovina becoming a hub on wind energy etc.) with energy being distributed across the region.		achieved and new strategies written (vicious circle) Kosovo – issues re industrial waste management that requires investment (1bn Euros for waste water treatment)	
Insecurity and conflict linked to resource competition					
Conflict about water use – water supply; hydro-power plants (access to and using of drinking water – shortage)	No cooperation between government bodies when it comes to water management. Improved supervision required as often there is lack of knowledge/ awareness on how the policy is being implemented. Need to tackle corruption. Need for policy incentives to improve water management (e.g. subsidies)	Strengthen monitoring There is an opportunity to increase fines for violations of existing regulations – currently it is cheaper to pay fines than respect legislation.	Increased regional cooperation	No continuity of these transboundary financial incentives (projects) – both from within the region and international.	Use the current/ previous projects of transboundary resource management as a platform for continuous improvement of these resources.
Climate cluster					
Implication: Extreme events – droughts, precipitation changes, heatwaves					
Water shortages – trade-offs: irrigation, drinking water, hydro	Additional problem presents insufficient / weak cooperation between different sectors (agriculture, waste water...). The cooperation between sectors in terms of water management actually not exists or it is extremely week. This was emphasized by all WB representatives participating in the	Transboundary cooperation in terms of water management is already in place in it works sufficiently through ICPDR and Sava Commission. Current legislation is not enough to encourage cooperation between sectors. Slovenian representative	Cross-sector integrated water management	-	-

Risks	Policy gaps and needs	Opportunities for transboundary cooperation	Opportunities	Policy gaps and needs	Opportunities for transboundary cooperation
	discussion.	emphasized how EU legislation (WFD) forced different sectors to start collaborate with each other. Cross-sectoral cooperation was not possible before EU legislation take into force. Representatives hope that WFD will have the same effect in their countries when it comes to cross-sectoral cooperation.			
Implication: Floods (coastal, river, urban)					
Soil erosion/ landslides	The policy regarding soil erosion/landslides is very fragmented and sectoral. There is national policy regarding this issue in ME, only plans on local level. In Macedonia there is also a lack of legislation and capacity. There is an important need for sufficient legislation, risk maps etc. Cooperation of spatial planning sector with other sectors should be strengthened.	Since this is more a local issue (in comparison with e.g. floods) the transboundary cooperation is not so crucial. Nevertheless, the cooperation could be possible in terms of capacity building, regional landslide risk maps development etc.	Improve technologies (transfer, implementation, development)	Every country is developing their own system; each country is using different method and time scale.	Transboundary cooperation in terms of technology transfer and implementation associated with flood is relatively weak. Big role and potential in the technology transfer have academic communities (e.g. remote sensing). Big potential for transboundary cooperation to develop common regional informational platforms (e.g. flood maps).

6 Key messages and recommendations

6.1 Reflections and recommendations

6.1.1 Reflections on GMT implications and responses

This 12 months study into the potential implications of GMTs in the Western Balkans region has drawn on the knowledge of a range of regional experts in environmental, resource, infrastructure and related research, planning and policy, together with the collection and review of available evidence (literature, indicators) on the status and outlook for regional environmental issues related to water, energy and food. The method applied was designed to be participatory in nature, and used a systematic approach to make use of the available evidence to discuss and prioritise potential impacts on water, energy and food in the Western Balkans region based on the knowledge and judgement of regional experts.

The outcomes summarised in the sections above are quite diverse, but illustrate some of the key ways in which the environment of the region is being, and will in future be, affected by global drivers and trends. They indicate that there is a need for environmental and other policy makers in the region to:

- Consider the long-term outlooks for water availability in their country (and the region) when developing policy and strategy across a range of policy spheres e.g.: agriculture and food; land-use and spatial planning; mining; energy production; manufacturing. Trade-offs and risks associated with competing demands for water in the region, including the potential for conflict, were consistently identified by regional experts.
- The increasingly sever consequences of climate change are likely to exacerbate all regional long-term environmental challenges around the water-energy-food nexus. Climate change scenario based modelling under Task 2 of the project predicts significantly reduced water availability in all regional catchments in the long-term (scenarios considered periods 2031–2040 and 2061–2090) due to climate and socio-economic changes, which will pose real challenges for energy generation (especially hydro), food production and other water uses (e.g. industry) with associated trade-offs in water use becoming more difficult to manage.
- The global demands on certain resources are expected to change dramatically to 2030 and beyond, affecting availability and price. Regional institutions/ policy makers should consider undertaking modelling or other research into the resource implications of different policy or strategic options, in particular exploring current supply and demand characteristics in the context of medium and long term global and regional socio-economic changes. Examples could include:
    - Considering what the long-term water needs of investment strategies related to agricultural land-use or energy production would be, and compare these to existing knowledge on likely future water availability (e.g. from scenario studies such as that completed in Task 2 of this project).
    - The supply and price of some key material resources (e.g. critical resources, fossil fuels) are uncertain in the long-term, and considering the needs of different industry or infrastructure planning decisions to seek ‘insulation’ from future resource supply risks could help build regional economic resilience.
- Assess and plan for, as far as is possible, trade-offs related to investment, planning and other decisions. In particular water is a shared regional resource, with vital significance for the economy (e.g. hydro-generation, agriculture) but also for health and wellbeing of the population and for the natural environment. Some resources and ecosystems in the region are particularly vulnerable, e.g. shallow aquifers, karst.
- Work with institutions across individual policy areas, both in planning more coherent policy, but also in helping to identify and consider key trade-offs, support enforcement of existing regulations and standards, and to draw on knowledge and expertise from across disciplines. For

example where energy production and industrial development are proposed in the same area, using combined modelling of water demand/ supply could help understand and manage potential future water-use conflicts by being explicit about trade-offs and identify where supply may not be adequate to meet demand. A relatively simple practical step could be to seek further regional and cross-sectoral workshops and meetings (e.g. bringing national agencies or ministries with responsibility for water, energy and agriculture together to discuss and explore common challenges and opportunities for cooperation).

- Agree on and seek to manage (as far as possible) potential future changes in the agricultural sector, in particular foreign investment and intensification of agricultural production in some areas. Recognising this can bring economic benefits for the region, there is also risks related to environmental pollution, ecosystem damage, loss of traditional rural lifestyles and the need to ensure the financial benefits of such investment are kept within the region.

6.1.2 Practical next steps

The reflections above provide some broad considerations for policy and decision makers in the region arising from the study into GMT implications. Some specific practical next steps that experts who participated in the project and others in the region could consider include:

- The outcomes of this study represent a set of implications and associated risks and opportunities together with a summary of regional evidence and potential policy responses. Experts in the region are invited to use the evidence (e.g. implication factsheets; risk and opportunity assessment outcomes) in their own work, and to build on these.
- Experts can also consider the medium- to long-term risks and opportunities identified to help frame their own thinking and work in environmental reporting (e.g. national state of environment reports) and other strategic activities.
- Aspects of the approach used for this study could be adopted by policy makers in the region, for example to supplement existing approaches used for national for state of environment (SoE) assessment and reporting. This could include: making better use of existing indicators, for example bringing selected indicators together in the form of thematic/sector overviews; framing SoE reporting around emerging issues and global (or regional) drivers to provide for an outlook aspect and consider future policy needs; make use of participatory approaches in regional policy discussions, which this project has illustrated can provide valuable insights and knowledge co-creation; make use of novel assessment approaches, including mind-maps and causal chains (or systems approaches), to help understand and communicate the complex relations and trade-offs in many environmental policy areas.
- Many interesting and valuable exchanges were apparent during the workshops, and experts from different countries and areas of knowledge discussed common challenges, risks and opportunities. To build on this exchange of ideas, regional experts involved in the study could continue to share experiences and hold follow-up discussions around the topics and themes emerging from this study. This could be in the context of other projects they may be involved in (e.g. inviting experts met through the GMT implication workshops to meetings under other projects), or by making use of existing networks to maintain connections and exchange.
- Some specific data and knowledge gaps were identified in the evidence review conducted during the study, and these were reported in the implication factsheets. Key gaps include a lack of effective environmental monitoring in some countries in the region e.g. water quality, the health of natural environments / ecosystems; as well as limited environmental outlooks in the region to support longer-term decision making. There may be opportunities for institutions in the region to identify and source funding to improve the regional knowledge-base for example through European Commission research projects.

- Some experts felt that there are opportunities for learning and exchange from good practice (e.g. in relation to policy development, enforcement, environmental management) in other regional countries and neighbouring countries. It was suggested that government agencies and ministries could seek out opportunities for twinning or exchange on regional risks and opportunities related to GMTs (and wider environmental issues).

6.1.3 Lessons learned in applying the methodological toolkit

In applying the method to a regional study, the project successfully engaged many experts in discussion and led to identification of implications, risks and opportunities for the Western Balkans. However, the scale and complexity of the connected GMT drivers, trends and possible implications meant decisions had to be made at each step to limit the scope in order to keep volume of information manageable: from 11 GMTs analysed by the EEA, 4 were selected for discussion in the scoping workshop; from 12 prioritised implications identified through scoping, 6 were carried forward for discussion in the workshop on risks and opportunities; and from 27 specific risks and 20 specific opportunities assessed by experts it was only possible to discuss 6 risks and 6 opportunities in relation to potential responses. Without extending the time and resource for such studies and the workshops (e.g. participants in the workshops held in this project suggested that 2 or even 3 day workshops would be required for more detailed discussions), for future studies at national or regional level, it will be important to agree a clear and narrow scope or focus, or to accept that the study may need to address a small number of high-level implications in limited detail.

Global megatrends represent a new concept to many experts, and the terminology used can be difficult to engage with. Therefore it is important to demonstrate the GMT concept with examples, and provide context that explains what they are and that they are used in various sectors as a means of structuring thinking about key drivers and trends that may influence a particular sector, country or issue.

Specifically for a regional study it was challenging to decide on the appropriate level of detail and evidence to include. While the project was intended to include 'national insights', in practice the project team found that for specific environmental issues there is often either too little information (e.g. due to limited number of regional studies), or the picture becomes overwhelming due to very detailed national monitoring data or reporting. Preparing a complete regional picture of a GMT implication based on existing national indicators and outlooks is simply not possible, so it is recommended that future studies develop illustrative descriptions from which wider conclusions can be inferred as was the intention in this study.

The methodological toolkit proposed the discussion of *policy* gaps and needs. However during the workshop on risks and opportunities it became clear that a broader focus was required: *responses*. Responding to the risks and opportunities associated with GMT implications may include policy changes, but can also involve other types of response e.g.: more joint working; better enforcement of existing policy; identification of long-term knowledge needs.

Other practical lessons from applying the method include:

- The workshops were very successful, with lively discussion and exchange and outputs generated as expected. However such workshops require considerable planning and preparation, as well as hands-on facilitation to guide group discussions, keep notes and complete worksheets, as well as to collate and compile a workshop record. In this study a minimum of four facilitators were used in each workshop. It is also clear that a good knowledge of the methodology as described in the toolkit is important for all involved in workshop planning and facilitation.
- For participatory workshops to be run as planned, requires appropriate meeting spaces. For example space is required for small-group discussions, space to hang posters, flip-chart paper and other information, and a lay-out of tables and chairs that encourages discussion and exchange. Class-room or conference room style arrangements are not effective or suitable for meetings to break-out in small groups.

- The ideal number of participants for the type of workshops used in this study appears to be 20 people maximum. Larger groups are possible, but make the sharing of views and perspectives in full plenary more difficult, and also implies larger break-out groups which can be harder to facilitate (e.g. to ensure all voices are heard).

An approach that was successfully adopted in group discussions during the workshop on risks and opportunities was to encourage experts to consider the topic or issue individually to begin with, before bringing all individual perspectives together to seek consensus and a group opinion. This provided a means of ensuring all experts feel able to contribute, and can help address e.g. issues such as experts working in a second or third language, or not feeling confident due to discussion addressing topics outside their area of expertise.

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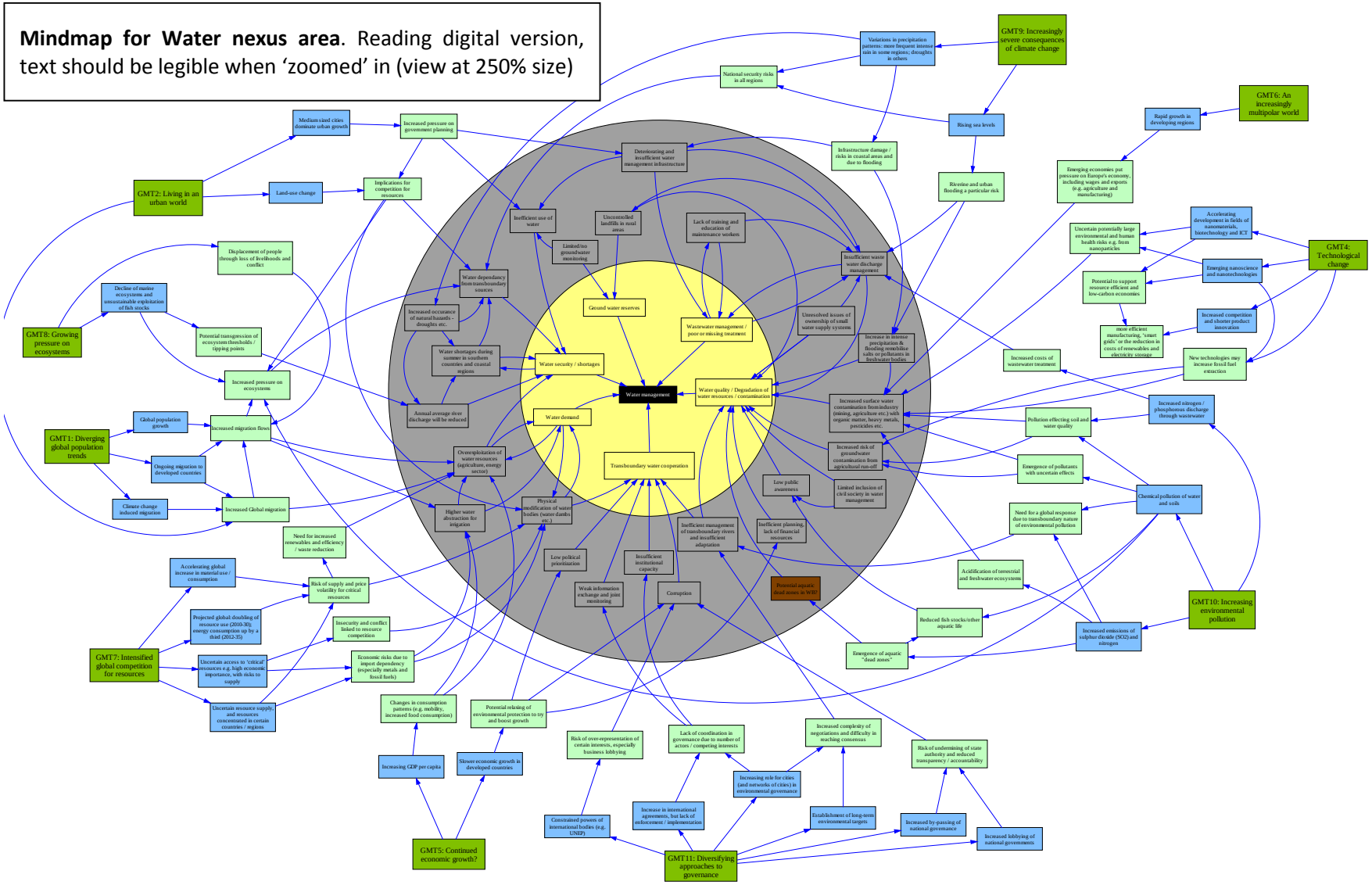
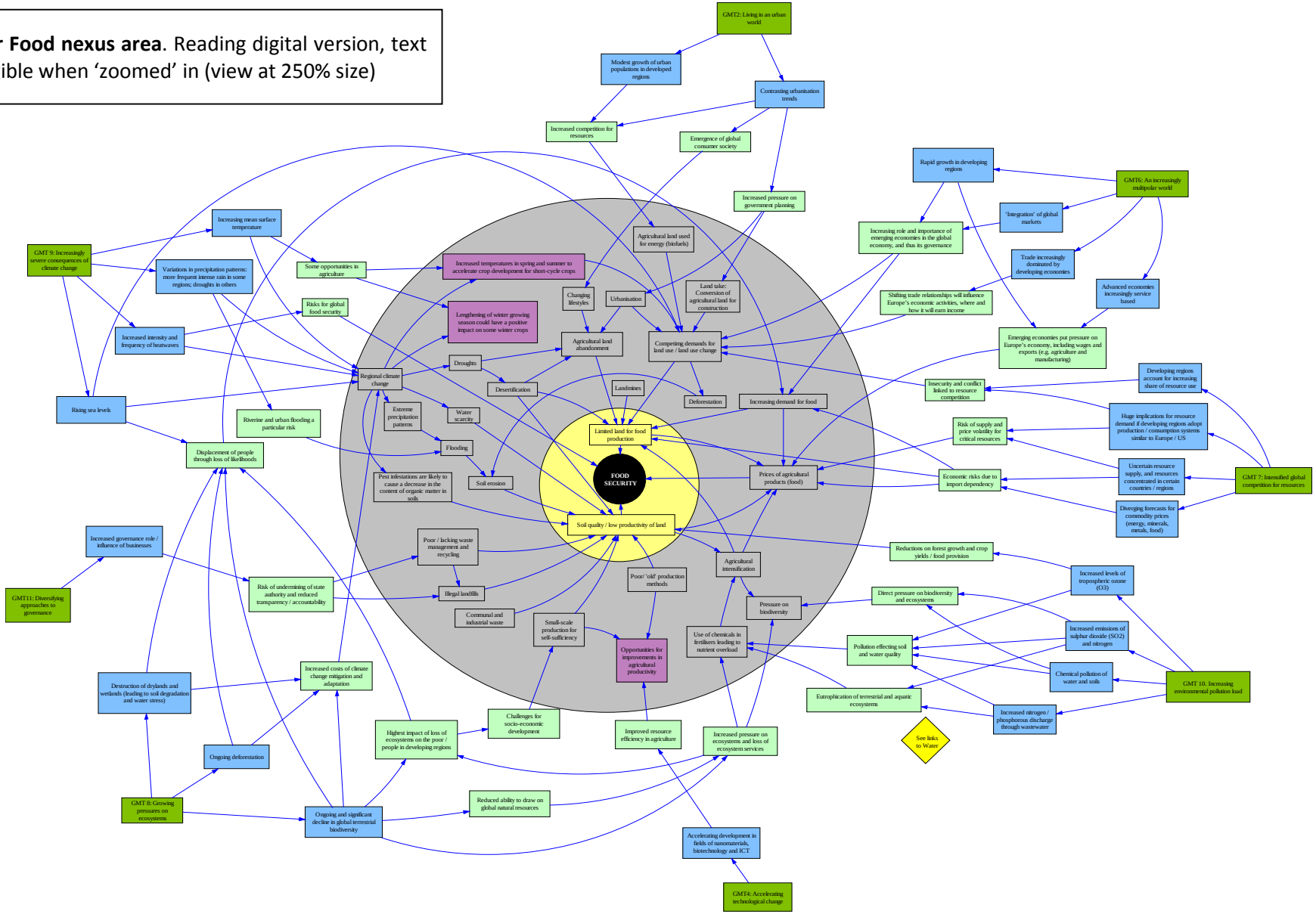
Annexes

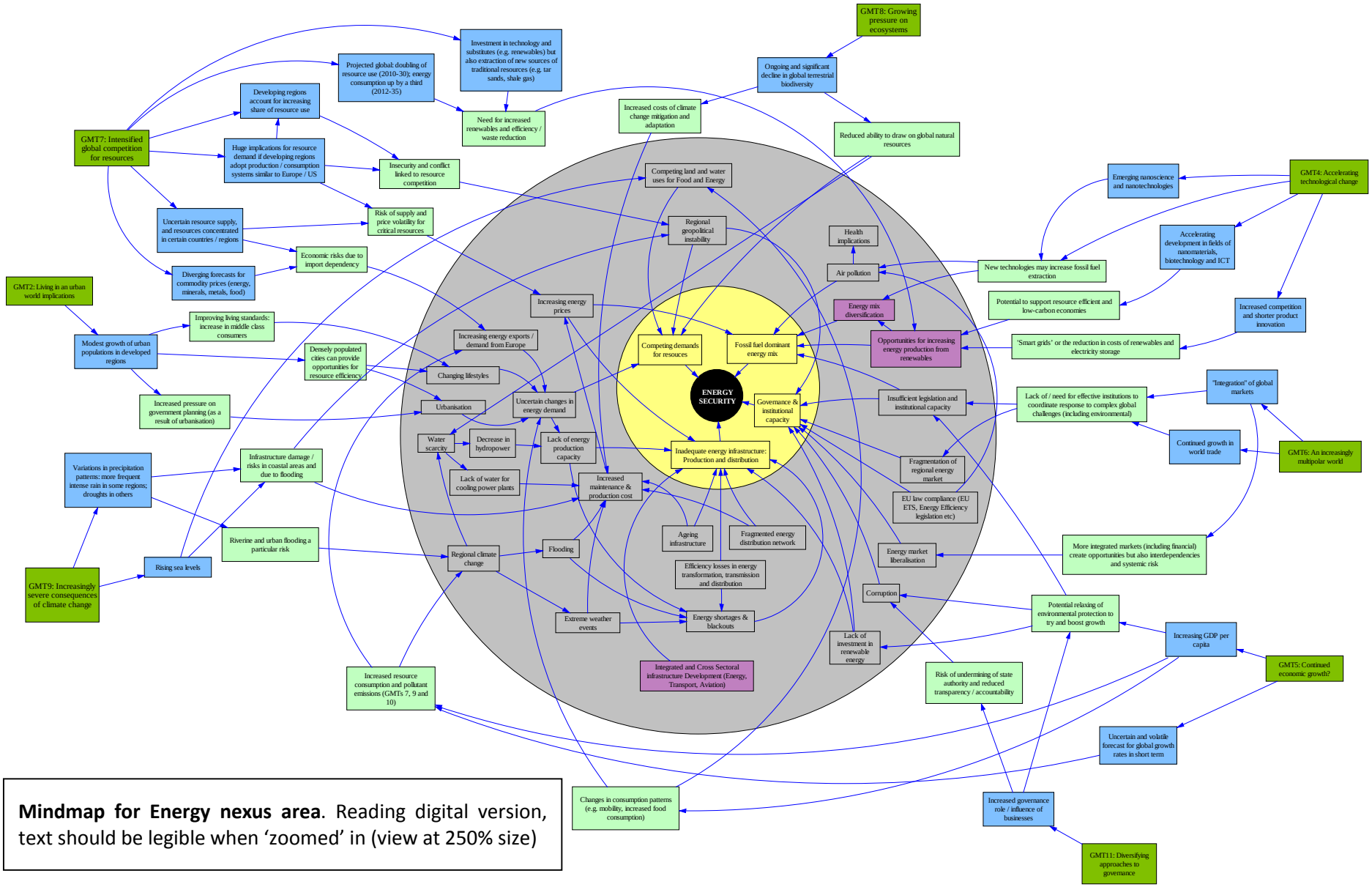
Annex 1. Mind-maps illustrating links between GMTs and the nexus issues

Mindmap for Water nexus area. Reading digital version, text should be legible when 'zoomed' in (view at 250% size)



Mindmap for Food nexus area. Reading digital version, text should be legible when 'zoomed' in (view at 250% size)

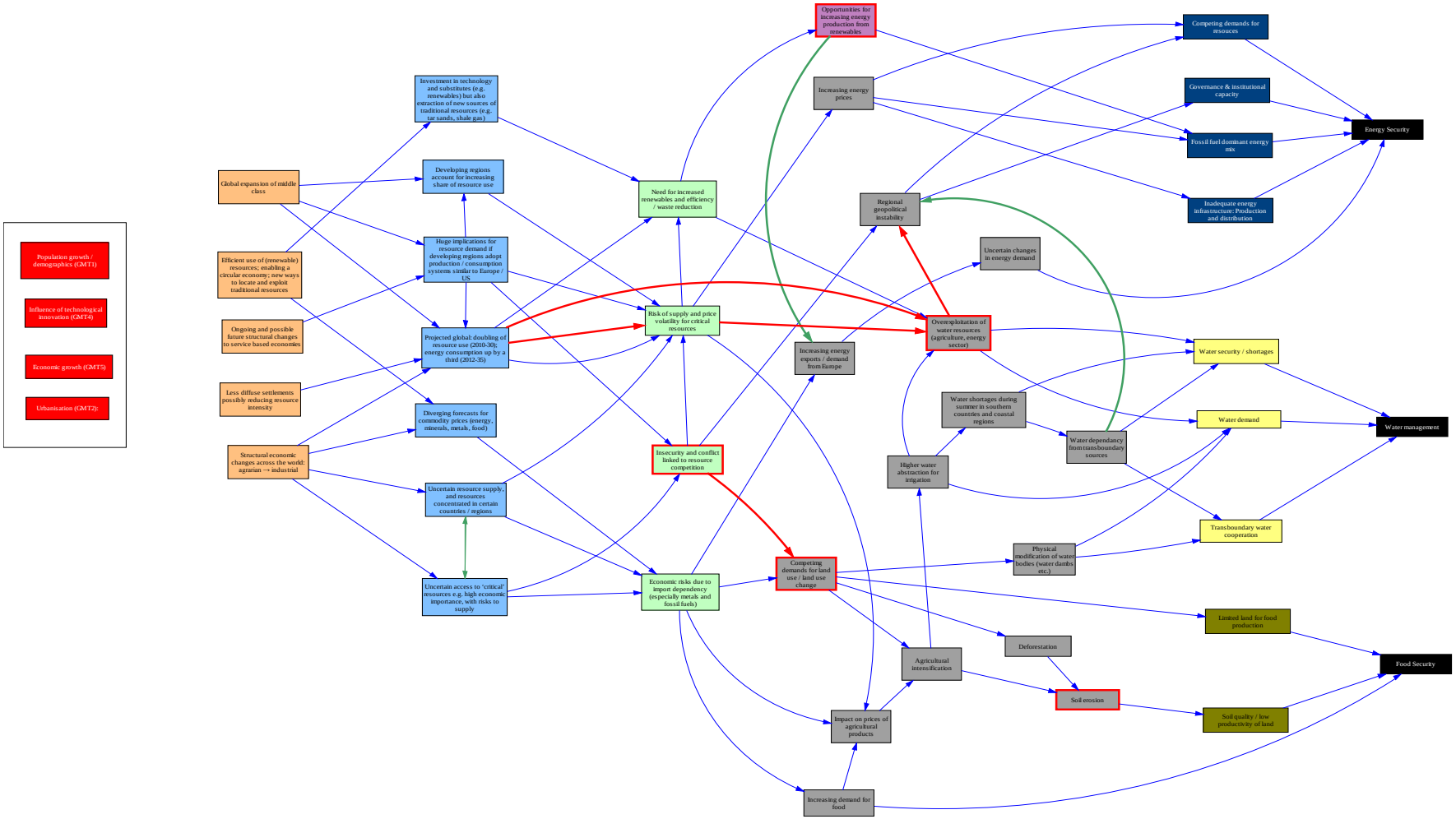


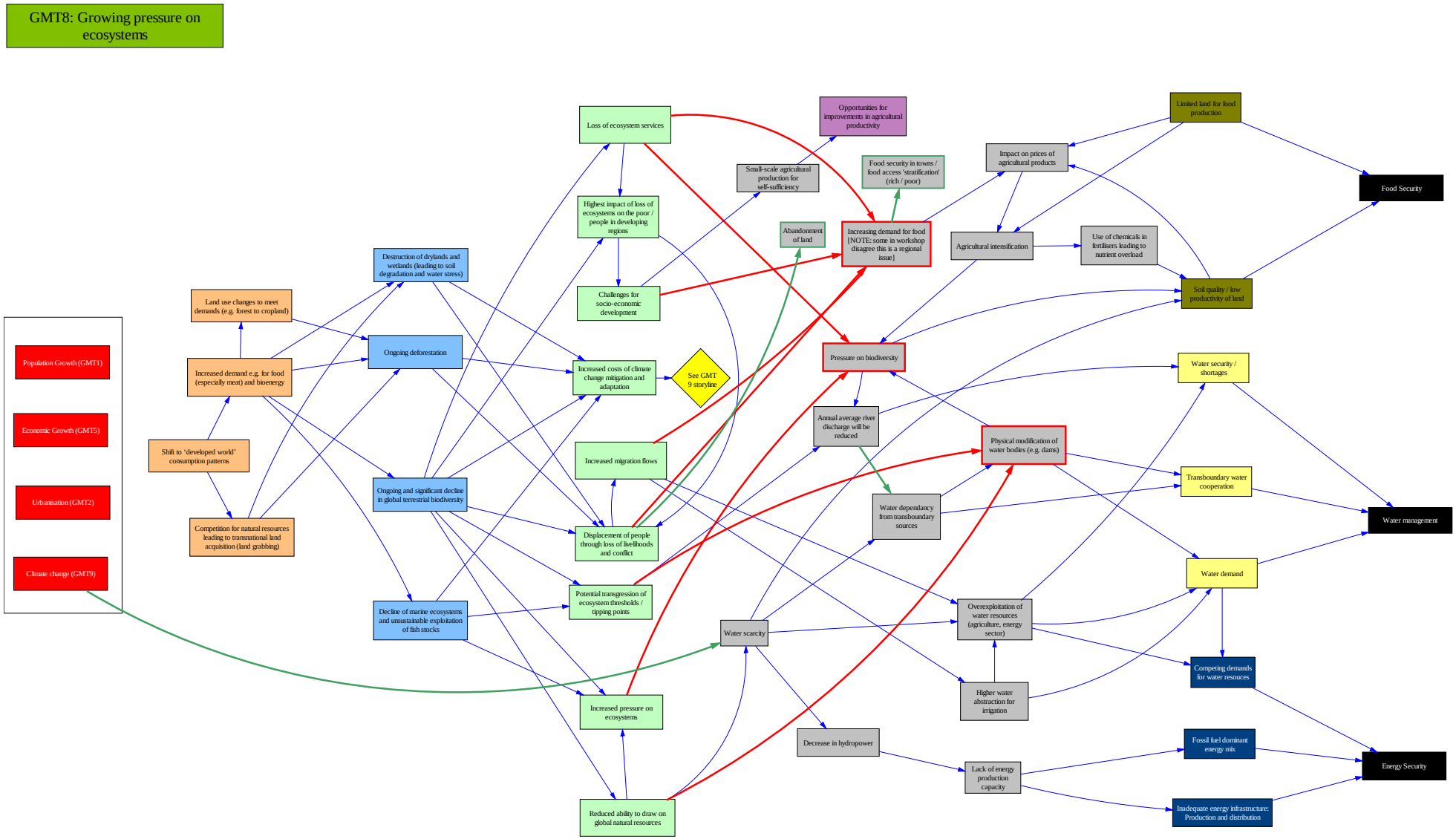


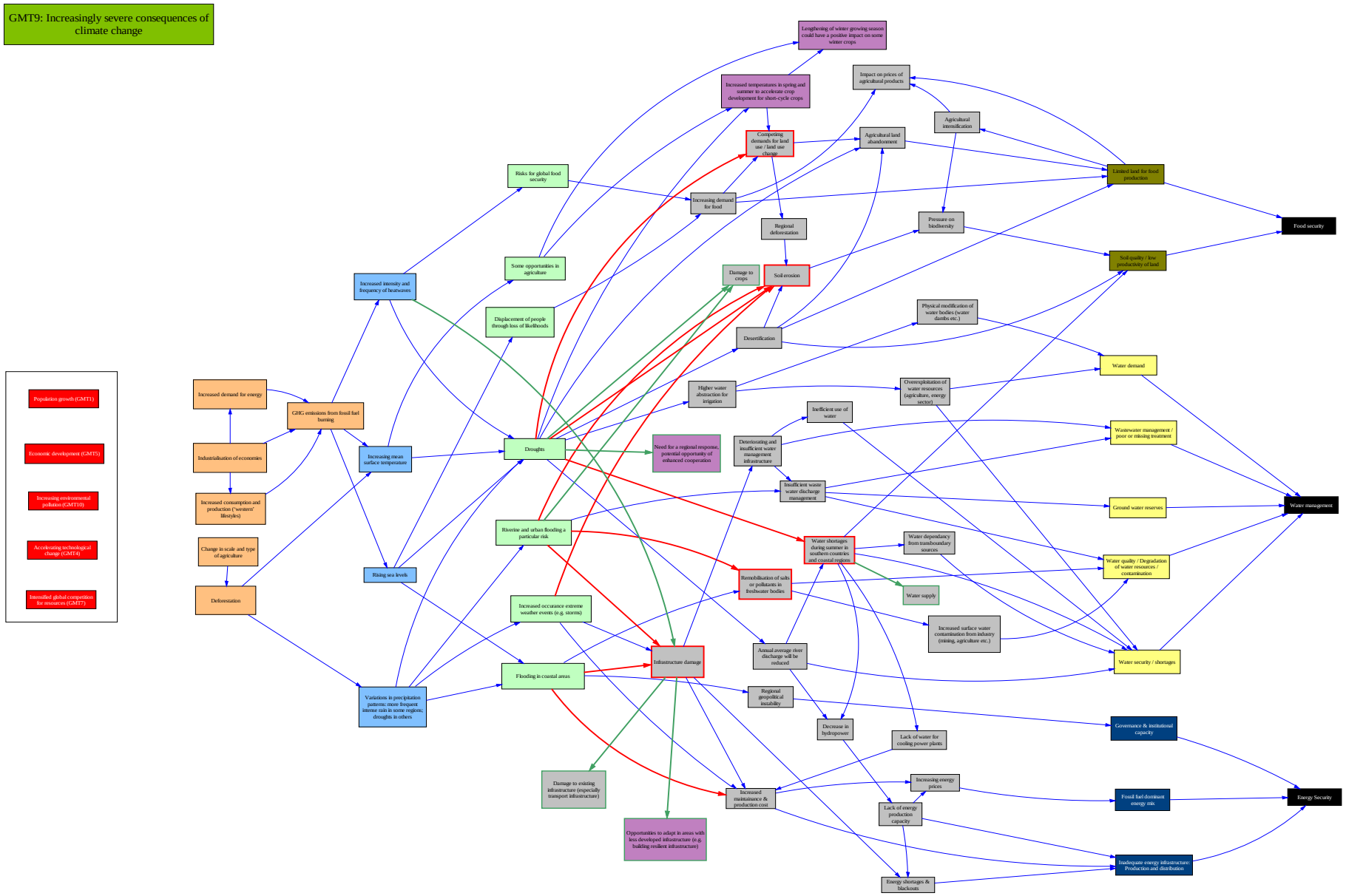
Mindmap for Energy nexus area. Reading digital version, text should be legible when 'zoomed' in (view at 250% size)

Annex 2. GMT storylines

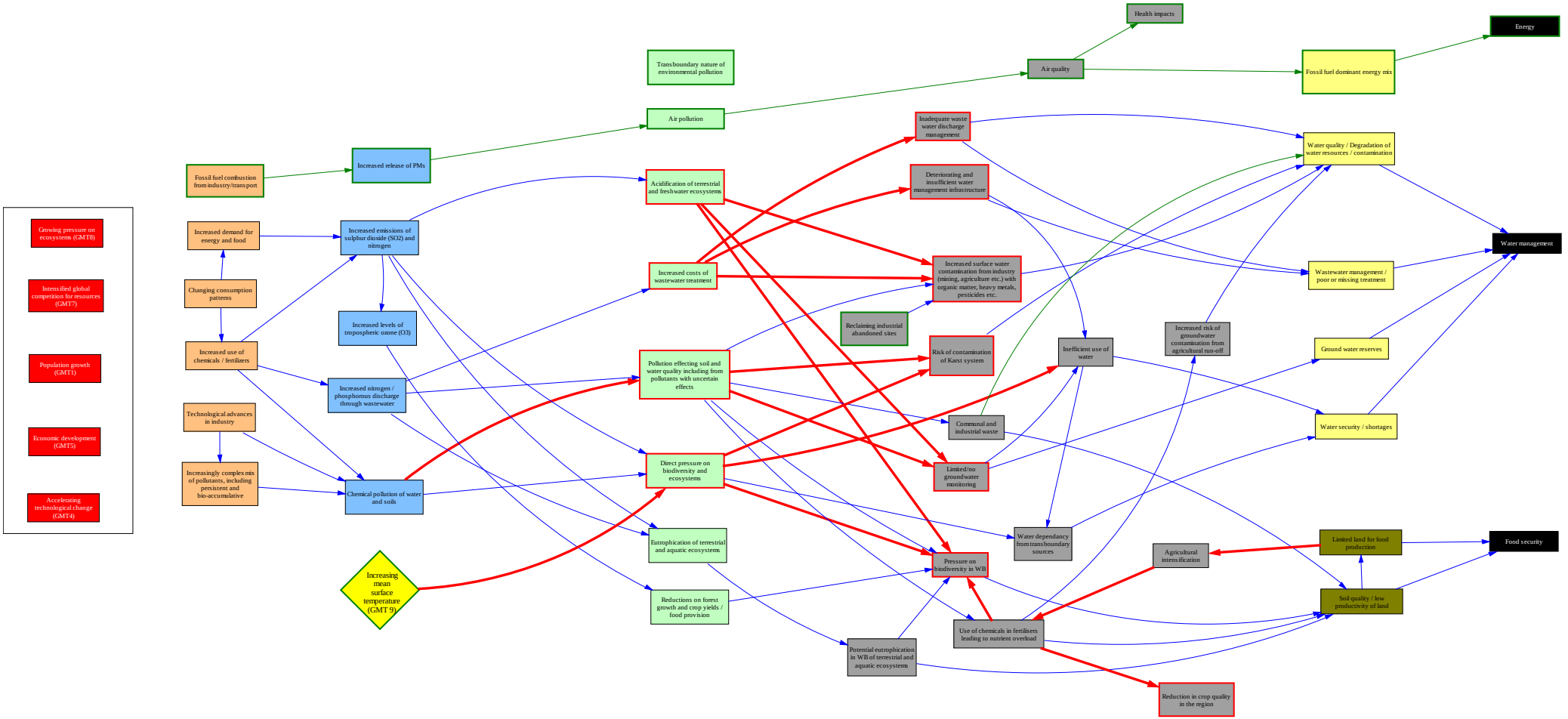
GMT7: Intensified global competition for resources




GMT8: Growing pressure on ecosystems
Population Growth (GMT1)
Economic Growth (GMT5)
Urbanisation (GMT2)
Climate change (GMT9)
Land use changes to meet demands (e.g. forest to cropland)
Increased demand e.g. for food (especially meat) and bioenergy
Shift to 'developed world' consumption patterns
Competition for natural resources leading to transnational land acquisition (land grabbing)
Destruction of drylands and wetlands (leading to soil degradation and water stress)
Ongoing deforestation
Ongoing and significant decline in global terrestrial biodiversity
Decline of marine ecosystems and unsustainable exploitation of fish stocks
Loss of ecosystem services
Highest impact of loss of ecosystems on the poor / people in developing regions
Challenges for socio-economic development
Increased costs of climate change mitigation and adaptation
See GMT 9 storyline
Increased migration flows
Displacement of people through loss of livelihoods and conflict
Potential transgression of ecosystem thresholds / tipping points
Increased pressure on ecosystems
Reduced ability to draw on global natural resources
Opportunities for improvements in agricultural productivity
Small-scale agricultural production for self-sufficiency
Food security in towns / food access 'stratification' (rich / poor)
Abandonment of land
Increasing demand for food [NOTE: some in workshop disagree this is a regional issue]
Pressure on biodiversity
Annual average river discharge will be reduced
Water scarcity
Water dependancy from transboundary sources
Decrease in hydropower
Limited land for food production
Impact on prices of agricultural products
Agricultural intensification
Use of chemicals in fertilisers leading to nutrient overload
Soil quality / low productivity of land
Food Security
Water security / shortages
Physical modification of water bodies (e.g. dams)
Transboundary water cooperation
Water management
Water demand
Overexploitation of water resources (agriculture, energy sector)
Higher water abstraction for irrigation
Competing demands for water resouces
Fossil fuel dominant energy mix
Lack of energy production capacity
Inadequate energy infrastructure: Production and distribution
Energy Security


GMT9: Increasingly severe consequences of climate change
Population growth (GMT1)
Economic development (GMT5)
Increasing environmental pollution (GMT10)
Accelerating technological change (GMT4)
Intensified global competition for resources (GMT7)
Lengthening of winter growing season could have a positive impact on some winter crops
Increased temperatures in spring and summer to accelerate crop development for short-cycle crops
Impact on prices of agricultural products
Agricultural intensification
Competing demands for land use / land use change
Agricultural land abandonment
Limited land for food production
Food security
Risks for global food security
Increasing demand for food
Regional deforestation
Pressure on biodiversity
Soil quality / low productivity of land
Some opportunities in agriculture
Damage to crops
Soil erosion
Increased intensity and frequency of heatwaves
Displacement of people through loss of likelihoods
Desertification
Physical modification of water bodies (water dambs etc.)
Water demand
Increased demand for energy
GHG emissions from fossil fuel burning
Higher water abstraction for irrigation
Overexploitation of water resources (agriculture, energy sector)
Industrialisation of economies
Increasing mean surface temperature
Droughts
Need for a regional response, potential opportunity of enhanced cooperation
Inefficient use of water
Deteriorating and inefficient water management infrastructure
Wastewater management / poor or missing treatment
Increased consumption and production ("western" lifestyles)
Insufficient waste water discharge management
Ground water reserves
Water management
Change in scale and type of agriculture
Riverine and urban flooding a particular risk
Water shortages during summer in southern countries and coastal regions
Water dependancy from transboundary sources
Rising sea levels
Remobilisation of salts or pollutants in freshwater bodies
Water supply
Water quality / Degradation of water resources / contamination
Deforestation
Increased occurance extreme weather events (e.g. storms)
Increased surface water contamination from industry (mining, agriculture etc.)
Infrastructure damage
Annual average river discharge will be reduced
Water security / shortages
Flooding in coastal areas
Variations in precipitation patterns: more frequent intense rain in some regions; droughts in others
Regional geopolitical instability
Governance & institutional capacity
Decrease in hydropower
Lack of water for cooling power plants
Damage to existing infrastructure (especially transport infrastructure)
Increased maintainance & production cost
Increasing energy prices
Fossil fuel dominant energy mix
Energy Security
Lack of energy production capacity
Opportunities to adapt in areas with less developed infrastructure (e.g. building resilient infrastructure)
Inadequate energy infrastructure: Production and distribution
Energy shortages & blackouts

GMT10: Increasing environmental pollution



Annex 3. Implication factsheets

Biodiversity and ecosystem related implication factsheets

Pollution affecting soil and water quality including from pollutants with uncertain effects

Implication title	Pollution affecting soil and water quality including from pollutants with uncertain effects		
Scoping result From workshop 1	**Estimated likelihood (high/ low)**	**Magnitude of effect (High/ low)**	**Timescale over which implication may occur[40]**
	High	High	Short term
Implication description	***Implication summary*** Increased pollution of soil and water is identified as a global trend in the SOER 2015 (GMT 10: Increasing environmental pollution), with environmental pollution often triggering 'harmful processes in the environment. For example, atmospheric deposition of sulphur and nitrogen compounds causes acidification of soils and freshwater resources'. Increasing pollution of soil and water was identified as a potentially important issue for the Western Balkans region during the expert workshop held in Slovenia (April 2017). The implication is defined by an increase in the use of chemicals in industry and agriculture in the region (such as pesticides and fertilisers used as a result of agricultural intensification) and from these sources the release of an increasingly complex mix of chemical pollutants into the environment, which have interrelated and uncertain effects for biodiversity and ecosystems. This is potentially exacerbated by the fact that countries in the region share many river basins and water resources, the vulnerability of certain ecosystems and water resources in the region (e.g. karst[41]; shallow aquifers), together with limited monitoring and data available for water and soil quality or pollution. ***Related global drivers and trends*** GMT drivers identified in the EEA SOER GMT 10 storyline[42] presented at the workshop (Slovenia, April 2017): • Changing consumption patterns, leading to increased use of fertilisers and other chemicals • Increasingly complex mix of pollutants, including persistent and bio-accumulative and toxic substances (PBTs)[43] • Technological advances in industry, leading to 'increased		

[40] Short term (to 2020); medium term (2020–2030); long term (2030–2050)

[41] In karsts, groundwater flow is rapid and highly vulnerable to pollution; karsts also host rare and endemic species of fauna (World Bank 2003).

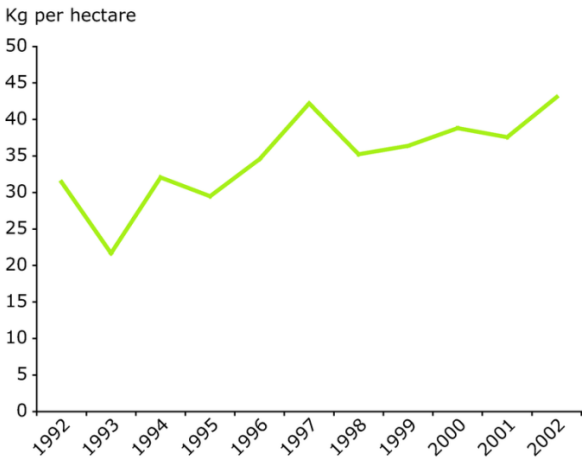
[42] https://forum.eionet.europa.eu/eea-west-balkans-cooperation-interest-group/library/etc-inland-coastal-and-marine-waters-activities-wb/2016-2017_west-balkan-project-gmt/2017_1st-workshop-gmt-west-balkan-region-1/workshop-record/annex-1-gmt-storylines-edited-during-workshop-sessions

[43] PBTs can remain in soil and sediment for a long time, and are absorbed by microorganisms and plants. In this way they accumulate in wildlife and increase in concentration as they move up the food chain. They have toxic effects in animals including cancer, immune system dysfunction and reproductive disorders (EEA SOER 2015).

	emissions and an increasingly complex mix of critical pollutants with interrelated environmental effects' (SOER 2015) GMT trends identified in the GMT 10 storyline: • Increased nitrogen and phosphorous discharge through wastewater and agriculture • Chemical pollution of water and soils Regional trends and observations 'Connected' regional observations highlighted by experts as being potentially important during group discussions at the workshop: • Risk of contamination of Karst ecosystems • Limited groundwater monitoring in the region • Agricultural intensification in the region, leading to increased use of fertilisers and other chemicals • Reduction in crop quality in the region Other connected regional observations identified in the storyline: • Increased surface water contamination from industry and agriculture with organic matter, heavy metals, pesticides etc. • Use of chemicals in fertilisers leading to nutrient overload • Communal and industrial waste • Direct pressure on biodiversity in Western Balkans (which is considered as a separate implication)
Summary of existing evidence	During the expert workshop, the implication *pollution affecting soil and water quality including from pollutants with uncertain effects* was assessed as being high in terms of likelihood and magnitude of impacts, and that effects will be seen in the short-term (now – 2020). Water quality varies significantly across the region, with waste water from urban areas and industry polluting the lower reaches of several rivers, while many rivers and lakes in mountainous areas remain pristine. However mining, industry and agriculture are key sources of pollution of water and soil in the region. Mining across the region is a source of water pollution, for example heavy metal spills from mine tailings. In a report from 2003 the World Bank noted that *'there are several toxic waste storage facilities located on tributaries to the Danube, many of which pose a severe threat to the surrounding human population and the environment. Mining accidents and mine-induced water pollution are issues of serious concern in the SEE region … the failure of mine tailings storage facilities can have devastating consequences.'* (World Bank, 2003). Limited information is available on the use of industrial chemicals; however data on trade between the EU and the region indicate a 16.7% increase in imports of chemicals and related products to the region between 2006-2016 (EC, 2016). Agricultural run-off is a problem for many parts of the region, especially nitrogen pollution of groundwater and surface water bodies (EEA, 2010). Diffuse pollution from agriculture is also identified as a 'significant pressure' with cross border impacts in the Danube River Basin Management Plan (2015), cited in JRC (2015).

Data for the period 1992-2002 showed that the use of agricultural chemicals in the region had grown (see figure below), and in 2010, EEA concluded that the use of agricultural chemicals in the region 'could be expected to grow in coming years', threatening water quality as well as biodiversity (EEA, 2010).

Figure: Fertiliser input per hectare in the Western Balkans (1992–2002)



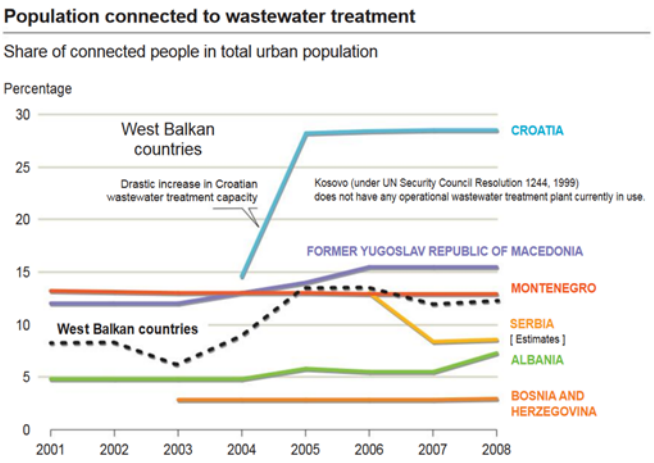
Source: Figure 4.4 in EEA (2010) Environmental trends and perspectives in the Western Balkans

Prevention of soil degradation is limited due to a lack of comprehensive data, however there are countries in the region i.e. Serbia that have adopted a list of indicators for soil degradation risk assessment (Serbian Environmental Protection Agency, 2015).

Pollution of groundwater is a particular concern as it is an important source of drinking water in many countries (e.g. Serbia obtains 60% of drinking water from groundwater), and many aquifers in the region are relatively shallow and therefore at risk of pollution (EEA, 2010).

Wastewater treatment in the region is often poor or non-existent, with data for the period 2001–2008 showing that less than 20% of the population were connected to wastewater treatment in most countries (see figure below) (EEA, Zoi, 2012). In addition, a lack of finance for investment and maintenance is a common problem (EEA, 2010).

The lack of wastewater treatment means that the discharge of wastewater is a major source of pollution for both surface and groundwater sources (World Bank (2003).

	 Source: EEA, Zoi Environment Network, 2012. West Balkan Environmental Core Set of Indicators 2012
Data gaps and needs	A notable issue is that much of the data available for the region appears to be quite out of date, with trends available generally up to 2010 only. Specific data gaps noted include: • No data related to chemical use or pollution. In particular no regional information was identified related to chemicals with uncertain effects / PBTs • EEA (2010) noted that 'forward-looking indicators of water pollution have not been identified for the region'. • Lack of data or other information relating to soil quality.
Overview of existing policy/ strategy	*To be discussed during the expert workshop, 7–8 September 2017*
Policy gaps and needs/ vulnerabilities	*To be discussed during the expert workshop, 7–8 September 2017*

Direct pressure on biodiversity and ecosystems

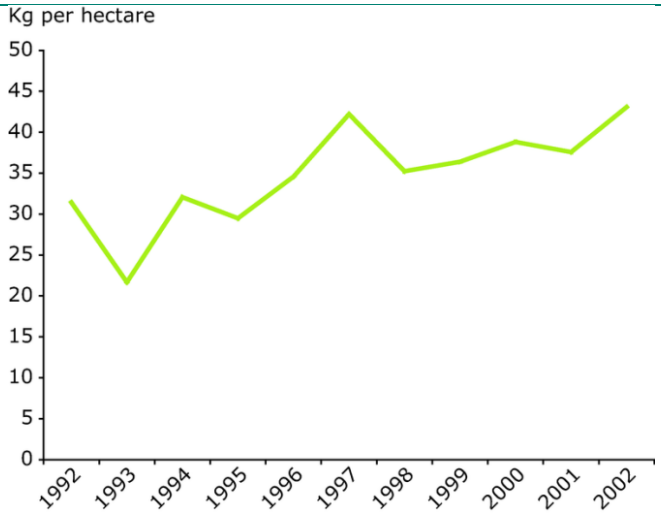
Implication title	Direct pressure on biodiversity and ecosystems		
Scoping result From workshop 1	**Estimated likelihood (high/ low)**	**Magnitude of effect (High/ low)**	**Timescale over which implication may occur[44]**
	High	Uncertain	Medium to long term
Implication description	***Implication summary*** SOER 2015 (GMT 10: Increasing environmental pollution) describes how environmental pollution can trigger harmful processes in the environment, such as atmospheric deposition of sulphur and nitrogen leading to acidification of soils and water resources, and increased levels of nitrate and phosphate leading to eutrophication of ecosystems. These impacts, which can have transboundary as well as local sources, lead to direct pressure on biodiversity and ecosystem services in the Western Balkans. This was identified as a potentially important implication for the Western Balkans region during the expert workshop held in Slovenia (April 2017). The region contains sensitive large areas of pristine environment, and many vulnerable ecosystems, such as karst and mountainous areas, which may be particularly at risk from such impacts. This implication will also be exacerbated by the consequences of climate change (GMT 9), in particular increased mean surface temperature. ***Related global drivers and trends*** GMT drivers identified in the GMT 10 storyline[45] presented at the workshop (Slovenia, April 2017): • Changing consumption patterns and increased demand for energy and food • Increased use of fertilisers and other chemicals • Increasingly complex mix of pollutants, including persistent and bio-accumulative and toxic substances (PBTs)[46] • Technological advances in industry, leading to 'increased emissions and an increasingly complex mix of critical pollutants with interrelated environmental effects' (SOER 2015) GMT trends related to the drivers identified in the GMT 10 storyline: • Increased emissions of sulphur dioxide and nitrogen, leading to acidification of terrestrial and freshwater ecosystems • Increased levels of tropospheric ozone (O_3), and hemispheric transportation of O_3 and other pollutants • Increased nitrogen and phosphorous discharges through waste water		

[44] Short term (to 2020); medium term (2020–2030); long term (2030–2050)

[45] https://forum.eionet.europa.eu/eea-west-balkans-cooperation-interest-group/library/etc-inland-coastal-and-marine-waters-activities-wb/2016-2017_west-balkan-project-gmt/2017_1st-workshop-gmt-west-balkan-region-1/workshop-record/annex-1-gmt-storylines-edited-during-workshop-sessions

[46] PBTs can remain in soil and sediment for a long time, and are absorbed by microorganisms and plants. In this way they accumulate in wildlife and increase in concentration as they move up the food chain. They have toxic effects in animals including cancer, immune system dysfunction and reproductive disorders (EEA SOER 2015).

	and agriculture • Chemical pollution of water and soils ***Regional trends and observations*** 'Connected' regional observations highlighted by experts as being potentially important during group discussions at the workshop: • Direct pressures on biodiversity and ecosystem services in the region • Risk of contamination of Karst ecosystems • The inefficient use of water resources in the region, which is likely to exacerbate pressure on water bodies and associated ecosystems Other connected regional observations identified in the storyline: • Negative impacts on soil quality, leading to reductions in forest growth and crop yields and therefore food provision/security • Eutrophication of aquatic and terrestrial ecosystems • The transboundary nature of many water resources in the region
Summary of existing evidence	During the expert workshop, the implication *direct pressure on biodiversity and ecosystems* was assessed as being 'high' in terms of likelihood and 'uncertain' in terms of impacts, and that effects will be seen in the medium and long-term (2020–2100). The Western Balkans is one of the richest parts of Europe in terms of biodiversity 'due in part to the region's variety of geography and habitats (which includes some specific ecosystems, i.e. karstic regions with rich underground biodiversity and old tectonic lakes)' (EEA, 2010). While across the region countries have increased the area of land designated as protected areas (e.g. in Albania the extent of protected areas increased from 9% of total land area in 2004 to 16% in 2013) (EEA, 2015), the region's biodiversity is still under threat (EEA, 2010). Reflecting on direct threats to the regions ecosystems and biodiversity, the same report notes that in relation to food in the region *'traditional patterns continue to influence household food choices — for example, strong ties to rural areas and family farms. New consumption patterns, facilitated by new supermarkets and processed food products, are spreading quickly and are expected to raise environmental impacts related to food'* (EEA, 2010). The report also suggests that ongoing demographic changes, in particular the trend towards smaller households and migration to urban areas (from rural) may add to these consumption trends *'as people lose their connection to local farm products and consume more processed and imported foods'*. Agricultural run-off is a problem for many parts of the region, especially nitrogen pollution of groundwater and surface water bodies (EEA, 2010). Diffuse pollution from agriculture is also identified as a 'significant pressure' with cross border impacts in the Danube River Basin Management Plan (2015), cited in JRC (2015). Data for the period 1992–2002 showed that the use of agricultural chemicals in the region had grown (see figure below), and in 2010, EEA concluded that the use of agricultural chemicals in the region 'could be expected to grow in coming years', threatening water quality as well as biodiversity (EEA, 2010). **Figure: Fertiliser input per hectare in the Western Balkans (1992–2002)**

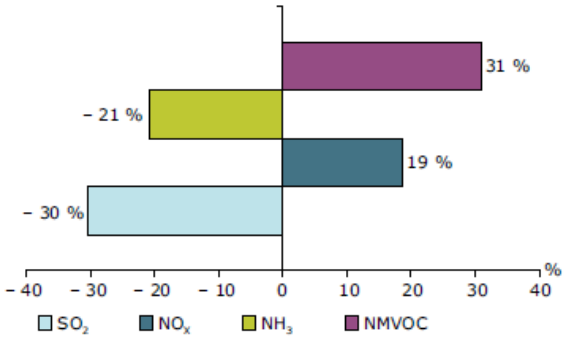


Source: Figure 4.4 in EEA (2010) Environmental trends and perspectives in the Western Balkans

The same report (EEA, 2010) includes information on energy consumption in the region, indicating that residential buildings are the largest consumer of energy in the region, and that residential energy use, especially for heating, is often inefficient, for example with wood and coal being widely used in some areas. These fuels lead to air pollution, and unregulated fuelwood cutting contributes to deforestation and biodiversity loss. Such impacts are likely to get worse over time, as *'without change in policies, energy consumption is expected to grow across the region in coming years'* (EEA, 2010). Air pollution also contributes to acid precipitation and to eutrophication of water bodies, often in countries distant from the source of emissions as pollutants are easily carried by the wind (EEA, 2010).

Trends and forecasts for acidifying substances show a mixed picture in the region (see figure below). On the one hand emissions of SO_2 (sulphur dioxide) and NH_3 (ammonia) are expected to fall in the period to 2020, NOx (nitrogen oxides) and NMVOC (non-methane volatile organic compounds) are expected to rise.

Figure 5.2 Projected change in emissions of acidifying substances in the Western Balkans, 2000–2020



Source: Figure 5.2 in EEA (2010) Environmental trends and perspectives in the Western Balkans

Data gaps and needs	Specific data gaps noted during the review include:

	• No information identified related to transboundary pollution / hemispheric transport of tropospheric ozone and other pollutants • Information linking consumption / production trends in the relation and related emissions to biodiversity loss / ecosystem damage • Eutrophication of inland water bodies and soil in the Western Balkans The EEA 2010 report on environmental trends and perspectives in the Western Balkans also noted that: • Further region-wide assessment of biodiversity is needed, as many species are found in more than one country, but data categories and methods differ between countries • Karstic ecosystems and old tectonic lakes need further investigation to establish the present status of their biodiversity. More generally, data are neither complete nor consistent across countries.
Overview of existing policy/ strategy	*To be discussed during the expert workshop, 7–8 September 2017*
Policy gaps and needs/ vulnerabilities	Policy choices can play a significant role in managing or minimising direct pressures on biodiversity and ecosystems, especially in relation to the future development of the food and energy sectors. *To be discussed during the expert workshop, 7–8 September 2017*

Increased costs of waste water treatment

Implication title	Increased costs of waste water treatment		
Scoping result From workshop 1	**Estimated likelihood (high/ low)**	**Magnitude of effect (High/ low)**	**Timescale over which implication may occur47**
	High	High	Short term
Implication description	***Implication summary*** The cost of removing nutrients from wastewater (especially nitrogen and phosphorous associated with agricultural use) is identified in SOER 2015 (GMT 10: Increasing environmental pollution load) as a key factor in the trend of increased release of nutrients into the environment. In the Western Balkans, current evidence suggests that the use of fertiliser and other agricultural chemicals is likely to increase in coming years, and this is likely to increase the costs of wastewater treatment in the region. As inadequate monitoring and treatment/ management of wastewater is already recognised as a factor in the region, increased costs of wastewater treatment may be expected to exacerbate this situation. This was identified as a potentially important issue for the Western Balkans region during the expert workshop held in Slovenia (April 2017). ***Related global drivers and trends*** GMT drivers identified in the EEA SOER GMT 10 storyline[48] presented at the workshop (Slovenia, April 2017): • Increasing global demand for energy and food • Changing consumption patterns (i.e. shift to more 'Western' lifestyles' • Increased use of chemicals and fertilisers in industry and agriculture GMT trends identified in the GMT 10 storyline: • Increased nitrogen and phosphorous discharge ***Regional trends and observations*** Connected' regional observations highlighted by experts as being potentially important during group discussions at the workshop: • Inadequate wastewater discharge management (and monitoring) in the region • Deteriorating and insufficient water management infrastructure • Increased surface water contamination from industry and agriculture, with organic matter, heavy metals, pesticides etc.		
Summary of existing evidence	A report on environmental trends and perspectives in the Western Balkans (EEA, 2010) notes that freshwater quality varies significantly across the region, and while water 'quality is good in many mountain streams and in upper		

[47] Short term (to 2020); medium term (2020–2030); long term (2030–2050)

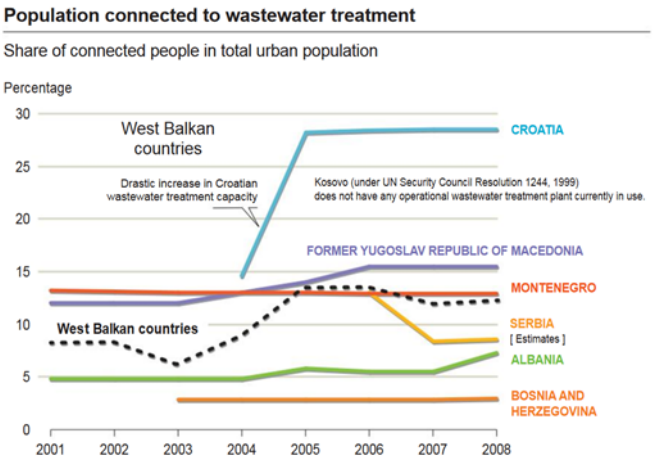
[48] https://forum.eionet.europa.eu/eea-west-balkans-cooperation-interest-group/library/etc-inland-coastal-and-marine-waters-activities-wb/2016-2017_west-balkan-project-gmt/2017_1st-workshop-gmt-west-balkan-region-1/workshop-record/annex-1-gmt-storylines-edited-during-workshop-sessions

reaches of rivers, wastewater from urban areas and industry has polluted the lower courses of several rivers, such as the Sava River in Serbia and the Sitnica River in Kosovo'.

The same report also notes that while a high share of the population in the region has access to safe drinking water, a smaller share is connected to sewerage systems, and 'wastewater treatment is poor or non-existent in many urban and industrial areas', and that for some countries a lack of financing 'hinders improvements for these water services'.

Wastewater treatment in the region is often poor or non-existent, with data for the period 2001–2008 showing that less than 20% of the population were connected to wastewater treatment in most countries (see figure below) (EEA, Zoi, 2012).

The management of wastewater is of particular importance in the region, given the transboundary nature of many water resources (e.g. shared river basins/ catchments).



Source: EEA, Zoi Environment Network, 2012. West Balkan Environmental Core Set of Indicators 2012

In addition the EEA 2010 report identified that (note that these data are from before 2010 so may be outdated now):

- In Serbia, many large industrial facilities are located at the outskirts of urban areas and discharge their wastewater directly into rivers with little treatment. Wastewater treatment plants served only 16 % of the country's population (data from 2005).
- Albania has one working wastewater treatment plant.
- In Bosnia and Herzegovina, 90 % of wastewater is reportedly released without treatment.
- In Kosovo under UN Security Council Resolution 1244/99, there is no wastewater treatment and less than a third of the population has access to a sewer system. It was reported in 2010 that a treatment plant has been constructed in Kosovo, but was not at the time in operation.

The lack of wastewater treatment means that the discharge of wastewater is a major source of pollution for both surface and groundwater sources (World Bank (2003). Looking ahead the report concludes that 'countries in the region face a major challenge in terms of improving drinking water and wastewater

	treatment services' (e.g. to meet EU requirements). During the expert workshop held in April 2017, it was also noted that much of the water infrastructure in the region is quite old and of deteriorating quality, meaning that there may be increased need for investment in infrastructure just to maintain current levels of water management and treatment. The global megatrend implication foresees the costs of wastewater treatment increasing in coming decades, which is likely to make meeting the cost of ensuring adequate wastewater treatment even harder for countries in the region.
Data gaps and needs	The EEA report (2010) on environmental trends and perspectives for the region reviewed the availability of environmental indicators and outlooks for the region and identified that it was not possible to assess past or future trends for topics including: urban wastewater treatment and gross nutrient balance (an indicator of potential surplus of nitrogen on agricultural land).
Overview of existing policy/ strategy	Most countries in the region have targets to improve the treatment of wastewater For countries that are seeking adopt EU directives: • Urban Wastewater Treatment Directive requires the treatment of wastewaters from all urban areas with the equivalent of more than 2,500 inhabitants • Nitrates Directive protects surface waters and groundwater from nitrates, which arise from the use of fertilisers and manure in agriculture as well as from livestock production.
Policy gaps and needs/ vulnerabilities	*To be discussed at the expert workshop, 7–8 September 2017*

Potential transgression of ecosystem tipping points

Implication title	Potential transgression of ecosystem tipping points		
Scoping result **From workshop 1**	**Estimated likelihood (high/ low)**	**Magnitude of effect (High/ low)**	**Timescale over which implication may occur[49]**
	Low	Low	Short term
	High	High	Medium term
	Medium	Medium	Long term
Implication description	***Implication summary*** SOER 2015 (GMT 8: Growing pressure on ecosystems) describes how on a global and regional scale, biodiversity and ecosystem loss are predicted to accelerate under all current models and policy scenarios, driven by changes in population and consumption, including dietary changes, and associated growing competition for land and water resources. As pressures on ecosystems grow there is an increased understanding that critical thresholds, or 'tipping-points' may be reached. These could occur globally with 'abrupt and irreversible failures in life-support functions of the planets' natural resources', or more locally with the loss of entire ecosystems in a country or region (e.g. a forest). This was identified as a potentially important implication for the Western Balkans region during the expert workshop held in Slovenia (April 2017). ***Related global drivers and trends*** GMT drivers identified in the EEA SOER GMT 8 storyline[50] presented at the workshop (Slovenia, April 2017): • Global shifts to more 'developed' consumption patterns • Increased demands for food (especially meat) and bioenergy, leading to competition for land and land-use changes to meet demands ***GMT trends identified in the GMT 8 storyline:*** • Destruction of terrestrial habitats including drylands and wetlands, deforestation • Decline in marine habitats and unsustainable exploitation of fish stocks • Leading to, increased pressure on ecosystems ***Regional trends and observations*** 'Connected' regional observations, including those highlighted by experts as being potentially important during group discussions at the workshop: • Potential impacts on hydrological system, leading to reduced river discharges and increased risk of water shortages (medium-term).		

[49] Short term (to 2020); medium term (2020–2030); long term (2030–2050)

[50] https://forum.eionet.europa.eu/eea-west-balkans-cooperation-interest-group/library/etc-inland-coastal-and-marine-waters-activities-wb/2016-2017_west-balkan-project-gmt/2017_1st-workshop-gmt-west-balkan-region-1/workshop-record/annex-1-gmt-storylines-edited-during-workshop-sessions

	• In turn this could lead to an increase in water dependency from transboundary sources and the physical modification of water bodies (e.g. dams), emphasising the need for transboundary water cooperation (medium-term). • Competing demands for potentially less secure water resources could have implications for water and energy security, as well as agriculture and food security (medium-term). • If tipping points are transgressed, this implies large-scale loss to regional biodiversity and potential reductions in soil and water quality, reducing the productivity of land. This may further drive agricultural intensification and the use of chemicals and fertilisers (medium to long-term). Other potential impacts on the region: • Loss of regional ecosystem services, potentially on a dramatic scale (long-term). As well as environmental, cultural and economic impacts for the region, this could impact on the regional tourism due to loss of scenic beauty and wealth of biodiversity. • Damage/ reduced ability to maintain traditional practices and patterns of production and consumption, especially e.g. small scale agriculture, forestry and hunting etc. (medium to long-term).
Summary of existing evidence	During the expert workshop, the implication *potential transgression of ecosystem tipping points* was assessed as being high in terms of likelihood and magnitude of impacts, and that effects are most likely to be seen in the medium-term (2020–2030). The region has a 'great variety of natural habitats, ranging from coastal lagoons and wetlands to Mediterranean forests, freshwater wetlands, karstic terrain and mountain forests' which support biodiversity of regional, and European importance (EEA, 2010). Furthermore the Western Balkans is one of the richest parts of Europe in terms of biodiversity 'due in part to the region's variety of geography and habitats (which includes some specific ecosystems, i.e. karstic regions with rich underground biodiversity and old tectonic lakes)' (EEA, 2010). The ecosystem services these habitats and natural areas provide are wide-ranging and important for countries in the region and for Europe (the region has been referred to as providing a 'green lung' for Europe). In addition, many important ecosystems in the region are considered to be vulnerable as they are sensitive to change and environmental pressures, such as karst and mountainous areas. Such ecosystems may therefore be particularly at risk of being damaged to the point of passing the thresholds that may lead to tipping points, where they could collapse or become fundamentally altered. Damage to these habitats and ecosystems, and potentially the transgression of ecosystem tipping points could cause significant losses to ecosystem services in the region. At present no specific information or data have been identified in relation to the extent of pressure on habitats and ecosystems in the region or how close they may be to critical thresholds.

	A database of tipping points (also referred to as 'regime shifts') is being compiled and maintained by the Stockholm Resilience Centre[51], which includes examples of specific ecosystem regime shifts from around the world. Although no examples are included from Western Balkans a number of European cases are highlighted including (for example): • Hypoxia causing mass mortality in the Krka estuary, Croatia[52] • Forest / scrub fire regime shift (greater frequency and severity) in Mediterranean Basin[53], due to rural depopulation leading to vegetation and fuel build-up after farm abandonment), together with drought periods. **What are tipping points?** Box 8.3 of SOER 2015, (citing Barnosky et al, 2012) summarises environmental thresholds and tipping points, noting that there is evidence that ecosystems may need to be of a certain minimum quality (in terms of abundance and diversity of species) to function effectively and deliver important ecosystem services. If critical thresholds are reached, ecosystems may reach a 'tipping point' and as a result suddenly switch in character, and no longer be able to provide the same level or variety of ecosystem services.
Data gaps and needs	Although there is increasing evidence that ecosystem thresholds and tipping points exist, no information was identified on tipping points in the region, and indeed there is limited information on status of ecosystems/ ecosystem health in the region.
Overview of existing policy/ strategy	To be discussed at the expert workshop, 7-8 September 2017
Policy gaps and needs/ vulnerabilities	To be discussed at the expert workshop, 7-8 September 2017

[51] http://www.regimeshifts.org/about

[52] http://www.regimeshifts.org/item/136-krka-estuary-croatia#

[53] http://www.regimeshifts.org/item/608-mediterranean-basin#

Resource use and supply related implication factsheets

Uncertain access to critical resources

Implication title	Uncertain access to critical resources		
Scoping result From workshop 1	**Estimated likelihood (high/ low)**	**Magnitude of effect (High/ low)**	**Timescale over which implication may occur[54]**
	High	Uncertain	Medium and long term
Implication description	***Implication summary*** Uncertain access to critical resources is identified as a global trend in the SOER 2015 (GMT 7: Intensified global competition for resources), and this trend was identified as a potentially important issue for the Western Balkans region during the expert workshop held in Slovenia (April 2017). The implication as described in SOER 2015 derives from ongoing growth in global demand for resources in the coming decades combined with uncertainty about resource supplies. There are 20 raw materials[55] identified by the European Commission as being critical because of risks of supply shortages and their importance to the economy. The global production of some of these critical materials is monopolistic and uncertain access would affect fast growing technologies e.g. wind turbines, solar power system, electric vehicles, computers and mobile phones. For the Western Balkans region uncertain access to some of these critical resources or products that rely on them, due to restricted imports, could have impacts on economic development and living standards. However, this could also create an incentive for the regions' governments and private sector to invest in research and innovation aimed at using existing resources more efficiently and accessing / extracting new resources (where available) in the region. Major base metals that have been historically mined in the region are considered to be critical resources, notably chromium, cobalt, and magnesium (UNEP, 2009). Uncertain global access to these resources could lead to reviving industrial mining in the region, due to the opportunities for economic benefit both from the use of these resources in the region and potentially their export to Europe and elsewhere. However this represents a risk also, as if sustainable mining practices would be ignored – this would cause negative environmental consequences, in particular for water quality and land use. ***Related global drivers and trends*** Increasing global population (GMT 1), and increase in global economic output (GMT 5), has brought radical changes in consumption patterns resulting in growing global demand for materials. Innovation and technological change are also having an impact on any future demand and access to critical resources. GMT drivers identified in the EEA SOER GMT 7 storyline presented at the workshop (Slovenia, April 2017) include: • Structural economic changes across the world: agrarian → industrial		

[54] Short term (to 2020); medium term (2020–2030); long term (2030–2050)

[55] The list includes: heavy and light rare earths (metals), Magnesium, Antimony, Tungsten, Magnesite, Gallium, Natural graphite, Germanium, Indium, Silicon metal, Fluorspar, Coking coal, Phosphate rock, Niobium, Beryllium, Platinum metals, Chromium, Cobalt, Borates.

	GMT trends identified in the GMT 7 storyline: • Uncertain resource supply, and resources concentrated in certain countries/regions 'Connected' regional observations highlighted by experts as being potentially important during group discussions at the workshop: • (Regional) insecurity and conflict linked to resource competition Other connected regional observations identified: • Economic risks to Europe due to import dependency (especially metals and fossil fuels) • Competing demands for land-use/ land-use changes
Summary of existing evidence	During the expert workshop, the implication *uncertain access to critical resources* was assessed as being high in terms of likelihood, uncertain in terms of magnitude of impacts, and that effects will be seen in the short-term (now – 2020). DG TRADE in their Trade flows and balance reporting for 2016 (DG TRADE, 2016) indicate that the total value of imports for the Western Balkans region with EU has increased from 13,769 Million EUR in 2013 to 17,746 Million EUR in 2016. This trend includes imports in machinery (e.g. power generating, electrical) telecommunication equipment and raw materials. Electrical and power generation machinery are among those that depend on critical resources, and as a result may be subject to supply (and price) volatility due to uncertain access to these resources. The increase in the extent (or value) of imports of products that are associated with these critical resources suggest that the region may be vulnerable, both to their accessibility and price volatility. EEA also reports (EEA, 2010) that the current share of GDP for research and development expenditure is relatively small in the region. This is likely to limit the discovery of alternative solutions and/or technologies that do not require the critical resources, thus potentially leaving the region with low resilience towards any changes in global demand and prices of these critical raw materials. In relation to critical resources historically mined in the region, medium term outlooks suggest growing global demand for all these materials - chromium, cobalt and magnesium. The outlook for chromium demand growth is positive, with total output of stainless steel expected to grow at 4% to 2026 which would continue to drive demand for chromite and ferrochrome (Roskill. 2016a). Also a strong demand from the aerospace and industrial manufacturing sectors in particular is expected to translate into steady growth in demand for steel over the period to 2026 (Roskill. 2016b). For the region this could indicate a possible incentive to re-invest in mining infrastructure to economically benefit from the increased demand. If such investment were to occur, this could lead to environmental issues associated with mining – in particular affecting water quality and availability as well as land use. Most mines and minerals-processing facilities in the region have ceased operation which brings additional challenges to environmental and health protection through instability, leakage and failure (UNEP, 2009). Mine water can significantly decrease water quality, making it unsuitable for human uses such as irrigation and livestock watering. This may increase the

	likelihood of insecurity and conflict in the region, both between industries (e.g. mining and agriculture) and nation states (for example due to concerns about transboundary waters). The insecurity of agricultural sector in regard to available clean freshwater is presented in a case study on Lujane – a former chromium and antimony mine in the north-east of FYR of Macedonia where '*water in the nearby river has the arsenic content up to 40 times higher than the threshold limit value (TLV) for effluent waters in FYR of Macedonia. This water is occasionally used for irrigation, thus impacting the irrigated soil and the crops produced'* (UNEP, 2009). Land use alteration is significant threat to biodiversity associated with mining. Within the mine cycle, temporary or permanent alteration of terrestrial and aquatic habitats is common during both mine construction and operation phases. Additionally, mineral exploration often results in land-clearing and population influx establishing new settlements. The physical degradation of land could put further pressure on agriculture in the region — perhaps driving small farmers out of business and encouraging large agricultural enterprises to use more intensive methods that can further lead to soil erosion. This is already recognised as a problem in many mountainous areas of the Western Balkans: in 2010, EEA concluded that the mountainous regions of Albania, were losing between 20 and 70 tonnes of soil per hectare annually, and in Serbia and Montenegro, erosion affects about 20 % of the territory (EEA, 2010).
Data gaps and needs	Specific data gaps noted include: • Information on demand for and supply of critical resources in the region. • Data on regional imports/ exports of these raw critical resources. • Information on products produced/ imported in the region that depend on these resources.
Overview of existing policy/ strategy	*To be discussed during the expert workshop, 7–8 September 2017*
Policy gaps and needs/ vulnerabilities	Policies on research and development and economic restructuring/industrial modernisation, could lead to mineral resources of the region again becoming important contributors to economic development. Such policies could directly impact the access rates of the existing critical resources in the region.

Insecurity and conflict linked to resource competition

Implication title	Insecurity and conflict linked to resource competition		
Scoping result From workshop 1	**Estimated likelihood (high/ low)**	**Magnitude of effect (High/ low)**	**Timescale over which implication may occur[56]**
	High	High	Short/ medium/ long term
Implication description	***Implication summary*** SOER 2015 (GMT 7: Intensified global competition for resources) describes how, in light of increasing global competition for resources, attempts to secure access to resources (either through extraction or trade) can increase regional tensions and lead to insecurity and conflict. The potential for increased regional insecurity and conflict linked to resource competition was identified as a potentially important issue for the Western Balkans during the expert workshop held in Slovenia (April 2017). The growing economies of the region (World Bank, 2017) are likely to use more resources — both renewable biological resources and non-renewable stocks of minerals, metals and fossil fuels. This is expected to increase pressure on local natural resources and add to the growing volume of imported resources (DG TRADE, 2017) to the region. Increasing dependence on trade and insecure access to regional resources could result in tensions regarding competing claims over resource stocks or indirectly as a result of restricted trade flows. 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 insecurity and conflict concerning resources. 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 resource stocks, while at the same time new technologies and denser settlement can result in less resource-intensive lifestyles if appropriate strategies are in place. ***Related global drivers and trends*** GMT drivers identified in the EEA SOER GMT 7 storyline presented at the workshop (Slovenia, April 2017) • Global expansion of middle class • Structural economic changes across the world: agrarian → industrial • Structural changes to service based economies offering potential to alleviate resource use (e.g. decoupling growth from resource use) • A shift to less diffuse (more compact) settlements, providing		

[56] Short term (to 2020); medium term (2020–2030); long term (2030–2050)

	opportunities for reducing resource intensity GMT trends identified in the GMT 7 storyline: • Huge implications for global resource demand if developing regions adopt production/ consumption systems similar to Europe/ US • Uncertain resource supply, and resource concentrated in certain countries/ regions, leading to: • Uncertain access to 'critical' resources e.g. high economic importance, with risks to supply ***Regional trends and observations*** 'Connected' regional observations highlighted by experts as being potentially important during group discussions at the workshop: • Competing demands for land use/ land use change Other connected regional observations identified: • Regional geopolitical instability
Summary of existing evidence	During the expert workshop, the implication Insecurity and conflict linked to resource competition was assessed as both being 'high' in terms of likelihood and the magnitude of impacts, and that effects will be seen in the short, medium and long-term (2020–2100). The World Bank has estimated that between 2013 and 2016, the average poverty rates for Albania, FYR Macedonia, Montenegro, and Serbia declined by close to 2 percentage points. This is estimated to have lifted approximately 240,000 people out of poverty. Decreased poverty rates may suggest that more people in these countries have access to financial resources enabling increased consumption. Data from the World Bank also indicate a positive Growth Outlook for the region - from 2.2% Real GDP growth in 2015 to 3.6% in 2018 as domestic demand rises (World Bank, 2017). GDP growth is generally associated with increased use of resources and energy. SOER 2015 notes that the global use of material resources has increased ten-fold since 1900 and is expected to double again between 2010 and 2030. As demand grows, there is increasing competition for resources between water, energy, agriculture, livestock, forestry, mining, transport and other sectors with unpredictable impacts for the environment. Amongst renewable resources, water is perhaps the most strategically important resource in the region. Competition for water is expected to increase as demand is likely to rise resulting from implications of climate change (Adelphi, 2013). Water use in agriculture is expected to increase as crops will require more water due to hotter, drier, longer summers (UNDP, 2013, Custovic et al. 2012) leading to an increase in number and size of irrigated areas. In Kosovo between 2001 and 2012 the extent of irrigated areas has increased by approximately 3000 ha (KEPA, 2015). Over-exploitation of water resources has been identified as significant pressure from the electricity generation sector (JRC, 2014), and such pressures may increase in the near future. Transboundary water management is considered sometimes to be weak in the Western Balkans with low political prioritisation, insufficient institutional capacity, limited information exchange and joint monitoring (UNEP, 2015; GIWEH, 2011; GEF TWAP, 2016). This is a major risk for the region in the light

	of potential conflict linked to water quality, availability and competition in the future. Countries like Serbia receive a significant proportion of their freshwater resources as external inflow. According to Eurostat indicators – the long-term average of external inflow from neighbouring territories in renewable freshwater resources for Serbia corresponds to 92.7 % (Eurostat, 2015). There are common synergies and trade-offs in competing uses of water and land use in the region that could increase tensions over their use among different sectors such as hydropower generation, agriculture, drinking water, tourism, fish-farming, etc. One area of tension could be water infrastructure projects, producing hydropower and providing water storage for irrigation and urban uses, which might impact downstream agro-ecological systems with social implications, such as resettlements. Similarly, growing bioenergy may help improve energy supply and generate employment opportunities, but it may also result in increased competition for land and water resources with impacts on local food security (FAO, 2014). Future insecurities from resource competition in the region might soar resulting from weak growth in the EU and post-Brexit uncertainties. The resulting political (and policy) uncertainty and instability could see the reduction in global trade growth (World Bank, 2017). Such outcome would increasingly complicate the relations with trading partners and cause more stiff competition for imported resources. The region has strong trade and investment links with the EU, as it is the regions' main trade partner (over 76% of the region's total trade) (DG TRADE). Any future uncertainties surrounding resource imports from EU could significantly impact the competitive outlook between the countries.
Data gaps and needs	UNEP in their 2015 report on climate change adaptation in the region indicate that monitoring and reporting on land resources is generally scarce in Kosovo, FYR Macedonia and BiH since there is no national soil monitoring (UNEP, 2015). Potential data needs include: • Information on international disputes regarding access to resources, and regional tensions/ conflicts related to resource competition • Resource consumption trends
Overview of existing policy/ strategy	Existing policy overview for the region for land use in "UNEP. 2015. Outlook on climate change adaptation in the Western Balkan mountains" p53 – also things on climate change adaptation policies International investment links are important drivers for improving management of transboundary water resources in the region. For example World Bank provided investment to establish mechanisms for the efficient and equitable water allocation amongst the users of two river basins at the transboundary level between Bosnia & Herzegovina and Croatia. This project also aimed to enhance the basin ecosystems and biodiversity through improved water resources management.
Policy gaps and needs/ vulnerabilities	*To be discussed during the expert workshop, 7–8 September 2017*

Supply and price volatility for critical resources

Implication title	Supply and price volatility for critical resources		
Scoping result From workshop 1	**Estimated likelihood (high/ low)**	**Magnitude of effect (High/ low)**	**Timescale over which implication may occur[57]**
	High	High	Medium term
Implication description	***Implication summary*** The risk of supply and price volatility for critical resources is identified as an implication of SOER 2015 GMT 7: Intensified global competition for resources, and was identified as a potentially important issue for the Western Balkans region during the expert workshop held in Slovenia (April 2017). The SOER 2015 'Assessment of global megatrends' report refers to critical resources in the context of the list of 20 critical raw materials defined by the European Commission (see footnote below). However aside from these it is also assumed that experts at the workshop were referring to critical resources in a broader sense including other key resources such as water and crops among others. This implication as described in SOER 2015, relates to uncertainty around access to essential resources and the volatility of their prices (e.g. global commodity process have fluctuated significantly in recent years). This represents a risk to economic development and to living standards, especially for economic sectors that depend on imports of these resources. Geographic concentration of reserves for some of the critical resources in a limited number of countries is a risk since it provides those regions with considerable influence over global prices and supplies. There are 20 raw materials[58] identified by the European Commission as being critical because of risks of supply shortages and their impact on the economy. The risk for Western Balkans region economies is that there is structural dependence on imports of such resources and dependence on global markets that could become unstable (e.g. decrease in trade, decrease in foreign direct investment in renewables and energy efficiency measures, thus relying more on national governments spending/more affected by price fluctuations of these resources/ their products). The nature of the non-energy raw materials link them to all industries across all supply chain stages (DG GROWTH, 2017), thus any changes in supply and/or price also affect the existing industries in the region. Modern technologies and renewable energy sources are also dependent on these materials (DG GROWTH, 2017). Indirectly this could affect the region through increased prices on imports of these products. An economic opportunity might present itself from extracting critical resources found in the region potentially for export, but also to help provide a secure source of regional supply in light of potential volatility of supply and prices globally. However this represents a risk also, as if sustainable mining practices would be ignored – this would cause negative environmental consequences, in		

[57] Short term (to 2020); medium term (2020–2030); long term (2030–2050)

[58] The list includes: heavy and light rare earths (metals), Magnesium, Antimony, Tungsten, Magnesite, Gallium, Natural graphite, Germanium, Indium, Silicon metal, Fluorspar, Coking coal, Phosphate rock, Niobium, Beryllium, Platinum metals, Chromium, Cobalt, Borates.

	particular for water quality and land use. ***Related global drivers and trends*** GMT drivers identified in the EEA SOER GMT 7 storyline presented at the workshop (Slovenia, April 2017) • Global expansion of middle class • Ongoing and possible future structural changes to service based economies • Structural economic changes across the world: agrarian → industrial • Less diffuse settlements possibly reducing resource intensity GMT trends identified in the GMT 7 storyline: • Developing regions account for increasing share of resource use • Huge implications for resource demand if developing regions adopt production/ consumption systems similar to Europe/ US • Projected global doubling of resource use (2010-30) energy consumption up by one third (2012-35) • Uncertain resource supply, and resources concentrated globally in certain countries/ regions ***Regional trends and observations*** 'Connected' regional observations highlighted by experts as being potentially important during group discussions at the workshop: • Over-exploitation of water resources (agriculture, energy sector), leading to potential challenges for water security Other connected regional observations identified: • Increasing energy prices • Impact on prices of agriculture products, leading potentially to pressure to increase agricultural intensification and associated environmental pressure
Summary of existing evidence	Since 2000, global commodity prices have more than doubled in real terms, as growing global resource demand outpaced increases in supply (World Bank, 2015a). This trend is expected to continue as latest data from 2017 indicate that metal prices have surged by 10 percent in the first quarter driven higher by strong demand presenting the fourth consecutive quarterly rise (World Bank, 2017). Considering the identified critical resources - platinum prices rose 4 % in the first quarter of 2017 based on strong investment demand. Looking ahead the World Bank reports that 'metals prices are projected to rise by 16 percent in 2017 as a result of strong demand in China and various supply constraints, including labour strikes and contractual disputes in the case of copper, and environmental and export policies for nickel' (World Bank, 2017). In longer term, the outlooks to 2020 for most metals and minerals indicate deflation of prices in constant dollar value except nickel – with its price projecting a considerable surge. Similar trends in prices are projected leading up to 2030 (World Bank, 2017). For the region, this could indicate a possible incentive to re-invest in mining infrastructure to economically benefit from the increased demand and to secure domestic and regional supply security. Such incentives could induce environmental issues associated with mining – in particular affecting water quality and availability as well as land use. Most Western Balkan countries

	have not been able to take advantage of fast-growing regions such as East Asia and South Asia in relation to exporting critical resources found in the region. Reduced crop yields from climate change implications in the region are expected to lead to food security issues, for example, increased food prices (UNDP, 2014a). Food commodity prices are expected to increase through 2020, with food and raw material prices increasing more than prices of beverages (World Bank, 2017) Considering both the increase in global commodity prices and reduced crop yields in the region could put pressure on regional food systems and water use for irrigation. Together with the potentially increasing demand from water intensive mining industry could result in the over-exploitation of water resources. Increasing energy demand from developing countries, political/economic instability in major energy resource producing countries are driving price volatility in energy markets and pushing up energy prices globally. Continued volatility could threaten the region's economy as a result of increased prices in energy imports in particular for crude oil and natural gas (e.g. Serbia's overall energy import dependency is moderate at 32%; however, it imports more than 85% of its crude oil and natural gas needs) (IEA, 2008). Data from IEA (2008) show significant differences across the region in terms of energy import dependency, for example in 2005 Albania and Croatia both had import dependency of higher than 50% while Bosnia and Herzogovina and Serbia both had their import dependency below 35%. In Western Balkans energy prices subsidies are prevalent. The implications of supply and price volatility of resources could potentially be already present in the region through recent electricity tariff increase and tighter payment enforcement (WBIF. 2016).
Data gaps and needs	• Monetary data on exports/ imports of critical resources/ energy/ food • Food price trends in the region
Overview of existing policy/ strategy	*To be discussed during the expert workshop, 7–8 September 2017*
Policy gaps and needs/ vulnerabilities	*To be discussed during the expert workshop, 7–8 September 2017*

Risks for global food security

Implication title	Risks for global food security		
Scoping result From workshop 1	**Estimated likelihood (high/ low)**	**Magnitude of effect (High/ low)**	**Timescale over which implication may occur[59]**
	High/ uncertain[60]	Uncertain	Short term
Implication description	***Implication summary*** The potential for significant risks to global and regional food security is described as a potential implication in GMT 9: Increasingly severe consequences of climate change. The implication is defined by pressure on food production due to the impacts of climate change in agricultural areas (e.g. droughts, changes in mean surface temperatures etc.) together with increased food demand due to population growth. This was identified as a potentially important issue for the Western Balkans during the expert workshop held in Slovenia (April 2017). ***Related global drivers and trends*** GMT drivers identified in the EEA SOER GMT 9 storyline presented at the workshop (Slovenia, April 2017): • GHG emissions from fossil fuel burning, due to: o Increased demand for energy o Industrialisation of economies o Increased consumption and production ('western' lifestyles) GMT trends identified in storyline: • Increased intensity and frequency of heatwaves • Increasing mean surface temperature • Variations in precipitation patterns: droughts in some regions, more intense rain in others. ***Regional trends and observations*** 'Connected' regional observations highlighted in workshop 1: • Increasing demand for food (from the region), in turn increasing pressure on the limited available land for food production (and potentially leading to land-use conflicts)		
Summary of existing evidence	During the expert workshop, the implication *Risks for global food security* was assessed as being 'high' in terms of likelihood and 'uncertain' for magnitude of impacts, and that effects will be seen in the short term (now – 2020). The SOER 2015 notes that global agricultural production as experienced 'some regionally limited gains' but mostly losses due to climate change since 1960, and that projections of yield suggest that local temperature increases of 2 °C or more will have negative impacts on yields of wheat, rice and maize in most temperate and tropical regions. This could leave Western Balkans vulnerable		

[59] Short term (to 2020); medium term (2020–2030); long term (2030–2050)

[60] Effects will depend on regional response

	to ensure sufficient and affordable food from local production. Looking ahead, 'the overall impact on the global food system is expected to be adverse and continue to deteriorate throughout the 21st century'. If strong global temperature increases (e.g. 4 °C) are seen, combine with projected increases in global food demand, this is expected to pose significant risks for regional and global food security (SOER 2015). Such effects would be important for the Western Balkans as for any other region. Much agricultural production in the region is based on relatively intensive farming (Sida's Helpdesk for Environment and Climate Change, 2012). The projected increase in temperatures and droughts are expected to affect crop yields through increased fire risk for cereal crops, which will also require more water due to hotter, drier, longer summers (UNDP, 2013) Reduced crop yields are expected to lead to local food security issues, for example, increased food prices that would affect food affordability for safe, healthy and nutritious products (UNDP, 2014a). Issues concerning increased droughts and soil quality include decreasing organic carbon in arable land, soils becoming in general drier; change of properties and processes in soils leading to accelerated erosion, landslides and desertification (UNEP, 2015) resulting in limited land available for agriculture.
Data gaps and needs	Information support is very poor for agriculture production patterns (EEA, 2010). The report also notes that 'the assessment of food consumption was also severely limited by the lack of quantitative and qualitative information (for example, consumption by major food groups, retail food markets and sources of food products)'.
Overview of existing policy/ strategy	*To be discussed during the expert workshop, 7–8 September 2017*
Policy gaps and needs/ vulnerabilities	Agribusiness in the region needs to develop further with countries consolidating agricultural holdings, improving the quality of collection, storage and marketing, and develop agricultural support services such as insurance (Sanfey et.al 2016).

Demand (need) for increased renewables and efficiency

Implication title	Demand (need) for increased renewables and efficiency		
Scoping result From workshop 1	**Estimated likelihood (high/ low)**	**Magnitude of effect (High/ low)**	**Timescale over which implication may occur[61]**
	High/ uncertain[62]	Uncertain	Short term
Implication description	***Implication summary*** SOER 2015 GMT 7: Intensified global competition for resources describes how a projected doubling of global resource use by 2030, and increased energy consumption by a third by 2035, will lead to increased risk of global supply and price volatility for resources. The already increasing energy demand, lack of diverse energy mix and the significant dependence on oil and gas imports may be considered vulnerabilities for the Western Balkans and lead to strong incentives for private and public investment in exploiting renewable energy sources (RES) and energy efficiency measures. Moreover, global technological innovations could also lead to more efficient and economically viable use of renewable resources, including in the region, but could also add to the pressures on water overexploitation by increasing hydropower generation as part of the RES portfolio. This was identified as a potentially important implication for the Western Balkans region during the expert workshop held in Slovenia (April 2017). **Related global drivers and trends** GMT drivers identified in the EEA SOER GMT 7 storyline presented at the workshop (Slovenia, April 2017) • Global expansion of middle class • Efficient use of (renewable) resources; enabling a circular economy; new ways to locate and exploit traditional resources • Less diffuse settlements possibly reducing resource intensity • Structural economic changes across the world: agrarian → industrial GMT trends identified in the GMT 7 storyline: • Investment in technology and substitutes (e.g. renewables) but also extraction of new sources of traditional resources (e.g. tar sands, shale gas) • Projected global: doubling of resource use (2010-30) energy consumption up by one third (2012-35) • Risk of supply and price volatility for critical resources (also an implication) *Regional trends and observations* 'Connected' regional observations highlighted by experts as being potentially important during group discussions at the workshop: • Opportunities for increasing energy production from renewables		

[61] Short term (to 2020); medium term (2020–2030); long term (2030–2050)

[62] Effects will depend on regional response

	Other connected regional observations identified: • Over-exploitation of water resources (agriculture, energy sector)
Summary of existing evidence	During the expert workshop, the need for increased renewables and efficiency implication was assessed as being 'high' in terms of likelihood and uncertain when it comes to magnitude of impacts. The effects were believed to be seen in medium and long-term (2020–2050). According to the Director for the Western Balkans at the Directorate-General for European Neighbourhood Policy and Enlargement Negotiations of the European Commission, the energy demand in the region is increasing, often in an unsustainable fashion adding that: 'the Western Balkans should focus on reducing demand and improving energy efficiency' (Western Balkans Investment Framework. 2016). Nonetheless the future energy supply mix is a major uncertainty for the whole region (EEA, 2010). In many parts of Western Balkans, power generation is dominated by either fossil fuel sources (notably through coal power plants) or by hydropower generation (Politis et al. 2016; Softič et al. 2012). The lack of diversity in energy supply sources, especially in countries that are highly dependent on hydropower, means exposure to a higher risk to climate change and possible water scarcity in summer periods. The risks for water availability could be further exacerbated by water exploitation as a result of energy strategies that foresee building new hydropower and nuclear plants (EEA, 2010). Although for most of the countries in the region energy dependency from imports is moderate, i.e. between 35–50% however the countries are import dependent in terms of oil and gas (76% – 100% being imported) – and demand volumes are increasing (IEA, 2008). This leads to threats for energy security and would require diversification of energy mix to minimise the risks from potential restrictions to supply and/ or price volatility of imports in the future. Except hydropower, other RES are at a relatively early stage of development in the region (Politis et al. 2016): they are less exploited, with relatively few incentives and regulations for their full exploitation (Karakosta et al., 2012). This presents an obvious need for promotion of development and use of hydro-energy potential, across environmental, integral water management, energy policy and market domains as recognised from the expert consultation in particular in the context of Bosnia & Herzegovina. The cost of RES remains an issue as some are generally higher than conventional energy sources. However, RES investments will continue for those countries that have instituted policies to derive a significant percentage of their total gross energy consumption from RES in the short to medium term. Also, prices are projected to decline with technical improvements, innovations, economies of scale and government incentives.
Data gaps and needs	To be identified
Overview of existing policy/ strategy	EU's financial instruments play a key role in supporting the development of energy efficiency finance in the region. The regional governments are working with EU and its network of Independent Fiscal Institutions to dismantle regulatory barriers and to provide additional funding and incentives. One such incentive is the "Regional Strategy for Sustainable Hydropower in the Western Balkans" that aims to foster the development of environmentally and climate

	change sustainable hydropower generation in the WB6 region (WBIF, 2016a). The desired outcomes of such strategy is to ensure the competitiveness of regional SMEs, improving public buildings, reducing energy bills for citizens and contribute to the economic growth and national energy efficiency targets (WBIF, 2016b).
Policy gaps and needs/ vulnerabilities	Studies have suggested that there is insufficient legislation and institutional capacity for implementing Energy Efficiency measures and Renewable Energy Sources (RES) deployment in the region (KEPA, 2015; Softič et al., 2012; Karakosta et al. 2012). The relative lack of legislative harmonisation may represent a particular issue in the context of a high concentration of new dams in southern Balkan countries: these may be built in a context of limited formal transboundary cooperation. A number of water infrastructure projects are planned or ongoing without adequate institutional arrangements (GEF TWAP, 2016), with involvement of foreign corporate investors or international organisations. At the same time the energy sector in the Western Balkans region has been associated with allegations of corruption (Balkan Green Foundation, 2016; UNDP 2016b). Liberalising energy market: the electricity sector in the region is characterised by dominant state owned utilities, with public service obligations and regulated prices. As a result, domestic consumers have enjoyed free or heavily subsidised energy for decades, thus investing in RES may impose significant political costs (Lindstrom, 2011). During expert consultation an expert indicated that there may be an opportunity for a regional approach for future energy market planning in the region specifically for balancing of energy supply sources, for example using hybrid schemes: e.g. pump-reversible hydro power, wind and solar power plants.

Climate Change related implication factsheets

Droughts / changes in precipitation / extreme weather / heatwaves

Implication title	Droughts / changes in precipitation / extreme weather / heatwaves		
Scoping result From workshop 1	**Estimated likelihood (high/ low)**	**Magnitude of effect (High/ low)**	**Timescale over which implication may occur[63]**
	High	High (and growing)	Short term (already seen)
Implication description	***Implication summary*** Over the course of this century, 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). In the Western Balkans, climate change impacts are expected to bring (and are already leading to): • An increase in extreme events, including summer heat waves and droughts. • A reduction in precipitation in the summer months, and thus reduced water availability (e.g. for agriculture, hydropower) and reduced water levels in rivers, streams and lakes. Impacts of such climate-related changes include 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), and damage to infrastructure and settlements. Climate change impacts, in particular droughts, heatwaves, changes in precipitation and extreme weather events were identified as a potentially important implication for the Western Balkans region during the expert workshop held in Slovenia (April 2017). ***Related global drivers and trends*** GMT drivers identified in the EEA SOER GMT 9 storyline presented at the workshop (Slovenia, April 2017) • GHG emissions from fossil fuel burning, driven in particular by: o Increased demand for energy o Industrialisation of economies o Increased consumption and production (“western lifestyles”) • Change in scale and type of agriculture • Deforestation GMT trends identified in the GMT 9 storyline: • Increased intensity and frequency of heatwaves • Increasing mean surface temperature		

[63] Short term (to 2020); medium term (2020–2030); long term (2030–2050)

	• Variations in precipitation patterns: more frequent, intense rain in some regions, droughts in others ***Regional trends and observations*** 'Connected' regional observations highlighted by experts as being potentially important during group discussions at the workshop: • Water shortages during summer in southern countries and coastal regions • Soil erosion • Competing demands for land use/ land use change Other connected regional observations identified: • Increased temperatures in spring and summer to accelerate crop development for short-cycle crops (possible opportunity) • Need for a regional response: potential opportunity of enhanced cooperation in the region • Agricultural land abandonment • Damage to crops • Desertification • Higher water abstraction for irrigation, especially in summer • Reduction of annual average river discharge • Infrastructure damage • Increased costs for energy infrastructure maintenance and energy production
Summary of existing evidence	During the expert workshop, the implication *Droughts/ changes in precipitation/ extreme weather/ heatwaves* 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 such impacts are already being seen in the region). Among the consequences of higher mean surface temperatures are more frequent and severe droughts. The IPCC scenarios of climate change suggest that Western Balkans are likely to experience more frequent and prolonged droughts and wildfires (IPCC, 2012) in the upcoming decades and leading up to 2100. In the Western Balkans, droughts tend to result in significant economic losses, particularly in the agriculture, energy and water sectors (UNDP, 2016). For example in 2012 Serbia experienced its driest year in the last 25 years, which had significant effects on Serbia's agricultural production (UNDP 2016). An outlook study by EEA projects that the coastal and southern regions of the Western Balkans will experience significant changes in annual mean temperature and a reduction in precipitation, influencing drought, wildfires and overall water security (EEA, 2015). Studies in the Mediterranean basin, including the Balkans, record recent negative annual trends in precipitation, where the decrease from 1950 to 2002 was greater than 50 mm per year (García-Ruiz et al., 2011). According to estimates in the IPCC 4th Assessment Report (2007), the total water run-off in southern Europe could decrease by up to 23 % in the 2020s and by up to 37 % in the next 50 years (although the specific impacts in the Western Balkans may vary) (EEA, 2010). Additionally, all countries in the Western Balkans with the exception of Bosnia and Herzegovina are expected to endure water stress, which is likely to increase by at least 10% (UNDP, 2016) because of rising

demand for water partly due to higher water abstraction for irrigation.

Changes in precipitation affect the equilibrium of the soil. In Southern Europe, soil water content is projected to decline; saturation conditions and drainage will be increasingly rare and restricted to periods in winter and spring. Albania already suffers from desertification as 25 % of the country is affected by soil erosion (UNEP, 2011) while wind erosion, is a significant risk in Serbia as larger regions of the country is exposed to it and could be amplified due to extended drought periods (Custovic et al., 2012).

Heatwaves contribute significantly to and often accompany droughts and wild fires. Milder forms of heatwave occur regularly in the Western Balkans (2002, 2003, 2004 and 2007), whereas extreme heatwaves are rare (UNDP, 2016). According to IPCC, it is highly likely that the future will bring heatwaves of higher frequency and duration than previously observed (IPCC, 2013) in the region.

The projected regional changes in precipitation are likely to reduce the suitability of rain fed agricultural production and increase water demand for crop irrigation – particularly in the summer: already about 49 % of Albania's cropped land is irrigated (EEA, 2010). However, the projected decline in total runoff and groundwater resources in the Mediterranean area suggests that there is limited capacity for increased irrigation in the region (Olesen et al., 2011).

A large proportion of farms in the Western Balkans comprise of smallholdings which is considered to make them less resilient to drought, extreme weather events (cold spells, frost and heatwaves), fires, extreme precipitation, land degradation, topsoil erosion and flooding (UNDP, 2016). Such consequences together with competing demands for land use may lead to agricultural land abandonment and land use change, such as has been seen in Kosovo where agricultural lands decreased from 31.3% of Kosovo's territory in 2002 to 27.8% in 2012 (EEA, 2015).

A regional study on the effects of climate change for Western Balkans agriculture foresees some positive effects, such as for the yields and quality of winter crops as a result of increased temperatures in spring and summer and extended growing period. Areas suitable for fruit and grape production are likely to expand with the reduced likelihood of extremely cold winters and late spring frosts. However, the picture is mixed as spring crops are also likely to be affected by high temperatures and water shortages during the summer months and are may therefore experience notable decrease in yield across the region. It is expected that the losses in yields in Southern Europe will range from 10 to 30% (Custovic, et al., 2012).

Experts at the workshop held in Slovenia in April 2017 identified the necessity for a regional response through enhanced cooperation on transboundary water management. Improved water management in upstream agricultural areas could mitigate adverse impacts downstream and groundwater recharge could be targeted in areas with poor water-holding soils (Kløve et al., 2011).

Extreme weather events may threaten all types of energy infrastructure, with the associated increase of production and maintenance costs. Events such as the 2014 low pressure cyclone bringing strong winds and rain in South-Eastern Europe could become a more frequent occurrence. The damage in Bosnia and Herzegovina, and Serbia resulted in the loss of tens of thousands of homes, agricultural land, schools, hospitals and businesses leaving thousands of

	people without electricity, with other critical infrastructure (road networks, energy infrastructure etc.) damaged or destroyed. The estimated total economic impact of the disaster reached 2.04 billion Euros or fifteen per cent of gross domestic product for Bosnia and Herzegovina (UNDP, 2016).
Data gaps and needs	Improvement of the monitoring and forecasting system for droughts (UNEP, 2011).
Overview of existing policy/ strategy	*To be discussed during the expert workshop, 7–8 September 2017*
Policy gaps and needs/ vulnerabilities	More robust water management, pricing, and recycling policies to secure adequate future water supply and prevent tensions among users could be required in Southern Europe (García-Ruiz et al., 2011). Establish/improve performance of early warning systems – Albania, Croatia, Montenegro and Serbia have invested extensively in DRR early warning systems, however these systems do not function optimally in practice. In Bosnia and Herzegovina such system is legislated, but there is no cross entity or cross district coordination or communication among the national civil protection agencies (UNDP, 2016). There is a need to broaden and systematise awareness raising activities on disaster risks using media, training events and mitigation activities (UNDP, 2016). Modernisation/construction of irrigation systems in drought-prone areas (Environment Security Initiative, 2011).

Floods (coastal, river and urban)

Implication title	Floods (coastal, river and urban)		
Scoping result From workshop 1	**Estimated likelihood (high/ low)**	**Magnitude of effect (High/ low)**	**Timescale over which implication may occur[64]**
	High	High	Short term (already seen)
Implication description	***Implication summary*** Severe floods are among the climate change consequences expected to increase (both their likelihood and severity) in upcoming decades (GMT 9: Increasingly severe consequences of climate change). It is with high confidence the IPCC 5th Synthesis Report (2014) project sea level rise and increases in extreme rainfall that will further increase coastal and river flood risks across Europe. This implication is characterised by increasing greenhouse gas emissions from fossil fuel burning, and also other activities including deforestation and agricultural changes, substantially contributing to global mean sea-level rise and changes in the frequency and intensity of precipitation. In recent years the Western Balkans has already been affected by severe floods and without adequate adaptive measures, countries in the region are expected to endure substantial increase in flood damages resulting in physical, economic, social and environmental costs. ***Related global drivers and trends*** GMT drivers identified in the EEA SOER GMT 9 storyline presented at the workshop (Slovenia, April 2017) • Change in scale and type of agriculture • Deforestation • GHG emissions from fossil fuel burning, driven in particular by: o Increased demand for energy o Industrialisation of economies o Increased consumption and production (“western lifestyles”) GMT trends identified in the GMT 7 storyline: • Variations in precipitation patterns: more frequent intense rain in some regions, droughts in others • Rising sea levels ***Regional trends and observations*** ‘Connected’ regional observations highlighted by experts as being potentially important during group discussions at the workshop: • Infrastructure damage • Damage to crops • Soil erosion • Remobilisation of salts or pollutants in freshwater bodies		

[64] Short term (to 2020); medium term (2020–2030); long term (2030–2050)

	• Increased maintenance and production costs (energy sector) Other connected regional observations identified: • Insufficient waste water discharge management • Regional geopolitical instability
Summary of existing evidence	During the expert workshop, the implication *Floods (coastal, river and urban)* was assessed as both being 'high' in terms of likelihood and magnitude of impacts, and that effects will be seen in the short term (experts noted that such impacts are already being seen in the region). Floods are the most recurring natural hazard in the Western Balkans as they occur in almost all river basins in the region (UNDP, 2016; Macedonian Environmental Information Center, 2014; KEPA, 2015, Sutton et al., 2013). Recent years have seen Western Balkans being affected by severe floods (2014 in Bosnia and Herzegovina, and Serbia; 2009, 2010, 2015 in Albania and former Yugoslav Republic of Macedonia) that have caused extensive damage to agricultural land, power and water utilities and communications and transport infrastructure (UNDP, 2016). Outlooks by EEA project that the north-eastern part of the region will likely experience increased levels of rainfall and therefore increased intensity of floods (EEA, 2015). The extent and severity of soil erosion is expected to increase over the next century as intense precipitation and flooding increase flow of underground waters causing widespread landslides. This can further induce pollution of waterways and reduce functioning of reservoirs and irrigation infrastructure (Custovic et al. 2012; Hristov, 2014). Crop damage from floods is particularly problematic in the spring period when flooding in the region can delay or prevent planting of summer crops. Furthermore when it occurs, late summer flooding in Western Balkans can see an entire year's growth destroyed and prevent farmers from timely harvesting. Less serious flood events can still reduce productivity through water-logging of roots (Hristov, 2014). Coastal flood risk will increasingly become a key challenge for the coastal cities in the region as port facilities, and other infrastructure become increasingly vulnerable to significant damage. A scenario study completed as part of Albania's Second National Communication to the Conference of Parties under the UNFCCC projected that its coastal floodplain area will increase from 55.61 (avg.min) in 2025 to 57.19 (avg.min) in 2100 (Ministry of Environment, Forestry and Water Administration, 2009). Such circumstances are likely to increase the maintenance and production costs for energy infrastructure that is located in territory vulnerable to flooding (UNEP, 2015). Sea-level rise could also result in increased salinity in estuaries and coastal aquifers as salts are remobilised from increased storm flooding (Ministry of Environment, Forestry and Water Administration, 2009).
Data gaps and needs	Needs: • improving hydro meteorological data collection (Hristov, 2014)
Overview of existing policy/ strategy	Early warning system introduced in a river basin in Kosovo (KEPA, 2015).
Policy gaps and needs/	Regional cooperation for managing risks and consequences of flooding does not exist to the extent necessary. The level of preparedness and prevention

vulnerabilities	for such events varies from country to country. Examples of policy and research needs identified in regional studies and literature include: • Maintenance strategy/ funds for existing flood protection systems (Macedonian Environmental Information Center; 2014) • Regulation (e.g. on excavation) and maintenance of riverbeds (KEPA, 2015) • Crop insurance (Hristov, 2014) • Improve capacity of hydrometeorological institutions (Hristov, 2014) • Integrate adaptation actions into development policy and planning at every level/ sector. • Prepare disaster relief to hazard-reduction programs • Establishing new legislation for water use • Land use policy: increase of forest area through reforestation especially on the eroded lands and abandoned agriculture lands. • Planning and construction of energy infrastructure need to take into consideration the climate impacts The IPCC AR5 Synthesis Report identifies the follow suggested policy needs / responses to increased flood risk: • Coastal zone management and coastal protection plans that integrate adaptation. • Improve early warning systems and early response measures, to ensure that climate change considerations are incorporated into marine strategies and water resource management, with mechanisms for regular update. • Integrated Water Resource Management – including public participation in decision making for flooding defence plans. • Expand the role of urban governance in adaptation regarding the development and implementation of measures to increase resilience to flooding.

Annex 4. Completed worksheets: identifying risks and opportunities

Biodiversity cluster of implications

Potential risks

Implication title	**Increased costs of waste water treatment**		
Potential risks	**Who/ what is likely to be affected?**	**Geographical scale(s)** (e.g. whole region, specific country etc.)	**Timeframe which risk is expected to occur** Short term (to 2020); medium term (2020–2030); long term (2030–2050)
Not enough financing – issue left untreated (mining)	Population and environment in regions of development (urbanisation)	Regions that are being developed (especially urbanisation)	
EU (and other international institutions) not helping – as it becomes too expensive	Government-level; Local communities	Regions that are being developed (especially urbanisation)	
Risks to safe drinking water	General population in urban areas	Regions that are being developed (especially urbanisation)	

Implication title	**Pollution affecting soil & water, including from pollutants with uncertain effects**		
Potential risks	**Who/ what is likely to be affected?**	**Geographical scale(s)** (e.g. whole region, specific country etc.)	**Timeframe which risk is expected to occur** Short term (to 2020); medium term (2020–2030); long term (2030–2050)
Further increased pollution due to intensification of agriculture/industry (privatisation, foreign investment)	Local communities downstream	Agricultural regions; industrial hotspots (e.g. Ilovica, Boslovo, Macedonia – private mining with ad-hoc river dam)	Medium term (2020–2030) to Long term (2030–2050)
Food production/ quality	Population in the region / farmers selling such food	Agricultural areas (Vojvodina, Macedonia)	

Low monitoring, especially for new/ unknown chemicals; Slow policy response (or not at all) ; implementation gap	Population in the region		
Health risks: drinking water, also in combination with lowering water quantity – less water has less self-purification ability	General population (especially low income population); focused to agricultural areas and industrial areas		
Increasing cost to deal with pollution (especially costly issues e.g. mining; also trans-boundary cascading effect – polluted Ibar river flowing from Kosovo to Serbia)	Government; Infrastructure management		
Adopting EU policy without consideration: higher threshold than current national law			

Potential opportunities

Implication title	**Increased costs of waste water management**		
Potential opportunities	**Who/ what is likely to be affected?**	**Geographical scale(s)** (e.g. whole region, specific country etc.)	**Timeframe which opportunity is expected to occur (choose 1 based on likely first appearance)** Short term (to 2020); medium term (2020–2030); long term (2030–2050)
EU funding of waste water treatment; International funding			
To apply more efficient technologies			
Using waste water for irrigation (if treated) - only if bacteria is cleared first			

Implication title	**Pollution affecting soil & water, including from pollutants with uncertain effects**		
Potential opportunities	**Who/ what is likely to be affected?**	**Geographical scale(s)** (e.g. whole region, specific country etc.)	**Timeframe which opportunity is expected to occur** Short term (to 2020); medium term (2020–2030); long term (2030–2050)
Policy improvement	Government level	EU-accessing countries	
Funding in general	Government level		
Developing/ applying technologies	Population in local communities		
Rising (investments) incentives for organic farming	Local communities that take advantage	Rural areas	

Resource cluster of implications

Potential risks

Implication title	**Demand (need) for increased renewables and efficiency**		
Potential risks	**Who/ what is likely to be affected?**	**Geographical scale(s)** (e.g. whole region, specific country etc.)	**Timeframe which risk is expected to occur** Short term (to 2020); medium term (2020–2030); long term (2030–2050)
Negative impact on biodiversity	Biodiversity – fish population (hydro-power plants affecting fish migration)	Whole region	
Overuse of resource	Biodiversity	Whole region	Short term (to 2020) to Medium term (2020–2030);
Using food (crops) for biogas	Local communities; Transboundary areas	Whole region	Short term (to 2020) to Medium term (2020–2030);
Lack of adequate monitoring praxis (if RES grows continuously)	Agriculture and other sectors; Population; Tourism	Whole region	Medium term (2020–2030) to Long term (2030–2050)

Inadequate spatial planning & strategic impact assessment	Transboundary areas; Biodiversity; Protected areas	Whole region	Short term (to 2020)

Implication title	**Insecurity and conflict linked to resource competition**		
Potential risks	**Who/ what is likely to be affected?**	**Geographical scale(s)** (e.g. whole region, specific country etc.)	**Timeframe which risk is expected to occur** Short term (to 2020); medium term (2020–2030); long term (2030–2050)
Increased poverty – vulnerable population	Rural areas	Whole region	Short term (to 2020) to Medium term (2020–2030);
Conflict about water use – water supply; hydro-power plants (access to and using of drinking water – shortage)	Population; Energy sector	Whole region	Short term (to 2020)
Illegal cutting (logging) even in protected areas	Forests; biodiversity; pollution; soil erosion	Whole region	Short term (to 2020)
Growing social inequality	Population – no middle class	Whole region	Short term (to 2020)
Land grabbing	Local communities; population	Whole region	Short term (to 2020)

Potential opportunities

Implication title	**Demand (need) for increased renewables & efficiency**		
Potential opportunities	**Who/ what is likely to be affected?**	**Geographical scale(s)** (e.g. whole region, specific country etc.)	**Timeframe which opportunity is expected to occur** Short term (to 2020); medium term (2020–2030); long term (2030–2050)
Improved waste management (biogas from waste)	Agriculture; Environment (waste management)		Short term (to 2020)
Develop tourism sector	Economy	Whole region	Short term (to 2020) to Medium term (2020–2030);

Implication title	**Insecurity and conflict linked to resource competition**		
Potential opportunities	**Who/ what is likely to be affected?**	**Geographical scale(s)** (e.g. whole region, specific country etc.)	**Timeframe which opportunity is expected to occur** Short term (to 2020); medium term (2020–2030); long term (2030–2050)
Enforcement of regulation	Life quality	Whole region	Short term (to 2020);
Increased regional cooperation	Economies of the countries in the region	Whole region	Short term (to 2020);
Improved resource management & raising knowledge about resources		Whole region	Short term (to 2020);
Foreign investment in agricultural land	Local communities; population	Whole region	Short term (to 2020);

Climate cluster of implications

Potential risks

Implication title	**Droughts/ changes in precipitation/ extreme weather/ heatwaves**		
Potential risks	**Who/ what is likely to be affected?**	**Geographical scale(s)** (e.g. whole region, specific country etc.)	**Timeframe which risk is expected to occur (choose 1 based on likely first appearance)** Short term (to 2020); medium term (2020–2030); long term (2030–2050)
Forest fires	Villages / rural Coastal areas Transitional forests	Albania, Macedonia, south part of Bosnia & Herzegovina	Short term (to 2020)
Crop failure (drought)	Dryland crops Agriculture sector Consumers	Serbia	Medium term (2020–2030)
Water shortages – trade-offs: irrigation, drinking water, hydro	All water using sectors	Whole region	Medium term (2020–2030) to Long term (2030–2050)

Public health – heatwaves/ allergies/ alien species	Vulnerable groups in society		Long term (2030–2050)

Implication title	**Floods (coastal, river, urban)**		
Potential risks	**Who/ what is likely to be affected?**	**Geographical scale(s)** (e.g. whole region, specific country etc.)	**Timeframe which risk is expected to occur** Short term (to 2020); medium term (2020–2030); long term (2030–2050)
Damage to infrastructure	Coastal settlements (flooded houses) Water infrastructure (old machinery)	Coast; Urban settlements; NE part of region (large rivers)	Short term (to 2020) to Medium term (2020–2030) **for river floods** Long term (2030–2050) **for coastal floods**
Drinking water supply	Water utilities depending on local governance		
Pollution (connected with low flows)	Agriculture, groundwater, riverine ecosystems		
Soil erosion/ landslides	Settlements (especially semi-legal); Agriculture	Local flash floods across whole region	

Potential opportunities

Implication title	**Droughts/ changes in precipitation/ extreme weather/ heatwaves**		
Potential opportunities	**Who/ what is likely to be affected?**	**Geographical scale(s)** (e.g. whole region, specific country etc.)	**Timeframe which opportunity is expected to occur (choose 1 based on likely first appearance)** Short term (to 2020); medium term (2020–2030); long term (2030–2050)
Cross-sector integrated water management			
Extreme events as triggers of change			
New crops/ crops in new areas			
Increase in Tourism		Mountainous areas	

Implication title	**Floods (coastal, river, urban)**		
Potential opportunities	**Who/ what is likely to be affected?**	**Geographical scale(s)** (e.g. whole region, specific country etc.)	**Timeframe which opportunity is expected to occur** Short term (to 2020); medium term (2020–2030); long term (2030–2050)
Wetland, riparian ecosystems			
Water shortage			
Improve technologies (transfer, implementation, development)			

Annex 5. Criteria for the assessment of risks and opportunities

Introduction

The assessment should use the criteria presented below for magnitude and likelihood, considering three timescales: short term (now until 2020); medium term (2020–2030); and long term (2030–2050).

Exact criteria to assess magnitude and likelihood will depend on the type of risk and opportunity being considered, and it is not possible to provide specific criteria in this method. The guidance below provides an outline of the type of signifiers that should be considered. As part of the completion of this assessment of magnitude and likelihood for each risk and opportunity, the reasons for arriving at a particular magnitude and likelihood weighting should be recorded in order to support/ explain the scores and to ensure that the decisions made are transparent and can be communicated to people not involved in the assessment itself.

Using the template provided, groups should discuss and agree on the following for each risk/ opportunity and timescale. If necessary, an 'unknown' score can be used (indicated by a '?') if a group does not feel that it is possible to estimate the magnitude or likelihood of an opportunity or risk.

Magnitude *of risk/opportunity (positive opportunity (+) or negative risk (–)):*

High (+++ or - - -):

The opportunity/ risk is expected to lead to direct and lasting effects on nationally important environmental assets (such as ecosystems or natural resources), and these effects may be irreversible and/ or have ongoing or increasing impact over time. A high magnitude may result from opportunities/ risks that effect different environmental receptors/ assets across the entire country, or have large and irreversible effects on one or more smaller areas deemed of national significance (e.g. a national park or area with valued natural resources). A high magnitude is also likely to be associated with opportunities/risks that influence different domains, e.g. environmental risks that compromise (or support in the case of opportunities) economic or social well-being and may undermine (or enhance) existing economic and social systems. A risk of high magnitude may also compromise the ability of the country to meet national environmental priorities (such as resource-efficiency or pollution-reduction targets), perhaps with implications for meeting international environmental commitments.

Medium (++ or – –):

The opportunity/ risk is expected to have indirect or direct effects on the environment or the ability of the country to meet environmental policy goals and targets. Such effects may require mitigation action, and if not managed or minimised, could have significant implications for environmental, economic and social systems. Although significant effects are possible, these may affect only specific environmental receptors/ issues, and perhaps only specific geographical areas or types of ecosystems.

Low (+ or –):

The opportunity/ risk may have some effects at the national level, but these are considered to be within existing levels of acceptable/ expected change. A low magnitude may also be associated with opportunities or risks which, although expected to have effects, are already well understood and managed/ mitigated/ enhanced and therefore not expected to disrupt national environmental receptors/ issues.

Level of **likelihood** *that the opportunity/ risk will occur:*

High (●●●):

Based on the available evidence, it is considered that there is a high likelihood that the opportunity/ risk will occur and will have effects for the country. The likelihood of the opportunity/ risk is judged to be 60 % or higher.

Moderate (●●):

Based on the available evidence, it is considered that there is a moderate likelihood that the opportunity/ risk will occur. The likelihood of the opportunity/ risk is judged to be between 20 % and 60 %.

Low (●):

Based on the available evidence, it is considered that there is a low likelihood that the opportunity/ risk will occur. The likelihood of the opportunity/ risk is considered to be less than 20 %.

Assessment matrices

Table 1: Assessment of risks

Magnitude of risk	Likelihood: High	Likelihood: Medium	Likelihood: Low
High	——/●●●	——/●●	——/●
Medium	—/●●●	—/●●	—/●
Low	–/●●●	–/●●	–/●

Table 2: Assessment of opportunities

Magnitude of opportunity	Likelihood: High	Likelihood: Medium	Likelihood: Low
High	+++/●●●	+++/●●	+++/●
Medium	++/●●●	++/●●	++/●
Low	+/●●●	+/●●	+/●

Annex 6. Completed worksheets: assessment of risks and opportunities

Biodiversity cluster of implications

Assessment of risks

Implication title	**Increased costs of waste water treatment**			
Risks (from session 1)	**Timeframe expected to occur** (from session 1)	**Assessment** (See handout for criteria description)		
		Likelihood	Magnitude	Overall assessment
Not enough financing – issue left untreated (mining)		High	High	High
EU (and other international institutions) not helping – as it becomes too expensive		**Medium/ High** (Depends on GMT; capacity of the country to absorb funds)	High	High
Risks to safe drinking water		Depends on water supply source (surface/ groundwater); **High** if from surface waters	**High** (under the same conditions if purification is expensive)	High

Implication title	**Pollution affecting soil & water, including from pollutants with uncertain effects**			
Risks (from session 1)	**Timeframe expected to occur** (from session 1)	**Assessment** (See handout for criteria description)		
		Likelihood	Magnitude	Overall assessment
Further increased pollution due to intensification of agriculture/industry (privatisation, foreign investment)		**Medium/ High** (depending on the region)	Medium	Medium/ High
Food production/ quality		**High** (in farming and individual households)	High	High
Low monitoring, especially for new/ unknown chemicals; Slow policy response (or not at all) ; implementation gap		High	**Medium/ High** (monitoring low already now)	High
Health risks: drinking water, also in combination with lowering water quantity – less water has less self-purification ability		Medium	High	High
Increasing cost to deal with pollution (especially costly issues e.g. mining; also trans-boundary cascading effect – polluted Ibar river flowing from Kosovo to Serbia)		High	High	High
Adopting EU policy without consideration: higher threshold than current national law		High	Medium	High

Assessment of opportunities

Implication title	**Increased costs of waste water treatment**			
Opportunities (from session 1)	**Timeframe expected to occur** (from session 1)	**Assessment** (See handout for criteria description)		
		Likelihood	Magnitude	Overall assessment
EU funding of waste water treatment; International funding		**High** (requires policy commitment)	High	High
To apply more efficient technologies		High	Medium	High
Using waste water for irrigation (if treated) - only if bacteria is cleared first		Medium	Low/ Medium	Medium

Implication title	**Pollution affecting soil & water, including from pollutants with uncertain effects**			
Opportunities (from session 1)	**Timeframe expected to occur** (from session 1)	**Assessment** (See handout for criteria description)		
		Likelihood	Magnitude	Overall assessment
Policy improvement	Long term (2030–2050)	**Medium/ High** (depending on country; also on soil/water sector)	Medium	Medium/ High
Funding in general	Short term (to 2020)	High	High	High
Developing/ applying technologies	Long term (2030–2050)	**Low/ Medium** (different between countries; depends on pollution level)	**High** (depending on sector/ technology)	Medium/ High
Rising (investments) incentives for organic farming	Short term (to 2020)	**Medium/ High** (Favourable public support; less institutional support; high – as a business opportunity)	Uncertain	Uncertain

Resource cluster of implications

Assessment of risks

Implication title	**Demand (need) for increased renewables and efficiency**			
Risks (from session 1)	**Timeframe expected to occur** (from session 1)	**Assessment** (See handout for criteria description)		
		Likelihood	Magnitude	Overall assessment
Overuse of resource	Short term (to 2020) to Medium term (2020–2030);	High	Medium	High
Using food (crops) for biogas	Short term (to 2020) to Medium term (2020–2030);	Medium/ Low	Low	Low
Lack of adequate monitoring praxis (if RES grows continuously)	Medium term (2020–2030) to Long term (2030–2050)	Medium	High	High
Inadequate spatial planning & strategic impact assessment	Short term (to 2020)	High	High	High

Implication title	**Insecurity and conflict linked to resource competition**			
Risks (from session 1)	**Timeframe expected to occur** (from session 1)	**Assessment** (See handout for criteria description)		
		Likelihood	Magnitude	Overall assessment
Increased poverty – vulnerable population	Short term (to 2020) to Medium term (2020–2030);	High	Medium	High
Conflict about water use – water supply; hydro-power plants (access to and using of drinking water – shortage)	Short term (to 2020)	High	High	High
Illegal cutting (logging) even in protected areas	Short term (to 2020)	High/ Medium	Medium	Medium
Growing social inequality	Short term (to 2020)	High	Medium/ High	High
Land grabbing	Short term (to 2020)	Low/ Medium	Low/ Medium	Low/ Medium

Assessment of opportunities

Implication title	**Demand (need) for increased renewables and efficiency**			
Opportunities (from session 1)	**Timeframe expected to occur** (from session 1)	**Assessment** (See handout for criteria description)		
		Likelihood	Magnitude	Overall assessment
Improved waste management (biogas from waste)	Short term (to 2020)	Medium/ Low	High	Medium
Develop tourism sector	Short term (to 2020) to Medium term (2020–2030);	Medium	High	High

Implication title	**Insecurity and conflict linked to resource competition**			
Opportunities (from session 1)	**Timeframe expected to occur** (from session 1)	**Assessment** (See handout for criteria description)		
		Likelihood	Magnitude	Overall assessment
Enforcement of regulation	Short term (to 2020);	Low/ Medium	High	Medium
Increased regional cooperation	Short term (to 2020);	Medium/ High	High	High
Improved resource management & raising knowledge about resources	Short term (to 2020);	Medium	Medium	Medium
Foreign investment in agricultural land	Short term (to 2020);	Medium	Medium	Medium

Climate cluster of implications

Assessment of risks

Implication title	**Droughts/ changes in precipitation/ extreme weather/ heatwaves**			
Risks (from session 1)	**Timeframe expected to occur** (from session 1)	**Assessment** (See handout for criteria description)		
		Likelihood	Magnitude	Overall assessment
Forest fires	Short term (to 2020)	High	Medium	High
Crop failure (drought)	Medium term (2020–2030)	Medium	Medium	Medium
Water shortages – trade-offs: irrigation, drinking water, hydro	Medium term (2020–2030) to Long term (2030–2050)	Medium	High	High
Public health – heatwaves/ allergies/ alien species	Long term (2030–2050)	High	Medium	High

Implication title	**Floods (coastal, river, urban)**			
Risks (from session 1)	**Timeframe expected to occur** (from session 1)	**Assessment** (See handout for criteria description)		
		Likelihood	Magnitude	Overall assessment
Pollution (connected with low flows)		Low	Medium	Medium
Damage to infrastructure	Short term (to 2020) to Medium term (2020–2030) **for river floods** Long term (2030–2050) **for coastal floods**	Low	High	Medium
Drinking water supply		Low	Low	Low
Soil erosion/ landslides		Medium	Low	Low

Assessment of opportunities

Implication title	**Droughts/ changes in precipitation/ extreme weather/ heatwaves**			
Opportunities (from session 1)	**Timeframe expected to occur** (from session 1)	**Assessment** (See handout for criteria description)		
		Likelihood	Magnitude	Overall assessment
Cross-sector integrated water management		Low	High	Medium
Extreme events as triggers of change		Medium	Medium	Medium
New crops		Low	Low	Low
Crops in new areas		Medium	Low	Low
Increase in Tourism		Medium	Low	Low

Implication title	**Floods (coastal, river, urban)**			
Opportunities (from session 1)	**Timeframe expected to occur** (from session 1)	**Assessment** (See handout for criteria description)		
		Likelihood	Magnitude	Overall assessment
Wetland, riparian ecosystems		Low	Low	Low
Water shortage		Low	Medium	Low
Improve technologies (transfer, implementation, development)		Medium	Medium	Medium

Annex 7. Policy gaps and needs worksheets

Biodiversity cluster of implications

Implication title	**Increased costs of waste water treatment**
Risk	**Not enough financing – issues left untreated**
Notes on existing policy, strategy or cooperation related to the risk/ opportunity	There is limited legislation, but little implementation
Identified policy gaps and needs	Organisation of institutions to prepare good projects which would win funds Financial contribution is often problematic, should be linked with economic strategies Separated between different institutions (ministries)
Notes on opportunities, e.g. for new transboundary cooperation	West Balkan project (by the old ETC, 2011) identified waste water treatment plants in the region

Implication title	**Pollution affecting soil & water, including from pollutants with uncertain effects**
Risk	**Further increased pollution due to intensification of agriculture/ industry (privatisation, foreign investment)**
Notes on existing policy, strategy or cooperation related to the risk/ opportunity	Legislation not implemented through direct rules; low response rate often collecting data on pollution (especially small companies); inspection not involved because priority is given to economic development of companies Implementation gap – (like in many cases in the EU)
Identified policy gaps and needs	Tools (technology of monitoring); law enforcement Updated registries of pollutants needed (agriculture; industry) Validation of data needed (e.g. E-PRTR reporting), especially industrial pollution Investments into monitoring process
Notes on opportunities, e.g. for new transboundary cooperation	New reporting software will be used (E-PRTR), but only for big companies

Implication title	**Increased costs of waste water treatment**
Opportunity	**EU funding of waste water treatment; International funding**
Notes on existing policy, strategy or cooperation related to the risk/ opportunity	Pre-accession funds to EU already used
Identified policy gaps and needs	Lack of transboundary cooperation
Notes on opportunities, e.g. for new transboundary cooperation	(Expert) relations between experts in the region that can apply for common trans-boundary projects funded by the EU

Implication title	**Pollution affecting soil & water, including from pollutants with uncertain effects**
Opportunity	**Policy improvement/ Funding in general**
Notes on existing policy, strategy or cooperation related to the risk/ opportunity	Policies exist – need improvement in implementation
Identified policy gaps and needs	
Notes on opportunities, e.g. for new transboundary cooperation	Use of public pressure (NGO activities) Sharing best practices within the region There is twinning, but not with neighbour countries

Resource cluster of implications

Implication title	**Insecurity and conflict linked to resource competition**
Risk	**Conflict about water use – water supply; hydro-power plants (access to and using of drinking water – shortage)**
Notes on existing policy, strategy or cooperation related to the risk/ opportunity	Enforcement of existing legislation more critical than the requirement of new legislation. Often the legislation is copied from EU with no consideration of their impact in the region (there are cases when the targets adopted from EU are worsening the situation in the region as it allows to exploit the situation more than compared to before the EU targets)
Identified policy gaps and needs	No cooperation between government bodies when it comes to water management. Improved supervision required as often there is lack of knowledge/ awareness on how the policy is being implemented. Need to tackle corruption. Need for policy incentives to improve water management (e.g. subsidies)
Notes on opportunities, e.g. for new transboundary cooperation	Strengthen monitoring There is an opportunity to increase fines for violations of existing regulations – currently it is cheaper to pay fines than respect legislation.

Implication title	**Demand (need) for increased renewables & efficiency**
Risk	**Inadequate spatial planning & strategic impact assessment**
Notes on existing policy, strategy or cooperation related to the risk/ opportunity	In Bosnia & Herzegovina – spatial planning is lacking. The country has complex administrative setting in the policy domain.
Identified policy gaps and needs	Weak municipal administration – often are waiting on national level to delegate. Unclear and split jurisdiction (overlap of responsibilities) Conflict between existing legislation – lack of harmonisation both horizontally and vertically
Notes on opportunities, e.g. for new transboundary cooperation	Harmonisation of strategies (transport sector, energy sector) / Bilateral and multilateral cooperation of transboundary regions (transboundary catchment areas) Opportunity to establish RES hubs – particular country becoming a hub on use of a particular renewable (for example Bosnia & Herzegovina becoming a hub on wind energy etc.) with energy being distributed across the region.

Implication title	**Insecurity and conflict linked to resource competition**
Opportunity	**Increased regional cooperation**
Notes on existing policy, strategy or cooperation related to the risk/ opportunity	There are regional strategies and existing transboundary water management in place. Activities are mainly on a project level (investments)
Identified policy gaps and needs	No continuity of these transboundary financial incentives (projects) – both from within the region and international.
Notes on opportunities, e.g. for new transboundary cooperation	Use the current/ previous projects of transboundary resource management as a platform for continuous improvement of these resources.

Implication title	**Demand (need) for increased renewables & efficiency**
Opportunity	**Improved waste management**
Notes on existing policy, strategy or cooperation related to the risk/ opportunity	Trend of copying/ adopting EU legislation. Often strategies are already in place – the issue is to follow them. Serbia – changed legislation from using food sources for biogas to using waste.
Identified policy gaps and needs	Lack of funds & capacity to implement EU legislation – experts writing strategies, but sometimes there is no capacity to implement these. When the strategies expire – little achieved and new strategies written (vicious circle) Kosovo – issues re industrial waste management that requires investment (1bn Euros for waste water treatment)
Notes on opportunities, e.g. for new transboundary cooperation	IPA funds being used for waste water management Twinning projects

Climate cluster of implications

Implication title	**Droughts/ changes in precipitation/ extreme weather/ heatwaves**
Risk	**Water shortages – trade-offs: irrigation, drinking water, hydro**
Notes on existing policy, strategy or cooperation related to the risk/ opportunity	WB countries are trying to integrate EU water related legislation into national legislation (WFD, UWWTD, Floods Directive). It is difficult to enforce this legislation because of lack of resources (e.g. lack of resource to designate water bodies in accordance with WFD). Lack of resources also to implement green infrastructure and nature based solutions associated with water shortages.
Identified policy gaps and needs	Additional problem presents insufficient/ weak cooperation between different sectors (agriculture, waste water...). The cooperation between sectors in terms of water management actually not exists or it is extremely week. This was emphasized by all WB representatives participating in the discussion.
Notes on opportunities, e.g. for new transboundary cooperation	Transboundary cooperation in terms of water management is already in place in it works sufficiently through ICPDR and Sava Commission. Current legislation is not enough to encourage cooperation between sectors. Slovenian representative emphasized how EU legislation (WFD) forced different sectors to start collaborate with each other. Cross-sectoral cooperation was not possible before EU legislation take into force. Representatives hope that WFD will have the same effect in their countries when it comes to cross-sectoral cooperation.

Implication title	Floods (coastal, river, urban)
Risk	**Soil erosion/ landslides**
Notes on existing policy, strategy or cooperation related to the risk/ opportunity	The main issue regarding the policy and management of soil erosion/land slide issue is that is not clear which management level should cover this topic. Example for RS: In the past this was covered by water management companies then it was moved to local municipality level and then to state level. It was evident that local communities usually do not have enough human/ financial resources to do the actual planning but help to implement legislation which have to be designated on national level. In Bosnia the efficiency of handling the soil erosion/ landslide issue differs from municipality from municipality. Some of the are handling the issue sufficiently whereas some of the do not have human/ financial resources and are therefore at high risk of landslides, mudflows etc.
Identified policy gaps and needs	The policy regarding soil erosion/landslides is very fragmented and sectoral. There is national policy regarding this issue in ME, only plans on local level. In Macedonia there is also a lack of legislation and capacity. There is an important need for sufficient legislation, risk maps etc. Cooperation of spatial planning sector with other sectors should be strengthened.
Notes on opportunities, e.g. for new transboundary cooperation	Since this is more a local issue (in comparison with e.g. floods) the transboundary cooperation is not so crucial. Nevertheless, the cooperation could be possible in terms of capacity building, regional landslide risk maps development etc.

Implication title	Floods (coastal, river, urban)
Opportunity	**Improve technologies (transfer, implementation, development)**
Notes on existing policy, strategy or cooperation related to the risk/ opportunity	Improved technology transfer in terms of green infrastructure, nature based solutions as instruments to tackle negative consequences of climate changes will be an important topic and opportunity in the future. In the present there is no legislation associated with this topic in the WB countries.
Identified policy gaps and needs	Every country is developing their own system, each country is using different method and time scale.
Notes on opportunities, e.g. for new transboundary cooperation	Transboundary cooperation in terms of technology transfer and implementation associated with flood is relatively weak. Big role and potential in the technology transfer have academic communities (e.g. remote sensing). Big potential for transboundary cooperation to develop common regional informational platforms (e.g. flood maps).

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