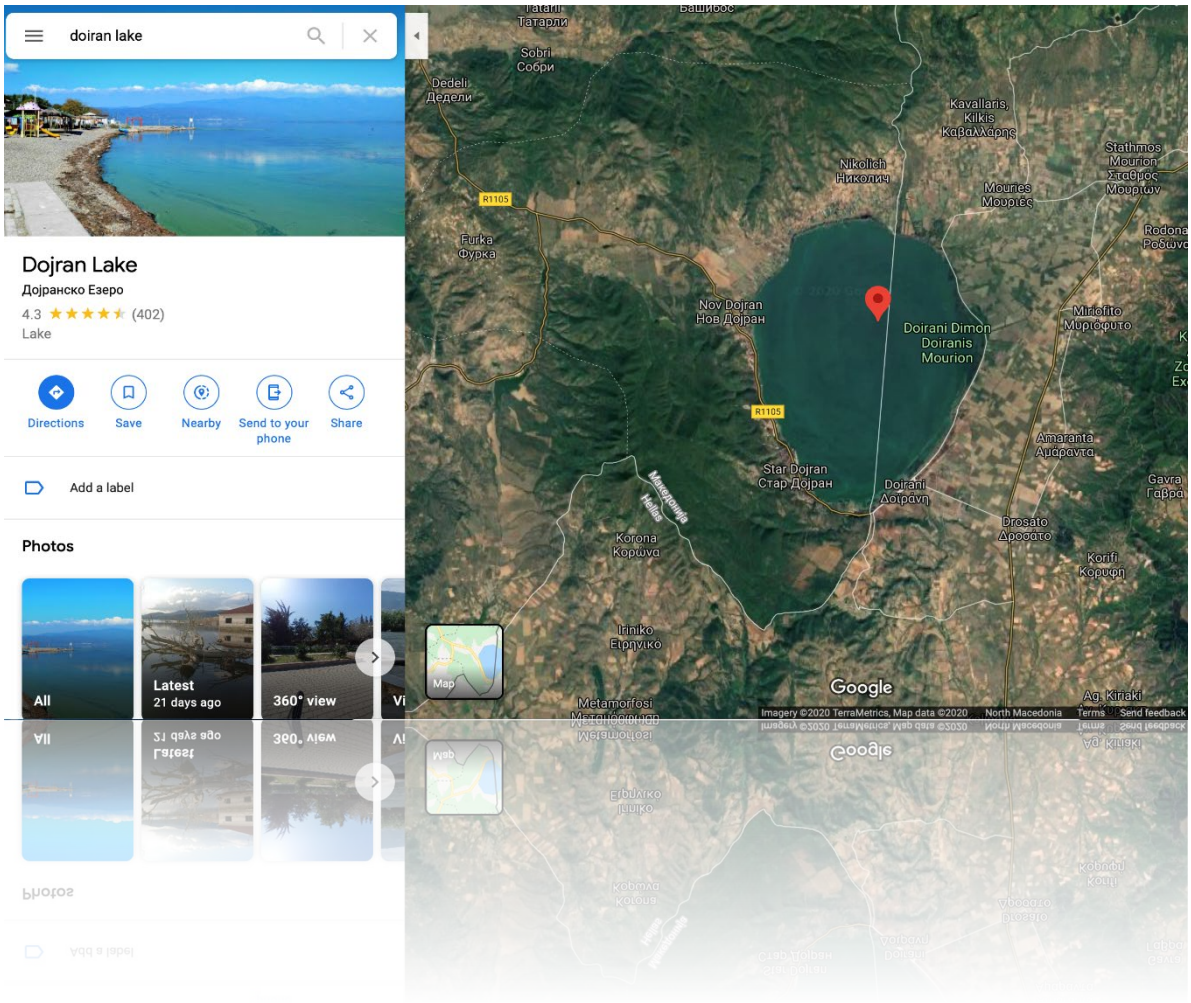
Strategic Foresight & Planning for Doiran Lake

FINAL REPORT



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Pitu Guli 27, 7000 Bitola, North Macedonia

Author of the study:
Dr. Renata Petrevska Nechkoska, Asst. Prof. & PostDoc
University St. Kliment Ohridski Bitola, North Macedonia &
Ghent University Belgium, Tactical Management in Complexity Hub

Collaborators:
Klaudja Koci, **MSc**, Protection and Preservation of Natural Environment in Albania - environmental aspects
Joni Vorpsi, Protection and Preservation of Natural Environment in Albania, - biological aspects
Dr. Monika Angeloska Dichovska, University St. Kliment Ohridski Bitola, North Macedonia - SWOT & PESTLE analysis & stakeholder visual
Rebeka Jovanovska - Vienna University, Austria - desk research support

DETRA Center, North Macedonia - public consultation

Coordinator of the development of the study:
Prof. Dr. Igor Nedelkovski
GAUSS Institute

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List of abbreviations

EC - European Commission

LSGU - Local Self Government Unit

EU - European Union

SEA - Law on Environment

LWM - Law on Waste Management

PUC - Public utility company

MoEPP - Ministry of Environment and Physical Planning

NEAP - National Environmental Action Plan

RNM - Republic of North Macedonia

SEA - Strategic Environmental Assessment

FAO – Food and Agriculture Organisation of the United Nations

IUCN – the International Union for Conservation of Nature

IWRM – Integrated Water Resource Management

SPA – Special Protection Areas

WFD – Water Framework Directive

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PART III - LONG TERM STRATEGIES FOR DEVELOPMENT

Disclaimer

This publication was prepared by the GAUSS Institute in the context of the Plan D.oiran project (URL: https://plandoiran.eu) implemented by Macedonian Science Society – Bitola in the framework of Interreg IPA CBC 2014-2020 Cross Border Cooperation Programme Greece – Republic of North Macedonia, and co-funded by the European Union and national funds of the participating countries, according the Terms of Reference for the respective work package and lot. The views expressed in this publication represent only the views of the authors.

Executive Summary

Making a strategic foresight and then complement it with strategic planning, tactical management and operational action plans has been a quite interesting and intriguing challenge. ***This study represents a conceptual bundle of the most necessary components, mechanisms and principles that are outlined for our area of interest - the transboundary Doiran Lake, with the aim to facilitate stakeholder action, serve as inspiration for various effective activities and be a governance booklet for 'the why,' 'the what' and 'the how' to reason and act.*** Adaptation to circumstances needs to be complemented with initiating positive change for Doiran Lake ecosystem salvation, rehabilitation and sustaining, predominantly from managerial and self-managerial point of view. Hopefully, that will result with a chance being given to the natural mechanisms and systems to do their part of the story.

The **strategic foresight** of the future means envisioning where the **Doiran Lake** socio-technological-economical-environmental system may and can be 2 decades from now. The methodology streamlined us to find most relevant megatrends, assess contextual trends, other factors to be considered, weak signals and developments to be able to contemplate two continuums - horizontal and vertical axis that help devise four scenarios to be used by policy-makers and all relevant stakeholders when taking affirmative action, but also what happens when being inactive or doing damaging activities.

It is more than clear that complex adaptive systems on this planet are interwoven and interdependent. The time has come to position every such endeavour like this to the principles of big picture view, systems design, transnational (not one-sided) reasoning and action, multidisciplinary approach, awareness and multi-stakeholder participatory working and living.

Studies and relevant reports on the as-is situation in North Macedonia, but also the region of the Balkans, are capturing somewhat form-without function situation in the basic alignment with the global directions in preservation, environmental, societal, technological sustainable advancement: "In North Macedonia, the formal institutional framework for coordination of the implementation and monitoring of the Sustainable Development Goals of the 2030 Agenda for Sustainable Development is established; however, it is not active. The national policy framework is still under development. No document adopted at the national level refers to the Sustainable Development Goals." (United Nations, 2019) However, we are hopeful things will improve, or at least we will do our best in that direction.

Strategic foresight means taking a point in future that has potential to occur due to global megatrends, regional and local trends and developments, informing oneself on the 'as-is' situation and then deploying strategic planning to outline strategic principles, tactical configuration and system design and offer action plans to help achieve it. It provides a methodological opportunity of connecting a preferable future with the current situation

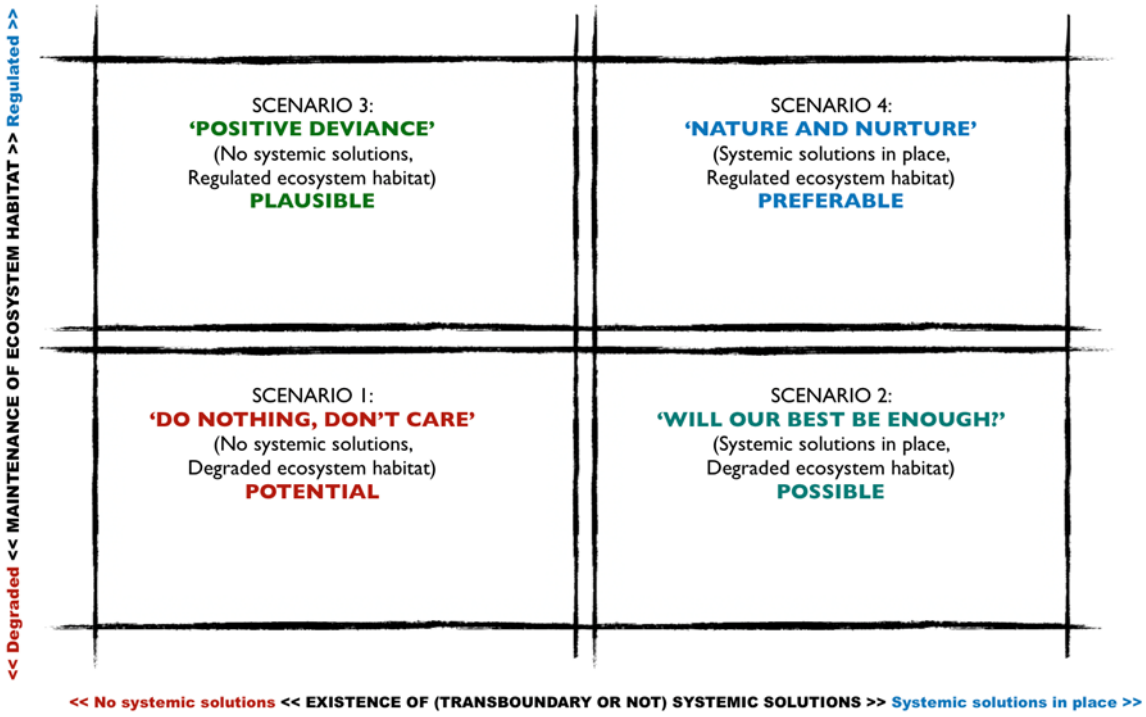
and helping navigate through the imagined landscape of potential, possible and plausible scenarios, in order to avoid the preposterous.

Out of 30+ global megatrends, we identified in our horizon scanning 5 most relevant, strong and increasing ones - rapid urbanisation, increasing environmental pollution, increasingly severe consequences of climate change, increasing environmental pollution and diversifying approaches to governance and complemented them with contextual trends and weak signals. This lead us to conceptualising the two **continuums** of (1) **existence of transboundary (or not) systemic solutions** (ranging from no to existence of such solutions) and (2) **maintenance of ecosystem habitat** (ranging from degraded to regulated). These axes helped us reason what would happen if human actors improved towards transboundary governance and systemic approaches or not, and how could nature cope with it. Next, we devised the four scenarios across the two axes landscape, portraying SCENARIO 1: **'DO NOTHING, DON'T CARE** ' (meaning No systemic solutions and Degraded ecosystem habitat) - evaluating it as POTENTIAL which is pretty much if people and countries continue to do or not do, as until now. This is borderline scenario with the worst case of preposterous where even more devastation exists (and is not subject to our analysis). Moving on right on the horizontal axis, is SCENARIO 2: **'WILL OUR BEST BE ENOUGH?** '(where Systemic solutions are in place, but there is Degraded ecosystem habitat) - evaluated as POSSIBLE. The third scenario is in the upper left quadrant along the axis of ecosystem habitat regulation: SCENARIO 3: **'POSITIVE DEVIANCE'** (with No systemic solutions, but Regulated ecosystem habitat) - as a PLAUSIBLE scenario. However, all the stakeholder consultations following the Local Agenda 21 guidelines for participatory engagement, discussions and interviews were directed towards visioning and achievement on track towards SCENARIO 4: **'NATURE AND NURTURE'** (with transboundary Systemic solutions in place, and Regulated ecosystem habitat) as most PREFERABLE point in the future.

Each scenario was examined through feasibility analysis in terms of **technological, financial, social and environmental feasibility**. These components enabled mathematical **modelling and simulation** of most and least feasible alternatives to assist policy-makers on different levels in choosing the right paths. The **long-term strategies**, governing principles, development objectives and goals have been outlined to make distinctions of must- and can-do activities, **tactical management recommendations** and **action plans**. Primary and secondary data, public consultations, interviews, discussion groups and diverse inputs have been used to inform and design methodologically sound and applicable guidelines and alternative solutions.

The introductory part of the study is followed by explanation on the methodology, tools and techniques used, while in the third heading we elaborate on the carriers and workflow. Fourth part are the megatrends and other relevant developments, while in the fifth heading are the

horizontal and vertical axis as continuums. The four scenarios are outlined in the sixth part. The seventh part is consisted of the feasibility study in detail for all the scenarios and the mathematical modelling and simulation. The public consultations as integral part throughout the study are elaborated in the eight heading. The long term strategies, tactics and action plans are in the ninth followed by the references and bibliography.



1. Introduction

1.1. A snapshot of Doiran Lake and its context

Doiran Lake is a monument of nature that exemplifies how small ecosystems can be susceptible to other's (damaging) action or inaction. The first recommendation of every competent scientist or expert from all diverse institutions and projects addressing Doiran Lake (also referred to as: Dojran Lake, Doyran Lake, Дојранско Езеро (MK), **Λίμνη Δοϊράνη** (GR) is to ensure its protection especially considering anthropogenic factors. At the same time, there is always the roadmap of balancing economical and ecological sustainability - so whenever you read an excerpt from this study, please have in mind that we have addressed the big picture - that always refers to the Lake Doiran through the socio-technical-economical-environmental prism. As a small, transboundary lake on the border of North Macedonia and Greece it is a small-sized reminder of the large ancient lake Paionia but abundant eutrophic treasure with biodiversity of endemic species and subspecies and habitat for migratory birds, fish, algae, invertebrates, … However, due to its richness in specific flora and fauna, the Doiran Lake has been subject to protection on national, regional and international level - the Emerald Network of Areas of Special Conservation Interest[1], Balkan Green Belt (EECONET) of the European Green Belt[2], CORINE site, Ramsar site no. 1735[3], Natura 2000 site[4] with European Union Birds and Habitats Directives, BirdLife International[5] as well as regional and local laws[6] and regulations. However, even though they prescribe and regulate outcomes, outline sanctions and point out dangers, and in spite of the fact that the Doiran Lake and its surrounding area is habitat for human settlements, source of income and a tourist destination - still, the human factor's approach and actions are main reason for concern, of this and several other studies before.

1.2. Guiding principles for the study

Complexity necessitates simple rules, moderately dense connections, and guidance on information search and responsive use (Ref). The topic in discussion is complex by all means - environmentally, geographically, socio-economically, technology-wise and politically. Hence, we

[1] https://www.coe.int/en/web/bern-convention/emerald-network
[2] https://www.europeangreenbelt.org/european-green-belt/
[3] https://rsis.ramsar.org/ris/1735
[4] https://ec.europa.eu/environment/nature/natura2000/index_en.htm, https://natura2000.eea.europa.eu/#
[5] http://datazone.birdlife.org/site/factsheet/lake-dojran-iba-north-macedonia/details
[6] https://dejure.mk/zakon/zakon-za-proglasuvanje-na-dojranskoto-ezero-za-spomenik-na-prirodata, http://www.moepp.gov.mk/wp-content/uploads/2014/09/Zakon%20za%20zastita%20na%20Ohridskoto,%20Prespanskoto%20i%20Dojranskoto%20Ezero%2023.12.1977.pdf

are introducing several guiding principles so that any stakeholder is aware of our direction that motivates the choices made further on in the study.

Here are some of the main concepts/approaches to be used as a basis for the formulation of the guiding principles.

1. **Sustainable water management of Dojran lake** represents a very important aspect (but also vision) for its present and future. A wise water management of Dojran lake should consider activities and measures focusing on **the water quality** standards/parameters of lake and other river streams connecting to it, but also **the quantity/level** of water for different uses, such might be for irrigation. Sustainable water management also contributes to the SDG Goal number 6 Clean Water and Sanitation, as well as the Water Framework Directive principles.
2. **Biodiversity of Dojran lake** has been facing different threats especially with the historical changes in water level, may have resulted in important changes in the variety of organisms/species which are present now in the lake. Even though a recent biodiversity assessment study has not been conducted in Dojran lake and its adjacent areas (the different ecosystems) (Bojovic et.al 2016:CEPF report), restoration measures should focus on minimising threats/stresses to the ecosystem, and also any proposed economic development plans should take into consideration the important and rich biodiversity of Dojran. Being an important area especially for the presence of bird species as recognised by international conventions and the Wetland International, but also recognising the importance of fishing as the primary activity for the area, the **socio-technical-economical-ecological integrity of the whole basin** is of primary importance. The challenge is to ensure the conservation of biodiversity and reduce direct pressures to the lake, and at the same time still nourish traditional local use practices of the Dojran lake by its local population.
3. **Dojran Lake is a transboundary area** shared between North Macedonia and Greece, and its water ecosystem and ecological diversity is shared by the two countries.Establishing cooperation among local authorities in all the basin is crucial for the recovery of biodiversity and sustainable development of Dojran lake. **Good collaboration** between stakeholders and local population, NGO's as all as donor coordination efforts for safeguarding the natural resources are very important for now and the future. The governing structures should build capacities to respond to such needs, especially for involving local communities and other stakeholders in the decision making process, so to have them as allies and resisting the conservation measures.

1.3. Strategic foresight (2040) and Strategic Planning for Doiran Lake - the Study

We have developed a study which postulates possible, probable, and preferable futures for sustainable socio-economic development of the Doiran Lake area within the direction of strategic foresight. For the development of study, we are considering appropriately diverse and relevant inputs, forecasts, and alternatives. We analysed existing considerations (urban plans, development plans, expert views, conclusions of the debates, seminars, etc.) and systematised the conclusions and recommendations in these documents into the foresights. These foresights have been communicated with the public, and through adequate methods and tools for participatory democracy (following Agenda 21 - Ref.), the citizens, businesses and political structures stimulating them to comment on the experts' foresights and to express their visions for the future of the region. Afterwards we have analyzed the insights and visions of the public and incorporated the most relevant ones into our foresights, to be able to address and consult the public in the next iteration. So, through this iterative approach of co-participation among the experts, citizens, businesses and political structures, this final document – strategic foresight of the possible future of socio-economic the Doiran Lake has been created.

Scenario Analysis: The scenario analysis has been created on the basis of the strategic foresight. The study for scenario analysis analyzes the identified foresights for sustainable socio-economic development. The aim of this analysis was to identify which are feasible solutions of the proposed vision in the strategic foresight.

Through if … then/what …if analysis we have analyzed:

- technological feasibility of the foresights
- financial feasibility of the foresights
- environmental feasibility of the foresights
- social feasibility of the foresights

The implemented methods for the if…then/what-if analysis is mathematical modeling and computer simulation. The Scenario Analysis answers what could happen to the Doiran Lake basin if the foresights are going to happen (for the identified foresight). On the basis of these analysis we have identified several alternative paths as feasible.

Long Term Strategies: The long-term socio-economic strategies is consisted of:

- Development Objectives: analysis of the expected progress to come over the coming three or four years.

- SWOT Analysis: examining the internal strengths (S) and weaknesses (W) of the region, as well as the opportunities (O) for advancement and threats (T) to the region's well-being.

- Identification of the Key Strategies based on the SWOT analysis: identification of key directions which will enable to develop the region based on its strengths, fix weaknesses, pursue opportunities and resolve any threats. These key strategies should be identified as "Must Do" and "Can Do."

- Goals and Action Plans: the goals should be expressed in terms of quantities and can relate to fulfilment of the identified key strategies. A final step in developing the long-term strategic plan was to outline five or six action plans, and to specify deadlines, budgets and time frames of the plans.

Risks and assumptions: we also identified as only risk the possible lack of sufficient interest at Municipality Doiran and other stakeholders in the region to participate in the project and sustain its mechanisms in the future.

2. Methodology for the study

2.1. Strategic foresight

Strategic foresight is the ability to create and sustain a variety of high-quality forward views and to apply the emerging insights in organisationally useful ways; for example, to detect adverse conditions, guide policy, shape strategy; to explore new markets, products and services. It as a process that attempts to broaden the boundaries of perception in four ways:

- By assessing the implications of present actions, decisions, etc. (Consequent assessment)
- By detecting and avoiding problems before they occur (early warning and guidance)
- By considering the present implications of possible future events (pro-active strategy formulation)
- By envisioning aspects of desired futures (preparing scenarios)

'Strategic foresight offers a way of making use of our inherent storytelling abilities in order to engage tactic knowledge, make assumptions explicit, forge new shared understanding (i.e. meaning making), and anticipate and prepare for what has yet to happen.' (Wilkinson, 2017)

We have developed Strategic Foresight on the basis of following principles:

The future does not yet exist. Foresight explores ideas about and images of the future. There are no data about the future and relying on extrapolating what we know about the present is seldom useful for strategy. Today's data are essential but so are our imaginations about the possible that doesn't exist yet – images and ideas about what matters that are informed by knowledge, experience and expertise are a valid data source

The future is not predetermined, inevitable or fixed. There are always alternative futures. Conventional planning approaches assume a single linear future and result in 'bet the farm' strategies, the equivalent to crossing your fingers and hoping you are right. Using foresight allows the range of alternative futures always available to an organisation to be explored **before** strategy is developed.

The future is uncertain and not predictable – we have choices today. Predictions are invariably extrapolations of today, based on what we believe we know today. Attempting to predict the future can result in smart people making statements that turn out to be a bit silly in hindsight. Taking time to think about the implications of change will endanger sensemaking that lets us move beyond prediction and engage with future uncertainty.

There are different types of futures whether preposterous, potential, possible, plausible and preferable. Using foresight in strategy development usually focuses on the preferable future, the one that provides the long-term context to guide action and decision making today. We will arrive at an understanding of what that is, however, only by working

through the other types of futures first, reducing the scale as our understanding of what matters increases in depth.

Future outcomes can be influenced by our action or inaction today. We can and should take action to move towards a preferred future or to mitigate an undesirable future. Inaction however, means ending up in someone else's future and in that case, you have no option but to deal with whatever you get. Inaction leads inevitably to being surprised when change you thought was highly improbable becomes a reality.

We are all responsible for future generations – every decision made today affects them. This principle is the most critical when doing foresight work. We use foresight in strategy development to craft robust strategy today and to ensure we do no harm to future generations. The two are not mutually exclusive.

2.2. Strategic planning

A strategic planning with key long-term objectives served us as a framework for making decisions and provides a basis for planning in general. Putting together a strategic plan can provide the insight needed to keep an organisation on track by setting goals and measuring accomplishments - or in this case, an entire community of at least two countries, and the relevant stakeholders to align and aim towards purpose. By analyzing the information in the long-term plan, decision-makers can make the necessary changes and set the stage for further planning and tactics.

Thus, the outline of development long term strategies is based on:

- Identification of long-term objectives of development of Doiran Lake Area.

- SWOT Analysis of long-term objectives.

- Prioritization of the Key Strategies based on the SWOT analysis.

- Goals and Action Plans.

On the basis of SWOT analysis we have outlined five or six action plans, specified generic deadlines, budgets and time frames of the plans.

2.3. Strategy and Tactics for Complexity

We are incorporating recommendations for appropriate strategy and tactics for complex problems and in complex environments since the subject matter is such, and the complex adaptive systems are of socio-technological-environmental nature. Our expertise in Problem Driven Iterative Adaptation - PDIA by Harvard University Center for International

Development as strategy for complexity[7] (Andrews et al., 2017) and tactical management and the DENICA managerial method (system of roles and accountabilities, information sensors, information emitters and risks) as applicable for implementation among multiple stakeholders and in projects, encompassing management, management information systems and complexity for the new era[8] (Petrevska Nechkoska, 2019)

2.4. Modelling and simulation

We have used a mathematical model to portray the scenario components in more details and to be able to offer a foundation of components and mechanisms for What - If & If - Then analysis. The simulation of the various scenarios can assist stakeholders in estimating the effects and consequences of their actions in the future Lake Doiran developments.

2.5. Feasibility studies

The development of Scenario Analysis on the basis of the strategic foresight is achieved through analysis and simulation that employs different qualitative assumptions (associated with probable events or phenomenon identified in the Strategic Foresight) to paint different scenarios, and tries to come up with the most optimal responses under the circumstances.
For every identified strategic foresight, we have developed if-then analysis:

1. technological feasibility of the foresights
2. financial feasibility of the foresights
3. environmental feasibility of the foresights
4. social feasibility of the foresights

The analysis results with computer-based simulation, i.e. delivered in an Excel table with advanced formulas which will enable diverse inputs and ranges for the variables within the four criteria described above, portraying various development paths.

2.6. Domain-specific methods

This study has been carried out following the principles and guidelines of Local Agenda 21 (LA21), more specifically conceptualised in chapter 28 of Agenda 21, which was adopted by 178 governments at the 1992 Rio Earth Summit. "Local Agenda 21 (LA21) is a voluntary

[7] https://bsc.cid.harvard.edu
[8] http://tactical-management-in-complexity.com

process of local community consultation with the aim to create local policies and programs that work towards achieving sustainable development. Local Agenda 21 encompasses awareness raising, capacity building, community participation and the formation of partnerships." (ICLEI, IDRC, UNEP, 1996). Local Agenda 21, as a local-government-led, community-wide, and participatory effort to establish a comprehensive action strategy for environmental protection, economic prosperity and community well-being in the local jurisdiction or area requires the integration of planning and action across economic, social and environmental spheres, by assuming broad stakeholder participation, towards full motivation and engagement. Key elements are full community participation, assessment of current conditions, target setting for achieving specific goals, monitoring and reporting.

The publication is in compliance with the latest Information and Publicity Guide of the IPC CBC GR-MK Programme concerning acknowledgement of EU financing of the project[9].

2.7. Tools and techniques used in the study

The study encompasses a range of tools, techniques, approaches and frameworks found fit for the different stages of the research, according to the expected outcomes.

To enlist a few:

- SWOT analysis,
- PESTLE analysis,
- What-if / If-Then analysis,
- Horizon scanning,
- Megatrend analysis,
- Visioning,
- Brainstorming,
- Interviews,
- Surveys,
- Panel discussions,
- Modelling tools,
- Sense and Respond framework,
- Problem Driven Iterative Adaptation - PDIA as strategy for complex problems,
- the DENICA method for tactical management,
- Feasibility analyses, …

All of which will be elaborated through the document, on conceptual and instantiated level.

[9] http://www.ipa-cbc-programme.eu/gallery/Files/news/programme/12.09.2018/Information-%26-Publicity-Guide_September2018.pdf

3. Carriers of the study and workflow

3.1. The team

The team of GAUSS institute experts and collaborates has been from diverse profiles, domains, supra-national and multidisciplinary.

The author of the study, Dr. Renata Petrevska Nechkoska is affiliated with two universities. She is assistant professor at University St. Kliment Ohridski Bitola, North Macedonia & PostDoc at Ghent University Belgium. Her domains are management, management information systems and complexity, all translated into strategy, tactics and operations.
Her complete profile and her hub for Tactical Management in Complexity can be found on: http://tactical-management-in-complexity.com/course/view.php?id=2 along with publications info and applied research endeavours.

The collaborators come from Albania, Klaudja Koci, MSc, Protection and Preservation of Natural Environment in Albania - PPNEA and Joni Vorpsi, Protection and Preservation of Natural Environment in Albania also PPNEA. Asst. Prof. Dr. Monika Angeloska Dichovska is from University St. Kliment Ohridski Bitola, North Macedonia from the Faculty of Economics in Prilep. Mr. Nenad Dafinchevski, as Operations Manager is from the DETRA Center, North Macedonia - public consultation. The coordinator of the development of the study has been prof. dr. Igor Nedelkovski from the GAUSS Institute.
Throughout the work, a great number of relevant stakeholder representatives contributed to the research and formulation of the findings as well as modelling and strategic guidelines for the Doiran Lake region, for which we are thankful.

3.2. The stakeholders and the public consultations

As visible on figure 1, there are quite some number of stakeholders that are involved in the Doiran Lake and its area wellbeing and sustainability.

- Local authorities
    - Municipalities (Dojran, Kilkis)
- Central authorities
    - Ministries (of Environment and Physical Planning, of Agriculture, Forestry and Water Management, …)
    - National Councils for Nature Protection
    - National Committees on Biodiversity
    - Hydrological Institute
    - ...
- Global institutions (authorities)

    - Regional Environmental Center (REC)
    - Wetlands International
    - EU Delegation
    - …
- Citizens
    - Farmers, Fisherman, …
- Tourists
- Businesses
- Civil society organisations (NGOs)
- Public Institutions
- Associations
- Universities, Research Centres
- Schools
- Media
- Others

Each of these, have at least two instances, if not more, in the respective countries of North Macedonia and Greece. During the work on this study, there has been continuous involvement and consultation with encompassing set of relevant stakeholders.

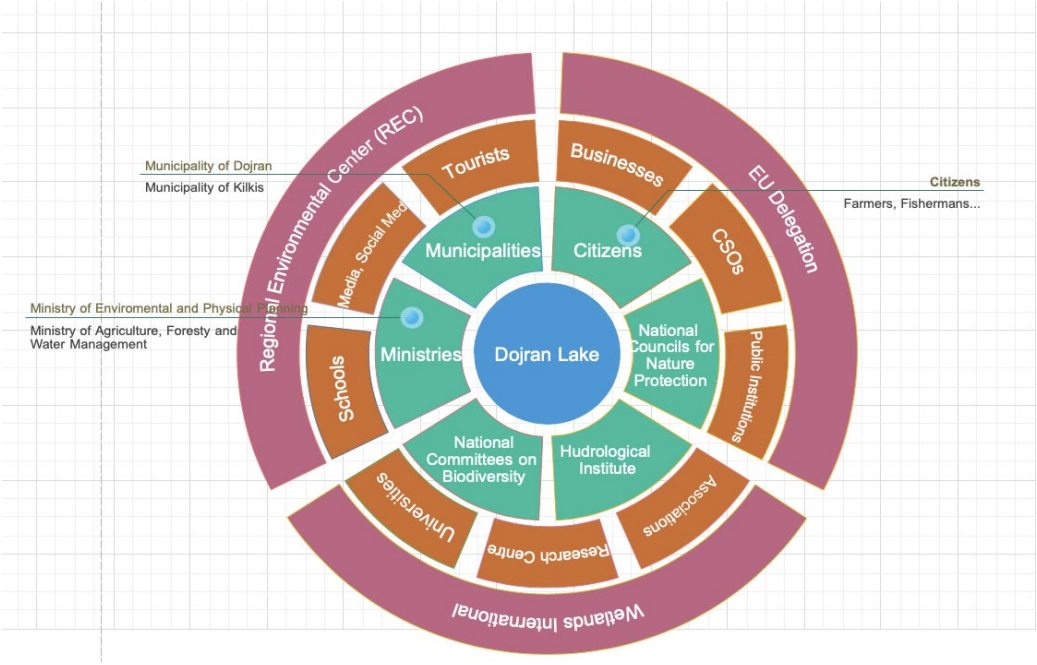


Figure 1 - Broad stakeholder system (source: Authors)

The methodology of development of the studies, as well as the guidelines of the project, have been designed to enable participatory workflow that provides iterative development of strategic foresight axes and scenarios, informed by science and practice, then iterative consultation with the public through surveying with questionnaires, interviews and debates (performed by

DETRA and GAUSS Institute), revision of the proposed scenarios and strategies based on the input of the stakeholders, and subjecting the reconfigured outputs again to public consultation, and future involvement, training and realisation. The heading 3.4 elaborates on the workflow including the public consultations.

This being said, and according the six key elements of the LA 21 (ICLEI, IDRC, UNEP, 1996) we have acted as follows (the components activated in our study are noted with ***italic*** letters):

1. *Managing and improving the local authority's own environmental performance*
   - Corporate commitment
   - *Staff training and awareness raising*
   - Environmental management systems
   - Environmental budgeting
   - Policy integration across sectors
2. *Integrating sustainable development aims into the local authority's policies and activities*
   - *Green housekeeping*
   - *Land use planning*
   - *Transport policies and programmes*
   - Economic development
   - Tendering and purchase/provider splits
   - Housing services
   - *Tourism and visitor strategies*
   - Health strategies
   - Welfare, equal opportunities and poverty strategies
   - *Explicitly 'environmental' services*
3. *Awareness raising and education*
   - *Support for environmental education*
   - *Awareness-raising events*
   - *Visits and talks*
   - *Support for voluntary groups*
   - Publication of local information
   - *Press releases*
   - *Initiatives to encourage behaviour change and practical action*
4. *Consulting and involving the general public*
   - *Public consultation processes*

- *Forums*
- *Focus groups*
- *'Planning for real'*
- Parish Maps
- *Feedback mechanisms*

5. *Partnerships*
   - *Meetings, workshops and conferences*
   - *Working groups/advisory groups*
   - *Rounds Tables*
   - Environment City Model
   - *Partnership initiatives*
   - *Developing-world partnerships and support*
6. *Measuring monitoring and reporting on progress towards sustainability*
   - *Environmental monitoring*
   - *Local state of the environment reporting*
   - *Sustainability indicators*
   - *Targets*
   - Environmental Impact Assessment (EIA)
   - Strategic environmental assessment

3.3. The consulted references

The inputs obtained for the study combine secondary data, as well as primary data gathered through interviews, surveys, discussions, meetings and consultations with authorities and stakeholders.

The main reports, regulations, publications and research published for the global, regional and local context, are enlisted in the bibliography at the end of this document, as well as in the references.

3.4. The workflow

The workflow to realise this study has been as follows.

The **Strategic Foresight** has been going through the following stages:

Task 1.1: Framing – Framing meant identifying the focus … the issue … for which strategic foresight is needed. There are many potential issues a region may be concerned about; but which few are most important? Taking time to clarify what is most important to the regional mission will help avoid focusing on too many issues, or the wrong issues. Executive involvement and buy-in is critical in this step.

Task 1.2: Scanning – The second task is scanning. Scanning is the process of looking internally and externally to identify what is on the horizon that may impact the organization relative to the issues you framed in the prior step. Usually, change occurs in one of five areas: societal, technological, economic, environmental, and/or political. Scanning is a way to identify the driving forces behind the changes, while they are still on the horizon.

Task 1.3: Forecasting – The third task is creating alternative futures … pictures of what the future may hold. As we mentioned above, we will analyze five types of future: preposterous, potential, possible, plausible and preferable.

Task 1.4: Visioning – The fourth task is deciding the preferred future for the Doiran Lake region. This step focuses attention back to the present. Considering the range of possible futures, what is the best for the region? It is important that the strategic foresight process connect the preferred future with the organization. We will implement this task as the saying, "Here is where we are and here is where we want to be in the future!"

Task 1.5: Planning – The fifth task incorporates planning. Given the gap between "where we are and where we want to be", what do the Doiran Lake authorities and other stakeholders need to do to bridge the gap? This is where planning develops specific goals and strategies to move the organization in the direction of the desired future. This is strategic planning.

Task 1.6: Acting – The last step is actionable and is the stage where the planning is implemented. What will be changed? How will progress be evaluated? Who is responsible for which strategies?

The **Scenario Analysis** based on the Strategic Foresight has been implemented though the following tasks:

Task 2.1 Technological analysis. Identification of technological alternatives for implementation of identified strategic foresights. Which technological solutions are needed and which are available.

Task 2.2. Financial analysis. What are costs for implementation of every identified technological alternative for implementation of identified strategic foresights.

Task 2.3 Environmental analysis. Impact on environment of every identified technological solution. Identification of different environmental parameters which influence air pollution, water pollution, land pollution, wildlife habitat etc. For every of identified technological solution we have identified how it will influence specific segment of environment.

Task 2.4 Social analysis. Quantifying probability a proposed technological solution to be accepted/ supported by locals, tourists, etc.

Task 2.5 Software development. We have developed Excel table with correlations – formulas between parameters specified in tasks 2.1-2.2 and they will be applied to every foresight identified in 1. Strategic Foresight.

The **Long Term Strategies** for development of Doiran Lake Area has been a process with the following tasks:

Task 1. Identifying Development Objectives: analysis of the expected progress to come over the coming three or four years on the basis of 1. Strategic Foresight and 2. If-then Analysis.

Task 2. SWOT Analysis: for every identified development objective examining the internal strengths (S) and weaknesses (W) of the region, as well as the opportunities (O) for advancement and threats (T) to the region's well-being.

Task 3. Identification of the Key Strategies. On the basis on SWOT analysis: identification of key directions which will enable to develop the region based on its strengths, fix weaknesses, pursue opportunities and resolve any threats. These key strategies have been identified as "Must Do" and "Can Do."

Task 4. Goals and Action Plans: the goals will be expressed in terms of quantities and can relate to fulfilment of the identified key strategies. A final step in developing the long-term strategic plan will be to outline five or six action plans, and to specify deadlines, budgets and time frames of the plans.

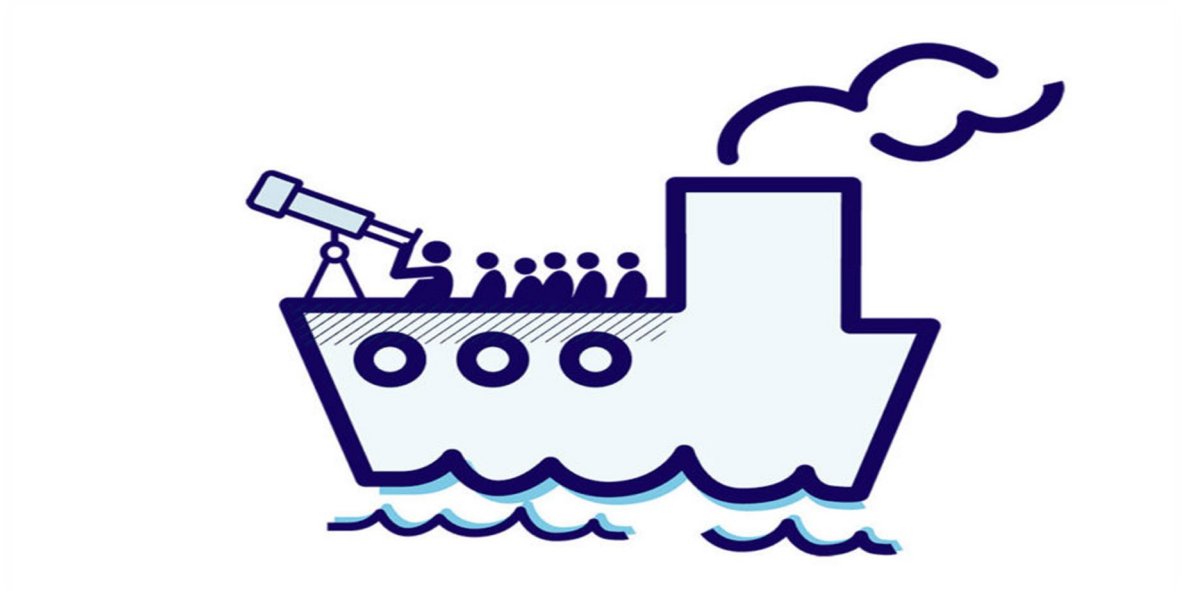
The stages of stakeholder and team collaboration have been as follows:

- ***November 2019***: Initial coordination meetings GAUSS Institute, desk research
- ***December 2019***: Drafting the concept; Gathering materials from various sources; coordination meetings GAUSS Institute and DETRA (Lot 2); core team WebMeetings; Visit to Dojran, meetings mayor, municipality, hotels, citizens, …; Meeting with the project manager of Milieukontakt Macedonia Association for Sustainable Development Milieukontakt Macedonia Skopje North Macedonia - project: Enhancing Dojran Lake Unique Biodiversity through Engagement of all Stakeholders and Implementation of Ecosystem – Based Approaches, financed by the Critical Ecosystem Partnership Fund (CEPF), a joint initiative of l'Agence Française de Développement, Conservation International, the European Union, the Global Environment Facility, the Government of Japan and the World Bank.
- ***January 2020***: Identification of megatrend threads (around 40) and synthesis of main 4-5 megatrends. Sources: secondary data on global, regional, local level from diverse domains (PESTLE, SWOT). Identification of other relevant contextual trends; Identification of two axes (horizontal and vertical) informed by the megatrend and the other significant relevant developments; Delivery of the inception report to the contracting authority.; Setting up 4 scenarios; Working on the scenarios - profiles, risks, feasibility (technological, financial, environmental, social); Modeling and simulation (one model, different simulations with various

inputs); Stakeholder discussion in Dojran (DETRA & GAUS) to prioritise and narrow alternatives; Development objectives, key strategies (must do & can do); Goals & Action plans (generic, Lot 2 & 3 does operational work); Project meeting with partners - discussion, consultation on the strategic foresight, input incorporated in the next iteration; DETRA public consultation throughout the country (Doiran, Skopje, …) and feedback

- ***February 2020***: Drafting the final report(s); Delivery of the draft final report(s) to be accepted by the contracting authority (project manager) and returned with comments & remarks (if any); Submission of the final report(s) in EN and MK, along with corresponding invoice.
- ***March, April 2020:*** Public consultation on the strategic priorities, conducted by DETRA, based on the strategic foresight and long-term strategies and action plans outlined by the GAUSS institute. The consulted stakeholders have been asked for opinion to prioritise the next steps, in terms of importance, who is to be in charge, probability to happen, needed resources and open comments. These findings along with the competent analysis by DETRA, have been incorporated in the shaping of the final strategic foresight report by GAUSS institute.

PART I –
STRATEGIC FORESIGHT



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4. Megatrends and other relevant developments

Megatrends analysis necessitates a 'systemic understanding how global megatrends are connected and how they influence each other. Such an assessment allows us to understand a part of the complexity of our interconnected world. And this will help us to find the right anchors to attach the most effective policy measures.' (Lorenz and Haraldsson, 2014)

By its definition, megatrends are those trends 'visible today that are expected to extend over decades, changing slowly and exerting considerable force that will influence a wide array of areas, including social, technological, economic, environmental and political dimensions (European Environment Agency, 2015). STEEP (social, technological, economic, environmental and political) acts as a framework of drivers of change, enabling investigation of the mechanisms of interest. The main focus of megatrends influences is towards food, water, energy and materials as resources, all of which to be sustained at the interplay while preserving the ecosystem balance and life.

There is extensive literature on megatrends from authors of all over the world. The considerations are somewhat diverse, but the most common megatrends do show certain predominance. We have narrowed the search down to 11, out of which 5 have passed the selection stage.

These are the initial megatrends considered (European Environment Agency, 2015):

- Diverging global population trends
- Towards a more urban world
- Changing disease burdens and risks of pandemics
- Accelerating technological change
- Continued economic growth?
- An increasingly multipolar world
- Intensified global competition for resources
- Growing pressures on ecosystems
- Increasingly severe consequences of climate change
- Increasing environmental pollution
- Diversifying approaches to governance.

To conclude, our horizon scanning resulted with early extensive list of 30+ megatrends, which were subjected to analysis from contextual aspect, summarising to 5 most important ones from the relevant institution, covering global planetary boundaries and EU standpoints of adapting to changes but also initiating change. The context-specific trends for the Doiran Lake region and for the concerned countries are described in the last, separate subsection in this heading.

4.1. Megatrend 1: Towards a more urban world - Rapid urbanisation (intensity: strong, direction: increasing)

The rapid urbanisation in global terms has been estimated to reach 68% of the population to live in cities (urban areas) by 2050 (United Nations Department of Economic and Social Affairs Population Division, 2018). The reasons for this trend are numerous - push factors such as the lack of necessary resources and systemic utilities in rural areas, pull factors such as belief for better professional life, extended supply nets where the urban business models are much more stable than agricultural and rural ones, depending a lot on natural circumstances, governmental support, subsidies etc.

''In Europe, as elsewhere, efforts to manage environmental pressures, economic development and human well-being need to overcome the short-termism currently dominating political and economic thinking and embrace long-term, integrated, global perspectives instead.'' (European Environment Agency, 2015)

We are witnesses that the 'multi-level decision making is particularly pressing for environmental governance'. This goes in direction of what constitutes the 'various spatial levels and their relationships with each other, as discussed under the term of "politics of scale"'. Especially since for 'environmental governance the spatial reference is strongly connected with another challenge, which concerns the question of how to deal with the biophysical conditions of particular places'. This means that landscape governance deals with the interconnections between socially constructed spaces (the politics of scale) and "natural" conditions of places' (Görg, 2007).

This trend is visible in the Republic of North Macedonia and the Republic of Greece. The rapid urbanisation separates people from nature, a behaviour completely opposite of the past where 'people cared for every centimetre of arable land and forest. Now, no care is taken in deciding which type of land is to be converted for urban use. These poor decisions manifest themselves by inhibiting the functioning of ecosystems, and lead towards degradation of the environment.' The industrial capacities and inadequate infrastructure for communal issues, urban and natural areas, systemically supported suburbs create significant problems (Ref: Country Study for Biodiversity of the Republic of Macedonia (First National Report), Skopje, 2003, Ministry of Environment and Physical Planning). The relatively high urbanisation of the country and the increasing trend in urbanisation have been noted by diverse institutions (United Nations, 2019) (Central Intelligence Agency, 2020)

The urban underprivileged will face greater poverty, as the systemic solutions are not favourable and the capabilities to reach certain level of professional and citizen-life participation in the urban areas are frequently mismatched (Lorenz and Haraldsson, 2014).

This megatrend is not just strong but is also with increasing tendency. On the other side, the systemic solutions and response to urbanisation, the planning procedures, as well as all other components and workflows in the country are either not following the pace, nor the quality is up to the necessary level. The lack of big picture approach and proper governance results with even more condensed and unplanned urban areas, cascading even greater pollution, frustration and environmental damage. The pace of introducing Tourist Development Zones (Туристички Развојни Зони - ТРЗ) through which large sections of the shore are urbanized and transformed into beaches and/or tourist objects, is not what the Doiran Lake would need at the moment (Central-Mediterannean Center for Climate Change - CMCC, 2018)

4.2. Megatrend 2: Increasing environmental pollution (intensity: strong, direction: increasing)

The complexity of the globalised interrelations among differently developed countries is also portraying a complex environment for the human population, as well as for the rest of the nature. Due to improperly designed, outdated and un-sustainable solutions and the prevalence of the linear (not circular) economy, the business and population waste is inconceivably damaging the ecosystems beyond repair. 'Nutrient effluents from agriculture and wastewater into the soil and oceans are projected to increase in most world regions, driven in part by the demand for increased agricultural production. The increasing complexity of chemical mixtures released into the environment is also a concern globally. There is clear evidence of the detrimental effects of pollution on the natural environment, ecosystem services and biodiversity, for example through processes such as eutrophication and acidification. The number of marine dead zones due to eutrophication has increased markedly in recent years.' (European Environment Agency, 2015)

Similar situation occurs in Doiran Lake - eutrophic lake with excess of biomass, becoming dangerous for the fish and humans, due to emissions of nitrogen, ammonia, phosphorus and other gasses. Eutrophication as 'the process by which water bodies acquire high nutrient concentrations (in particular phosphates and nitrates) and also sediment from the surrounding watershed and become more fertile and shallow. typically followed by excessive growth and decay of plants (algae) in the surface water and also death of other organisms. This can lead to the reduction of O2 because of hypoxia phenomenon , Eutrophication often occurs as a result of pollution related to human activity, such as fertiliser runoff and sewage discharge and the atmospheric deposition of nitrogen compounds.'(Jenkins, Woodward and Hildrew, 2013).

Eutrophication or hypoxia is a key problem also for freshwater ecosystems (rivers, lakes) also remains a key challenge (UNEP, 2012) (OECD, 2012).

The current business models are deeply dependent on non-renewable resources, linear economy, externalities and casualties. From local issues, to a global problem, environmental pollution rests on complex mix of critical pollutants, frequently transferred externally to less regulated or poor(er) regions. The 'global distillation' concentrates the persistent, bioaccumulative and toxic substances in the colder areas of the globe, dispersing global toxicity anyhow. (Swackhamer, Needham, Powell and Muir, 2009). Complementary to the airborne pollutants, water and soil are polluted from direct releases from different sources of waste.

Such contextual trend occurs in Doiran Lake region too - due to urbanisation, unregulated and unsanctioned acts of pollution of individuals/legal entities, the lake has excessive eutrophication that presents hypoxic environment for the organisms in the Doiran Lake ecosystem.

4.3. Megatrend 3: Increasingly Severe Consequences of Climate change (intensity: strong, direction: increasing)

There is almost no other non-political trend that is more overwhelming than the climate change. Generally, temperature rise, intensive decrease of precipitation in all seasons, loss of biodiversity and more frequent force majeure events that develop beyond human control;

Towards the mid-21st century, habitat loss due to bioenergy-crop farming and climate change is expected to gain in significance as drivers of decrease (CBD, 2010; OECD, 2012b). The increasing spread of some invasive alien species because of climate change (Bellard et al., 2013) is now a daily occurrence around the globe.

Global and regional assessments indicate that biodiversity loss and ecosystem degradation will continue or accelerate under all policy scenarios considered (IEEP et al., 2009; Leadley et al., 2010).

Ecosystem-based approaches that rely on ecosystems to buffer human communities against the adverse impacts of climate change would allow natural ecosystems to play an important role in climate change adaptation (IPCC, 2014b; Jones et al., 2012; World Bank, 2010).

4.4. Megatrend 4: Intensified Global Competition for Resources - Resource scarcity (intensity: strong, direction: increasing)

Globalised supply chains mean that European consumption contributes to pressures on ecosystems and communities in other areas of the globe, for example through threats to global freshwater quality and quantity, and the degradation of habitats and landscapes (Tukker et al., 2014).

Drought and resulting water scarcity related to climate change are expected to increase considerably in southern Europe, where 80% of national water abstraction is already used for agricultural irrigation (EEA, 2013b).

In the Doiran Lake context, the water, as well as the fish in the past, have been perceived as endless - resulting with unmanaged use damaging the entire ecosystem.

4.5. Megatrend 5: Diversifying approaches to governance (intensity: moderate, direction: increasing)

"The world is devising new governance models, including multilateral agreements, on numerous issues and public-private ventures. In the absence of global regulations, high European standards and procedures are often adopted worldwide. But will this also be the case in the future?" (EEA, 2015). Of course, the strength of competition pressures is much greater than the strength of governing bodies, their backgrounds and motivation, so the intensity of this megatrend is moderate. The fragmentation, the convergence, the lack of system cross-boundary solutions and approaches, bodies and projects are somewhat common thread in the past, present and future. "Government governance is often made more participatory through the establishment of multi-stakeholder platforms and expert bodies with advisory or even some decision making roles. Delegated management seem to be accepted more or less in most of the countries (either to state authorities - devolved - or to non-state actors - delegated management). Delegation to non-governmental actors might be also combined with mechanisms that help improve participation. The multi-stakeholder platforms and the expert bodies represent the first clear steps towards collaborative management of different 'degrees' in some of countries from the study area. Variations of the IUCN governance types and within the same subtypes were identified and described by the project team with the aim to provide a clear picture on the differences encountered. There are also new, innovative approaches for the region in protected area governance, like joint and private management, building experience for almost all IUCN governance types. In some cases the new governance types are recognized and implemented by the national authorities and reflected in the legislation, in others there are bottom-up initiatives of non- governmental actors, demonstrating that it is beneficial to have delegated or

shared governance. There are examples also of some private governance." (Stanciu and Ioniță, 2014)

Projects such as this one, do give some hope for Doiran Lake and the bilateral collaboration of Greece and North Macedonia, however, there are several governance levels that need to be aligned and complex mechanisms to come to function, so the diversity in governance is not exactly a positive megatrend for transboundary issues.

4.6. Contextual trends: other relevant developments to be considered (Local, National, Regional) - contextual factors and weak signals

Under this section, we enlist all the contextual trends that need to be considered to capture the context of Doiran Lake, and are influencing its future, be it from local, national, regional level, strong trends, weak signals and aspects not instantiated by the megatrends.
They are:

- Rapid urbanization with no regard to the environment, natural ecosystems, sustainability. Ineffective procedures, regulatory prescribed, in reality deviated.
- Labour and qualifications mismatch - fuelling migration from rural to urban. Especially due to preposterous number of universities and bachelor, master and PhDs for such a small country - people not willing to work agriculture or crafts.
- Idle workforce in winter, shortage in summer - due to peaks in tourist seasons
- Different priorities for the two governments (ever since 1954 till present) - N. Macedonian country tends to keep the water levels high to have no problems in the specific way of fishing, while the Greek neighbor has the goals to irrigate as many areas in the region from the Doiran Lake (Municipality of Doiran, 2019).
- Politics playing dominant role in everything - not leaving space for professionalism, meritocracy, competence, principles
- Nobody cares perception among all stakeholders
- Dojran Lake is one of the Macedonian water bodies shared with a European country and the necessity for transboundary water basin management is drawn as an aspect of significant importance in the WFD.

5. Identification and elaboration of two continuums (axes)

The horizon scanning, complemented with megatrend and issue analyses have been reflected with interviews and primary data from diverse stakeholders, have been a substantial input for identification of the two continuums (axes) that embody the 2040 point in time and space, and assist the build of scenarios.

The strategic foresight exercise takes a point in the future and attempts to portray routes of developments that can be preposterous, potential, possible, plausible or preferable, considering the as-is situation and the activities, trends and occurrences in between the as-is and the to-be states. The difference with strategic forecasting is obvious, as we are not taking the current situation and projecting to the future, but the future overlays the present and the mechanisms of choices we make are interwoven in the reasoning of the axes and the scenarios.

Through the horizontal axis: Existence of (transboundary or not) systemic solutions, capturing extremes of no systemic solutions and systemic solutions in place and the vertical axis: Maintenance of ecosystem habitat with its extremes of degraded and regulated, we will try to portray a landscape of scenarios that consider both the natural and the human side of the foresight. By combining in-between the two extremes, policy-makers, citizens, governing bodies and all relevant stakeholders can reason and project possibilities, what-if analysis and divergent or convergent pathways of actions, and see how the developments will effectuate in future.

5.1. Horizontal axis: Existence of (transboundary or not) systemic solutions (no systemic solutions/systemic solutions in place)

The horizontal axis considers the human, socio-technical side of the story - and how it should be, according literature and best practices. It incorporates the systemic perspective and systems design of solutions, carried out by human actors through a choice of governance. It expands along the extremes of no systemic solutions in place, as is at this moment, and systemic solutions in place, as a preferable tendency. By systemic solutions, we perceive the perception and governance of the cross-country region of Doiran Lake, where all activities are interrelated towards outcomes for the lake and its area as a whole.

5.2. Vertical axis: Maintenance of ecosystem habitat (degraded/regulated)

The vertical axis aims to reflect the natural side of the story - meaning the ecosystem habitat, which is a complex system on its own. We are considering the extremes of degraded ecosystem habitat, that is left beyond the point of no return, after reaching it (which may already be the case). The other extreme is still not extremely natural, but it helps reason that the natural mechanisms are active and the human engagement is in its preservation, regulation, no-intrusiveness and no further damage.

PART II – SCENARIO ANALYSIS OF STRATEGIC FORESIGHT

6. Review of the scenarios

The most interesting artefact of this study is visualised on Figure 2 - the strategic foresight for Doiran Lake, representing the horizontal and vertical axis and the four scenarios, which are all to be conceptualised and outlined in the following headings.

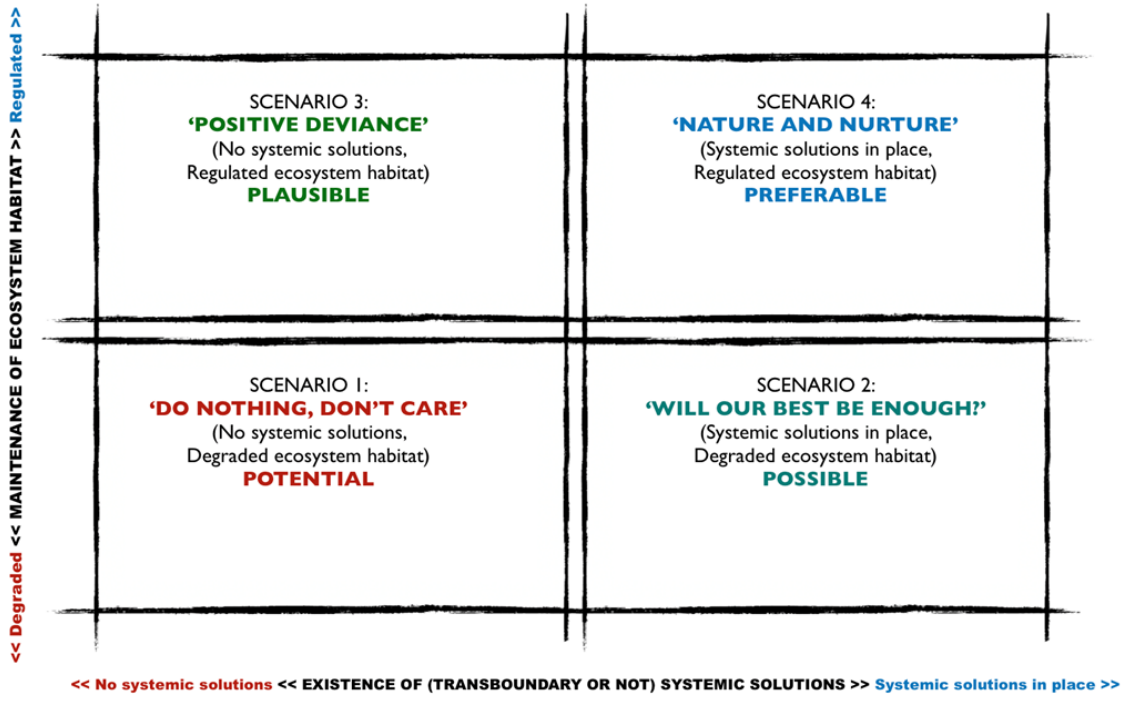
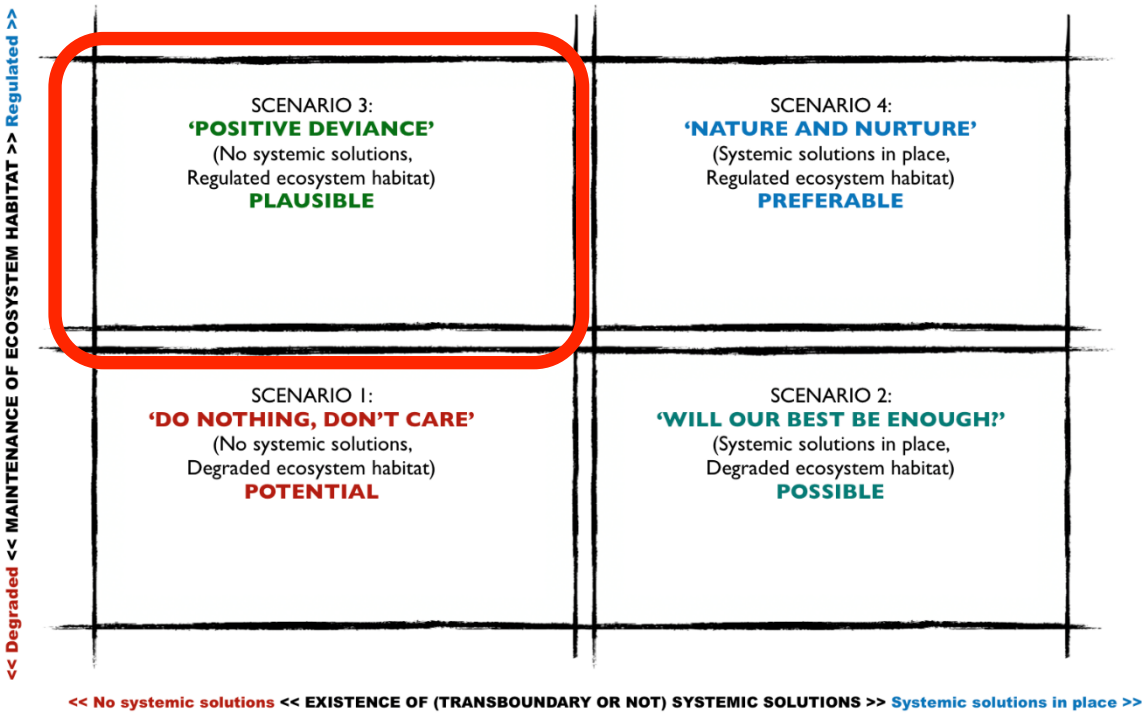


Figure 2 - Strategic foresight for Doiran Lake - axes and scenarios (source: Authors)

6.1. Scenario 1: 'DO NOTHING, DON'T CARE' (No systemic solutions, Degraded ecosystem habitat)

Scenario 1 is situated in the bottom left quadrant, capturing the extremes of no systemic solutions and degraded ecosystem habitat. It is pretty much what may happen if the stakeholders don't act upon the necessities of the ecosystem and it degrades even more because, according to our notions, it has reached a point of no return, and cannot resolve within its own mechanisms and on its own. This scenario has been qualified as 'potential'.
Here are the characteristics that can be subject to discussion among policy-makers, governing bodies and all other stakeholders, on individual and collective level.



SCENARIO 1: **No systemic solutions (transboundary or not), Degraded ecosystem habitat**

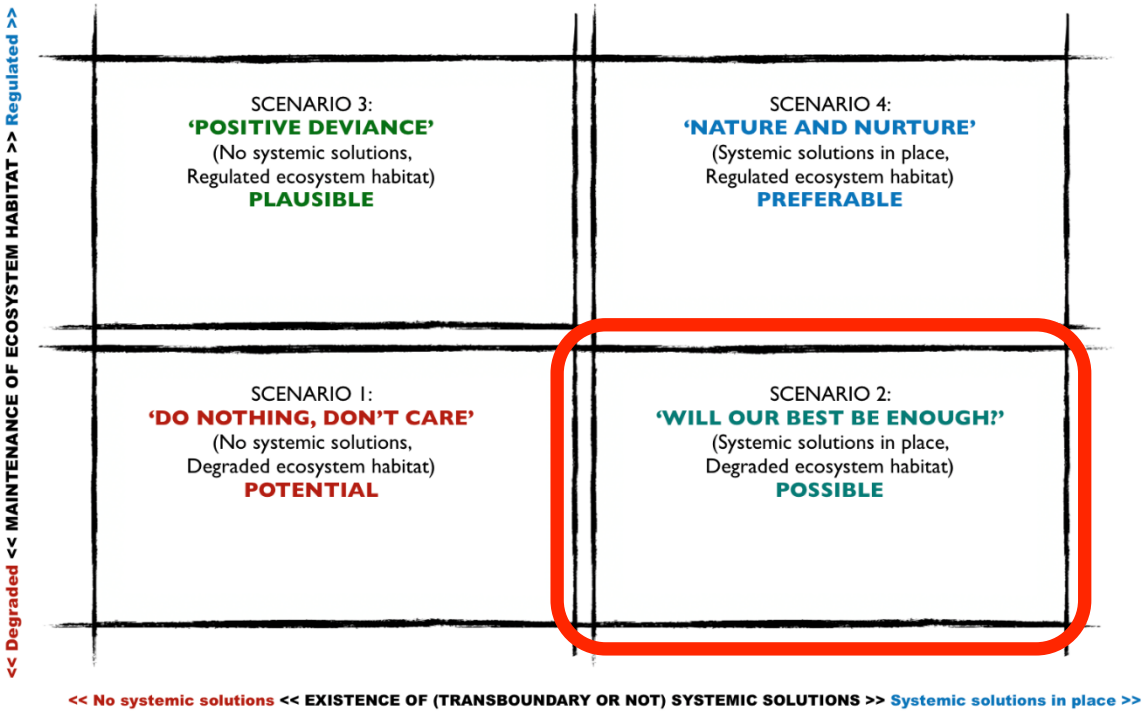
- Lake remains to be subject of uncontrolled and unmanaged exploitation
- Waste pollution thrives
- Uncontrolled use of water for irrigation
- Businesses do actions at will
- One or two big businesses locate in the area and dictate everything upon their business model and politics
- Fishing is uncontrolled
- Lake tourism is promoted (using the lake for activities) with no big picture overview or control, doing bigger damage
- Urbanisation with no global plan - reflecting on waste management infrastructure, environmental damage, ecosystem pollution, biodiversity loss
- The climate shifts are extreme - hot summers and every second/third year is with sufficient rainy periods
- There are sporadic projects funded by grants, but few are interrelated or part of bigger system that is designed to produce effects
- No cross-boundary nor country governance
- No responsible entity in place, nor proper citizen/visitor mindset
- There is scarce funding or none, MK is not in EU nor on the right track

- The entities governing the Doiran Lake don't have the capacity to absorb, manage and control the developments
- RISKS: The lake will not revive itself, as it needs structured, planned human and system intervention, it will turn into a smaller unusable degraded swamp, the countries don't fulfill their global dedication to resolutions and regulation, SDGs, ...
- Assessment: preposterous, potential, possible, plausible or preferable

6.2. Scenario 2: 'WILL OUR BEST BE ENOUGH?' (Systemic solutions in place, Degraded ecosystem habitat)

Scenario 2 is situated in the bottom right quadrant, capturing the extremes of systemic solutions in place (be them transboundary or not) and degraded ecosystem habitat. This scenario considers some affirmative actions, some aligned governance (transboundary or collaborative) which help stop the further damage being done to the Doiran Lake. However, nature and ecosystems self-restauration takes time, so even if we manage to halt the status as-is, it is still not 100% certain that the Doiran Lake can be salvaged from degradation and loss. This scenario has been qualified as 'possible'.

Here are the characteristics that can be subject to discussion among policy-makers, governing bodies and all other stakeholders, on individual and collective level.



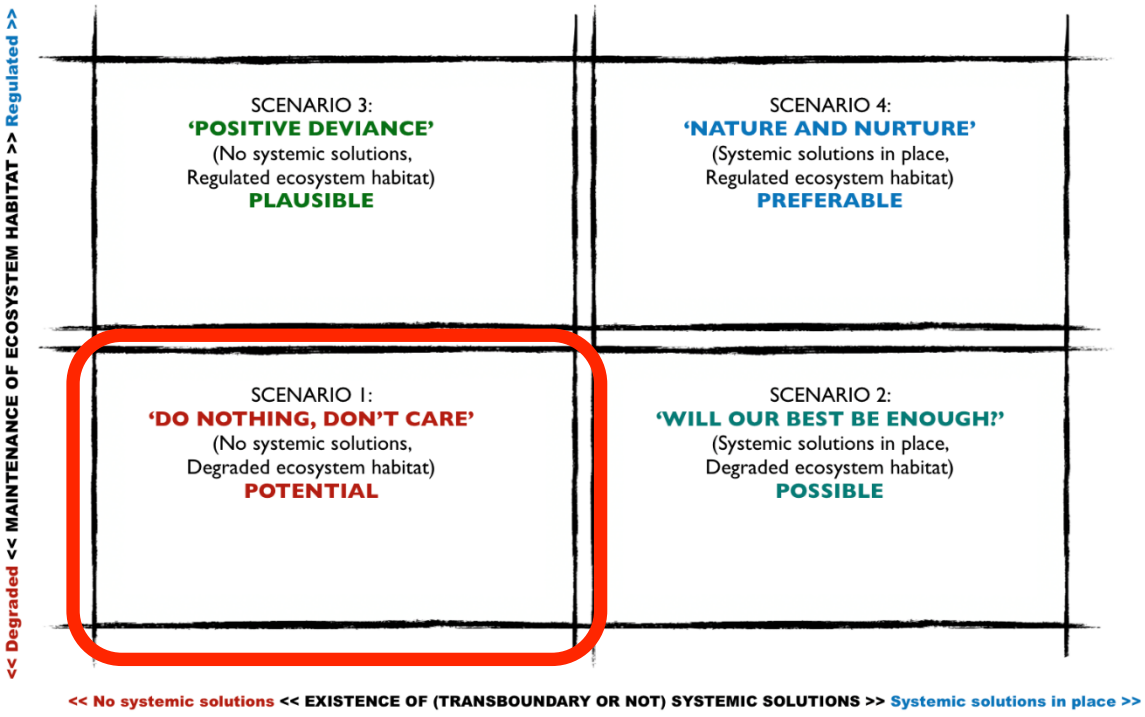
SCENARIO 2: **Systemic solutions in place (transboundary or not), Degraded ecosystem habitat**

- The lake ecosystem conservation needs are acknowledged by the governments of North Macedonia and Greece, and efforts are made to preserve the biodiversity and restore the habitats, but it is taking a slow pace, fearing that the point of no return has been overshoot
- Waste pollution is managed
- The water is controllably used for irrigation
- Businesses do actions with restrictions
- Sustainable fishing practices are in place
- Direct tourism activities in the Lake have not been performed!!! - shorter reassessment cycles (not 2 decades), while other types of tourism are promoted (bicycling, conference, historical sites, hiking, paragliding, …)
- Urbanisation is regulated in theory, practice takes time
- The climate shifts are extreme - hot summers and every second/third year is with sufficient rainy periods
- There are sporadic projects funded by grants, but the number of them are interrelated as part of a bigger system that is designed to produce effects
- Governance system both at national and local level exists, however in a cross-border level the cooperation needs strengthening further towards a shared governance. A management body is established and works actively to managing visitor tourists and also works with local community to educate and train them for the concept of ecotourism The funding is streamlined, MK is towards EU or on the right track, there are other investors too, crowdfunding, donations etc.
- The entities governing the Doiran Lake have the capacity to absorb, manage and control the development challenges and take balanced decisions for the benefit of both people and nature, without harming natural resources
- RISKS: The lake will not restore itself, but the human efforts are primarily stopping further degradation until restoration occurs - if it does, these efforts may still be too late or insufficient after overshooting the point of no return, some instances of not following rules and regulations may sabotage the efforts, the mentality and the visitor culture may be hard to discipline towards following prescribed guidelines, lack of engagement from the management body, expectations for incentives to be motivated to act.
- management structures for river basins have been set up but they are not yet operational and there is a lack of coordination between local competent authorities, which affects the implementation of the legislation.
- Assessment: preposterous, potential, possible, plausible or preferable

6.3. Scenario 3: 'POSITIVE DEVIANCE' (No systemic solutions in place, Regulated ecosystem habitat)

Scenario 3 is situated in the upper left quadrant, capturing the extreme of no systemic solutions in place but regulated ecosystem habitat. This means that some 'positive deviations' are in place and they have been effective (regulatory aspects, projects, partial efforts, …) so the ecosystem habitat had a chance to be rehabilitated, however, the governance has not been established in systemic manner. This scenario has been qualified as 'plausible'.

Here are the characteristics that can be subject to discussion among policy-makers, governing bodies and all other stakeholders, on individual and collective level.



SCENARIO 3: **No systemic solutions (transboundary or not) in place, Regulated ecosystem habitat**

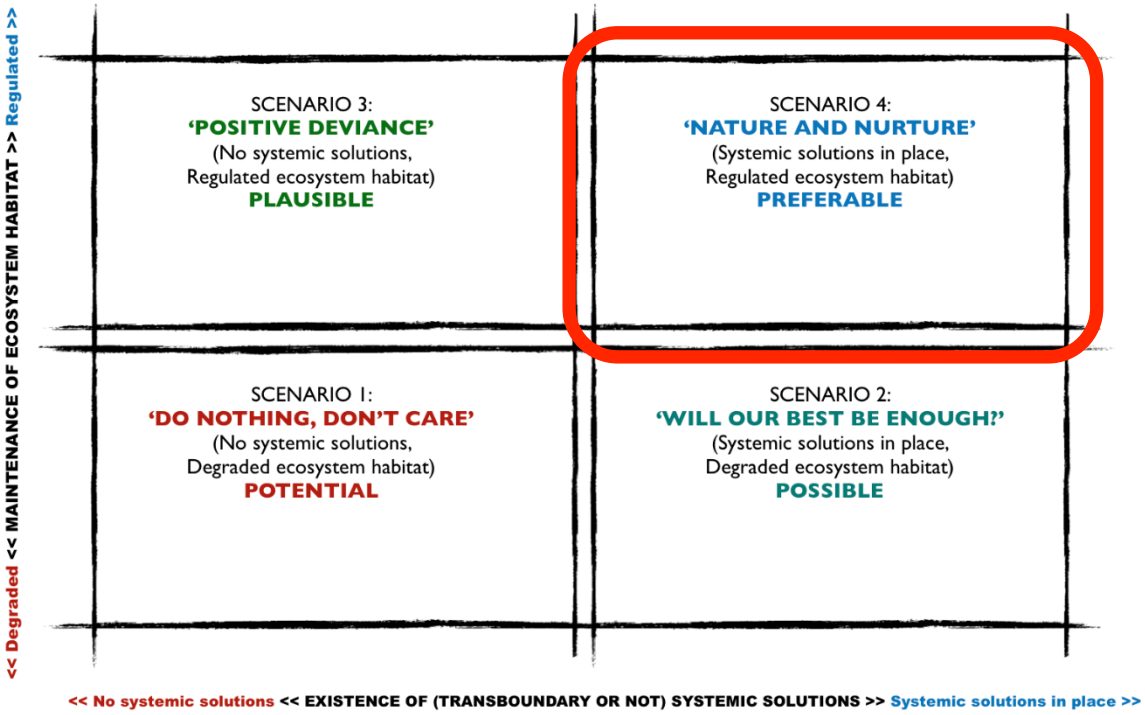
- The lake ecosystem conservation needs are being addressed through the few unrelated projects from external funding and competent involved parties
- Waste pollution is managed on operational level
- The water is controllably used for irrigation
- Direct tourism activities in the Lake have not been performed, while other types of tourism are promoted (bicycling, conference, historical sites, hiking, paragliding, …)

- Urbanisation is tended to be regulated in theory and practice, both take time
- Businesses do actions at will
- One or two big businesses locate in the area and dictate everything upon their business model and politics
- Fishing is attempted to be controlled even though there is no fisherman associations have not been established, not the main activity to local population
- Fishing is controlled and during the reproduction period, fishermen do not hunt in the lake. Local population respects the biological life cycle of fish as it considers it important for their culture
- The climate shifts are extreme - hot summers and every second/third year is with sufficient rainy periods
- There is country governance and some dedication to cross-boundary arrangements
- There is no transboundary water basin management in place for NMK and Greece
- No cross-boundary governance, may be/not be a country governance
- Probably a responsible entity is in place (not necessarily), and/or proper citizen/visitor mindset
- There is scarce funding or none, MK is not in EU nor on the right track
- The entities governing the Doiran Lake have limited capacity to absorb, manage and control the developments, but things are functioning to the necessary minimum
- RISKS: The lake will not revive itself, but the human efforts are primarily stopping further degradation until revival kicks in, there are many dangers of deviations, disobeyance, vandalism, deliberate damage, the mentality and the visitor culture may be hard to discipline towards following non-binding guidelines
- Assessment: preposterous, potential, possible, plausible or preferable

6.4. Scenario 4: 'NATURE AND NURTURE' (Systemic solutions in place, Regulated ecosystem habitat)

Scenario 4 is situated in the upper right quadrant, capturing the positive extremes of both systemic solutions, in transboundary, cross-country manner) and regulated ecosystem habitat. This scenario means that the human individual and collective efforts have fruited with developments in favourable direction, and that the Doiran Lake is restored, protected, maintained and Doiran Lake area has sustainable existence and development. This scenario has been qualified as 'potential'.

Here are the characteristics that can be subject to discussion among policy-makers, governing bodies and all other stakeholders, on individual and collective level.



SCENARIO 4: **Systemic solutions (transboundary or not) in place, Regulated ecosystem habitat**

- The lake ecosystem conservation needs are being addressed, and efforts are made to preserve the biodiversity and restore the lake, the habitat is reaching sustainable balance, biodiversity is preserved
- Waste pollution is managed
- The water is controllably used for irrigation
- Direct tourism activities in the Lake have not been performed!!! - shorter reassessment cycles (not 2 decades), while other types of tourism are promoted (bicycling, conference, historical sites, hiking, paragliding, …)
- Urbanisation is regulated
- Businesses do actions within regulated scopes and manner
- Fishing is controlled, still not very dominant local activity
- A fishing period
- The climate shifts are extreme - hot summers and every second/third year is with sufficient rainy periods

- The projects funded by external bodies are all part of one big system to produce the desired effects
- There is country governance and strong dedication to cross-boundary arrangements
- There is responsible entity in place, shaping proper citizen/visitor mindset
- The funding is streamlined, MK is towards EU or on the right track, there are other investors too, crowdfunding, donations etc.
- The entities governing the Doiran Lake have the capacity to absorb, manage and control the developments
- Macedonia has completely transposed the WFD into the Law on Waters, secondary legislation
- has fully achieved the transposition of the obligations of WFD concerning river basin plan
- preparation, but the WFD implementation has not yet been totally carried out (Personal
- Communication, MoEPP).
- RISKS: The lake is deliberately preserved and sustained in that manner but it is taking a lot of self-control on all stakeholders (which may not be the case), the main components of urbanisation, human and business action are regulated (and as usual, deviations exist), the mentality and the visitor culture ought to be streamlined towards following prescribed guidelines (but deviations exist) that may undo the fragile area of the Doiran Lake
- Assessment: preposterous, potential, possible, plausible or preferable

7. Scenario analysis - feasibility and modelling (strategic, tactical & some operational aspects)

Before working out to a greater depth, the feasibility aspects of the Doiran Lake scenarios, we have performed PESTLE analysis, in order to portray all the Political, Economical, Societal, Technological, Legal and Environmental aspects that are to be considered by any policy-maker and stakeholder.

Political	Economical	Social
- The Government supports activities of environmental protection - Most donors have high criteria for project financing. - Local initiatives - Interest in external stakeholder projects - NGOs activities and projects - Political situation in the country and the region	- Lack of staff with experience in the environmental protection in the Municipality - Low standard of living - Low level of awareness in the business sector for financial support of the protection action of the lake. - Volunteering support measures - Low-budget tourism - Alternative tourism - Universities and Research Centers in the country - Economic crises at European and world level	- People spend much of their free time on social networks - Negative natural population growth - Youth emigration trend

Technological	Legal	Environmental
- The expanding advancement of digital and mobile technology - Modern technologies for environmental protection - Digitalization - Costs for licensed software - Poor computer literacy - Technology and digitized database of cultural and natural heritage	-The 2018 National Strategy for Nature Protection and Action Plan for the period - 2017–2027 National Biodiversity Strategy and Action Plan - State Environmental Inspecorate activities - Low of Environmental - Most relevant low and rules for Dojran lake - Law on Nature Protection - Law on Waste Management - Non-compliance with international legal standards - Pure change of legislation (legal uncertainty) - Local Strategy of the Municipality	- Climate change - Energy efficiency - Air pollution - Use of lake water for agricultural irrigation

Figure 3 - PESTLE analysis for Doiran Lake (source: Authors)

7.1. Feasibility of the scenarios

After performing the general PESTLE analysis on Doiran Lake, we are going to focus more on the foresight scenarios, analysing their technological, financial, social and environmental feasibility, still on general basis, but with more detailed components and mechanisms.

Scenario I Feasibility Analysis

Scenario I feasibility: No systemic solutions in place, Degraded ecosystem habitat - "Do nothing, don't care" is, sadly, easy to analyse and hard to witness - it designates nothing being done and continuing the situation and the efforts as they are so far. This means that nobody is doing things to improve the governance or the ecosystem, and that it is irreversibly being devastated, passing the point of no return. Even though, there is one scenario even more worse than this one - when intentional and deliberate damaging actions are taking place, but that is not discussed in these axes. The state of the: Technological, Financial, Social and Environmental feasibility of this scenario is 'yes' but with negative connotation. Total proximate costs are just for the if-then analysis in the amount of 1 mil. EUR for the next 20 years extrapolated from current scattered activities.

Scenario II Feasibility Analysis

Scenario II feasibility: Systemic solutions in place (transboundary or not), Degraded ecosystem habitat - "Will our best be enough?" Is considering existence of systemic solutions, maybe not to their best integration and cross-country establishment, but definitely in direction of good collaboration and effectiveness. But, the ecosystem habitat is slower to respond, because extra efforts are needed to address present devastation towards future restored state. This scenario is possible, with a lot of intentional change management of the human factor.

TECHNOLOGICAL

- If systemic solutions are in place in managerial sense, then proper **management/governance capacity and logistics** need to be fully functional, (if possible transnational)and EU integrated:
  - ✴ Ecosystem information input and processing (real-time big data, sensors, observations, activities)
  - ✴ Socio-economical information input and processing
  - ✴ Proximate amount for 20 years: 6 - 8 mil. EUR

- If systemic solutions are in place in managerial sense, then proper management **information systems and equipment** need to be fully functional, transnational and EU integrated, in several directions:
    - ✳ Ecosystem information input and processing (real-time big data, sensors, observations, activities, telemetric networks, water quality sensors, water level sensors, …)
    - ✳ Socio-economical information input and processing
    - ✳ Management information system for the governing body with strategic, tactical and operational data
    - ✳ Knowledge management systems
    - ✳ Expert systems
    - ✳ PR information systems
    - ✳ Participatory governance information system
    - ✳ Multi-stakeholder collaboration
    - ✳ Information systems for education, research, science, laboratories, experiments, alternative tourism, …
    - ✳ Proximate amount for 20 years: 4-6 mil. EUR

- When the systemic potentials are activated, then relevant, competent HR capabilities are configured towards apprehending all possible EU and global knowhow, funding, expertise and networks - requiring such **expert and/or advisory HR capabilities** that eventually build local capacity too
    - ✳ Proximate amount for 20 years: 6 mil. EUR

- **Alternative tourism investments** (where swimming is not the main focus or is omitted completely!) such as eco-tourism, clean air, historical sightseeing, sports, walking, biking & hiking tours, conference tourism, winter tourism, sports teams preparations, country-tourism, dental tourism and medical tourism, paragliding, … and canoe, kayak, standup paddle board use of the lake.
    - ✳ Proximate amount for 20 years: 30 mil. EUR

- **Infrastructure** for drinking water & waste water, as well as roads falls under technological feasibility to a great extent
    - ✳ Proximate amount for 20 years: 30 mil. EUR

FINANCIAL

- **Management/governance capacity and logistics**
  - ✳ Proximate amount for 20 years: 6 - 8 mil. EUR (6 if the governance is single-country with political borders, 8 if the governance is cross-country and transnational and within watershed borders)

- **Information systems and equipment**
  - ✳ Proximate amount for 20 years: 4 - 6 mil. EUR (4 if the governance is single-country with political borders, 6 if the governance is cross-country and transnational and within watershed borders)

- **Expert and/or advisory HR capabilities**
  - ✳ Proximate amount for 20 years: 6 mil. EUR

- **Alternative tourism investments**
  - ✳ Proximate amount for 20 years: 30 mil. EUR

- **Infrastructure**
  - ✳ Proximate amount for 20 years: 30 mil. EUR

- **Other costs**
  - ✳ Proximate amount for 20 years: 15 mil. EUR

TOTAL proximate costs, SCENARIO II: 91 - 95 mil. EUR

(91 if the governance is single-country with political borders, 95 if the governance is cross-country and transnational and within watershed borders)

SOCIAL

The social aspects of this scenario, are the ones that lead the way. Namely, since the direction is towards stakeholders acting upon their challenges in the Doiran Lake region, in their personal, professional capacities and collectively. This means a lot of alignment, sensemaking, education, engineering, enforcement, hard work, and purposive actions and sustainable motivation. The social component needs to direct positive action and behaviour towards stopping further damage and prevent misbehaviour. The instances of not following rules and regulations may prevail and sabotage the efforts, the mentality and the visitor culture may be hard to discipline towards following prescribed guidelines, lack of engagement from the management body, expectations for incentives to be motivated to act. Knowing that the the social aspect is most important in complex adaptive systems, and combining the current state of social awareness and self-motivation, the social feasibility in this sense, of any other scenario aside from the first one, is very low.

ENVIRONMENTAL

This scenario considers systemic solutions that somehow will effectuate the ecosystem habitat, but with a slow pace and even slower transition to the natural systems. Hence, even though this scenario is possible since human actions can be enforced, still the risks of the scenario in environmental sense may occur too: the lake not to restore itself, but the human efforts are primarily stopping further degradation until restoration occurs.

Scenario III Feasibility Analysis

Scenario III feasibility: No systemic solutions in place, Regulated ecosystem habitat - "Positive Deviance" is considering the effects of projects and investments up to present times that are assisting the further damage of the lake environment, but the future is not acted upon in the present, and all further solutions are just segments of unmanaged bigger system. This scenario is plausible but not very complete in terms of what is really needed to be done.

TECHNOLOGICAL

- This scenario does recognise implementation and existence of certain project funded **information systems and equipment** such as:
  - ✳ Ecosystem information input and processing (real-time big data, sensors, observations, activities, telemetric networks, water quality measurements, water level sensors, …)
  - ✳ Expert systems
  - ✳ PR information systems
  - ✳ Information systems for education, research, science, laboratories, experiments, alternative tourism, …
  - ✳ Proximate amount for 20 years: 5 mil. EUR

- **Alternative tourism investments** (where swimming is not the main focus or is omitted completely!) such as eco-tourism, clean air, historical sightseeing, sports, walking, biking & hiking tours, conference tourism, winter tourism, sports teams preparations, country-tourism, dental tourism and medical tourism, paragliding, … and canoe, kayak, standup paddle board use of the lake.
  - ✳ Proximate amount for 20 years: 10 mil. EUR

- **Infrastructure** for drinking water & waste water, as well as roads falls under technological feasibility to a great extent
  - ✳ Proximate amount for 20 years: 5 mil. EUR

FINANCIAL

- **Information systems and equipment**
  - ✳ Proximate amount for 20 years: 5 mil. EUR

- **Alternative tourism investments**
  - ✳ Proximate amount for 20 years: 10 mil. EUR

- **Infrastructure**
  - ✳ Proximate amount for 20 years: 5 mil. EUR

- **Other costs**
  - ✳ Proximate amount for 20 years: 5 mil. EUR

TOTAL proximate costs, SCENARIO III: 25 mil. EUR

SOCIAL

The social aspects of this scenario, are the ones that lead the way should be pointed out and followed - since they are the ones showcasing how to be effective integral part of a socio-technical-environmental complex system. However, the past directed efforts of scattered projects have been influential to regulate the ecosystem habitat and it is taking its course to overcome the dangers of further degradation in time in the future. Without integral systemic approach and transnational governance, this scenario may lead towards scenario I situation, since further sustainability is in question - and that is where and how the positive deviations need to be captured and expanded among the stakeholder system.

ENVIRONMENTAL

This scenario considers regulated ecosystem habitat, meaning further damaging actions are paused or managed and the lake is given a chance to restore itself (if possible) and 'fight' the socio-technical devastating behaviour. Hence, even though this scenario is plausible, it addresses managing past negative effects, while the future is not acted upon in the present.

Scenario IV Feasibility Analysis

Scenario IV feasibility: Systemic solutions in place (transboundary), Regulated ecosystem habitat - "Nature & Nurture" is the most preferred scenario where at least positive hopes and plans of some of the stakeholders consulted are directed into. Its main characteristics are that

we envision both human activities to be at their best - systemic, transnational and EU/globally aligned governance with focused efforts both to stop further devastation at present times and to prescribe sustainable measures for future biodiversity and ecosystem preservation; while the natural system of the Lake Doiran is also doing its share of work - restoring its internal complex mechanisms in rather feasible time and manner.

TECHNOLOGICAL

- If systemic solutions are in place in managerial sense, then proper **transnational management/governance capacity and logistics** need to be fully functional, (if possible transnational)and EU integrated:
  - ✳ Ecosystem information input and processing (real-time big data, sensors, observations, activities)
  - ✳ Socio-economical information input and processing
  - ✳ Proximate amount for 20 years: 10 mil. EUR

- If systemic solutions are in place in managerial sense, then proper management **information systems and equipment** need to be fully functional, transnational and EU integrated, in several directions:
  - ✳ Ecosystem information input and processing (real-time big data, sensors, observations, activities, telemetric networks, water quality sensors, water level sensors, …)
  - ✳ Socio-economical information input and processing
  - ✳ Management information system for the governing body with strategic, tactical and operational data
  - ✳ Knowledge management systems
  - ✳ Expert systems
  - ✳ PR information systems
  - ✳ Participatory governance information system
  - ✳ Multi-stakeholder collaboration
  - ✳ Information systems for education, research, science, laboratories, experiments, alternative tourism, …
  - ✳ Proximate amount for 20 years: 8 mil. EUR

- When the systemic potentials are activated, then relevant, competent HR capabilities are configured towards apprehending all possible EU and global knowhow, funding, expertise and networks - requiring such **expert and/or advisory HR capabilities** that eventually build local capacity too
  - ✳ Proximate amount for 20 years: 10 mil. EUR

- **Alternative tourism investments** (where swimming is not the main focus or is omitted completely!) such as eco-tourism, clean air, historical sightseeing, sports, walking, biking & hiking tours, conference tourism, winter tourism, sports teams preparations, country-tourism, dental tourism and medical tourism, paragliding, … and canoe, kayak, standup paddle board use of the lake.
  - ✳ Proximate amount for 20 years: 40 mil. EUR

- **Infrastructure** for drinking water & waste water, as well as roads falls under technological feasibility to a great extent
  - ✳ Proximate amount for 20 years: 40 mil. EUR

- **Education, Engineering, Enforcement** of all stakeholders and their actions within the Doiran Lake system but also as that system being a subsystem of national, regional and international socio-technical-environmental system
  - ✳ Proximate amount for 20 year: 20 mil. EUR

FINANCIAL

- **Management/governance capacity and logistics - transnational**
  - ✳ Proximate amount for 20 years: 10 mil. EUR

- **Information systems and equipment**
  - ✳ Proximate amount for 20 years: 8 mil. EUR

- **Expert and/or advisory HR capabilities**
  - ✳ Proximate amount for 20 years: 10 mil. EUR

- **Alternative tourism investments**
  - ✳ Proximate amount for 20 years: 40 mil. EUR

- **Infrastructure**
  - ✳ Proximate amount for 20 years: 40 mil. EUR

- **Education, Engineering, Enforcement**
  - ✳ Proximate amount for 20 year: 20 mil. EUR

- **Other costs**
  - ✳ Proximate amount for 20 years: 20 mil. EUR

TOTAL proximate costs, SCENARIO IV: 148 mil. EUR

SOCIAL

The social aspects of this scenario, are emphasised in positive manner in the sense of value co-creation, collaboration, co-evolution and common purposes. All stakeholders are acting upon their challenges in the Doiran Lake region, in their personal, professional capacities and collectively. This means a lot of alignment, sensemaking, education, engineering, enforcement, hard work, and purposive actions and sustainable motivation. The social component needs to direct positive action and behaviour towards stopping further damage and preventing misbehaviour but also creating and acting towards sustainable future. The self-control may not always be the case, but it is not significant in this scenario, the main components of urbanisation, human and business action are regulated (and as usual, minor deviations do exist), the mentality and the visitor culture ought to be streamlined towards following prescribed guidelines (but deviations exist) that are not that strong to undo the fragile area of the Doiran Lake. The social feasibility of this scenario to happen, if we take the mentality and all relevant aspects is surprisingly low.

ENVIRONMENTAL

This scenario considers systemic solutions that somehow will effectuate the ecosystem habitat, with a moderate-to-fast pace. The risks of the scenario in environmental sense may occur too: the lake not to restore itself, but the human efforts are primarily stopping further degradation and affirmative actions until restoration occurs and sustains. The environmental feasibility of this scenario is moderate to high, if we nurture, nature will kick-in and surprise us, as humanity.

7.2. Modelling and simulation

Here (figure 4) is the Excel/Numbers mathematical model of the scenario components and mechanisms and their financial implications, to be used to simulate the scenarios, assist the policy-makers and help direct all stakeholders in generic manner.

The financial projections do suggest efforts being placed in obtaining multimodal funding lines on global, EU, regional, national and local level, while all other components are subject to manoeuvres to estimate what would happen if a component is checked in or not and if that happens what are its financial and technological implications. They are calculated for the next 2 decades i.e. 20 years.

Financial Projection of the scenarios and baseline for WHAT - IF & IF - THEN Analysis

Scenario	**Scenario I:** No systemic solutions in place, Degraded ecosystem habitat	**Scenario II:** Systemic solutions in place, Degraded ecosystem habitat	**Scenario III:** No systemic solutions in place, Regulated ecosystem habitat	**Scenario IV:** Systemic solutions in place (transboundary), Regulated ecosystem habitat
Expenditure item (technological, social, environmental, managerial)	**"Do nothing, don't care"**	**"Will our best be enough?"**	**"Positive Deviance"**	**"Nature & Nurture"**
Management/governance capacity and logistics - transnational				€ 10.000.000
Management/governance capacity and logistics - single country		€ 6.000.000		
Information systems and equipment - transnational				€ 8.000.000
Information systems and equipment - single country		€ 4.000.000	€ 5.000.000	
Expert and/or advisory HR capabilities		€ 6.000.000		€ 10.000.000
Alternative tourism investments		€ 30.000.000	€ 10.000.000	€ 40.000.000
Infrastructure		€ 30.000.000	€ 5.000.000	€ 40.000.000
Education, Engineering, Enforcement				€ 20.000.000
Other costs	€ 1.000.000	€ 15.000.000	€ 5.000.000	€ 20.000.000
TOTAL proximate costs for next 20 years (in EUR):	**€ 1.000.000**	**€ 91.000.000**	**€ 25.000.000**	**€ 148.000.000**
Scenario categorisation	Potential	Possible	Plausible	Preferable

Figure 4 - Financial projection of the scenarios as baseline for What-if and If-then analysis (Source: Authors)

As can be seen in the simulation and as pointed out in the feasibility elaborations, scenario I is continuing 'business as usual', so financially it notes just some sporadic investments and projects of 1 million EUR. Scenario II is focused on what stakeholders can do in order to organise themselves and govern and participate in the Doiran Lake system in probably single-country entities and actions. This scenario draws significant funding aimed at some technological changes, managerial aspects, alternative tourism investments and infrastructural investments - adding up to approximate 91 million EUR. Scenario III is more of witnessing the sporadic past efforts take place, do some investments in technology and alternative tourism and exemplify the rare positive deviances to mature slowly the social and human component. This scenario is not with great expenditures of 25 million EUR. The most preferable scenario IV is balanced in terms of employing all the stakeholders and nature - so it encompasses transnational socio-technical-environmental system and additional investments in education, engineering and enforcement of

affirmative main and supportive actions and regulations - projecting realistic 148 mil EUR for the next 2 decades.

Feasibility per component for IF - THEN / WHAT - IF Analysis and simulation

Scenario	**Scenario I:** No systemic solutions in place, Degraded ecosystem habitat	**Scenario II:** Systemic solutions in place, Degraded ecosystem habitat	**Scenario III:** No systemic solutions in place, Regulated ecosystem habitat	**Scenario IV:** Systemic solutions in place (transboundary), Regulated ecosystem habitat
Feasibility component (Feasible - Yes, No) & Undesired	**"Do nothing, don't care"**	**"Will our best be enough?"**	**"Positive Deviance"**	**"Nature & Nurture"**
TECHNOLOGICAL	Undesired	Yes	Yes	Yes
FINANCIAL	Undesired	Yes	Yes	Yes
SOCIAL	Undesired	No	Yes	Yes
ENVIRONMENTAL	Undesired	Undesired	Yes	Yes
TOTAL proximate costs for next 20 years (in EUR):	**€ 1.000.000**	**€ 91.000.000**	**€ 25.000.000**	**€ 148.000.000**
Scenario categorisation	Potential	Possible	Plausible	Preferable
Feasibility assessment (overall, per scenario)	**FEASIBLE & UNDESIRED**	**NOT FEASIBLE**	**FEASIBLE**	**FEASIBLE**

Figure 5 - Feasibility per scenario component analysis and simulation (Source: Authors)

The assessment of the feasibility of the scenarios per component and overall is in the following simulation.

As visible (figure 5), scenario I is feasible in terms of it will happen, but in negative connotation as undesired. Scenario II is not feasible, since the single-sided efforts are not to be encouraged and promoted, they represent a significant expenditure but little effectiveness on the true needs of Lake Doiran and its basin environment. Scenario III is encouraged as feasible, since the financial aspects are manageable, and it allows for iterative co-evolution of the complex adaptive socio-technical-environmental system. Scenario IV as preferable is complete in all directions, and with rather manageable financial component, it allows for proper and prosperous interaction of humans and nature.

PART III – LONG TERM STRATEGIES FOR DEVELOPMENT

8. Long-term strategies

8.1. Development objectives

The development for the Doiran Lake would be towards facilitating developments towards track for Scenario 4 - 'Nature and Nurture'. However, the other two scenarios: Scenario 2 - 'Will our best be enough' and Scenario 3 - 'Positive deviance' have been subject to discussion among stakeholders too. The public consultations realised by DETRA among the Doiran Lake stakeholders, have been informative, served as input for the study process, but also validation of the proposed scenarios and axes, and strategic sense-making in general, thus prioritising the action plans proposed by the long-term strategies.

That would mean, the stakeholders, and especially the ones in the governing role, need to ensure the following diverse development objectives:

- Divert lake tourism towards other types of tourism discussed in the previous headings
- Manage and reduce to zero the pollutants into the lake
- Maintain the governance around the specified outcomes, regardless of the circumstances
- Always keep the big picture and multi-stakeholder view when making decisions for the lake ecosystem (including inhabitants)
- Perform management, reasoning and actions according to the watershed boundary, treating the Doiran Lake as whole (eco)system, integrating resources, natural components and treating integral components (not discrete units), with this transcending the existing geopolitical boundaries
- Utilising limited resources (sharing economy) and avoiding duplication of activities
- Increase of the capacity of the sewage system to be able to parallel the hype periods of tourist visitors
- Control of biggest pollutants and entities that are dropping waste-water directly into the lake

- Water supply system (designed for about 3000 inhabitants, in summer reaching more than double of the number)
- Controlled (and minimal) use of the water for irrigation
- New Detailed Urbanistic Plan to come to force, for regulation of urbanistic activities and investments
- New concept for tourism where swimming is not the main focus or is omitted completely (eco-tourism, clean air, historical sightseeing, sports, walking, biking & hiking tours, conference tourism, winter tourism, sports teams preparations, country-tourism, dental tourism and medical tourism, paragliding, …) and canoe, kayak, standup paddle board use of the lake
- Waste selection and waste management facilities
- State support (grants, funding, subsidies, …) and promotion
- Inspections and sanctioning to be in place
- Tourist tax collection in reality (for example, in summer season, tax per bed, regardless of number of visitors, since all capacities are filled)
- Revision of the categorisation of tourist facilities (with professional principles)
- Public awareness for tax collection and proper public money use and transparency
- Outflow channel to be opened from Greek side, to purify the water of the lake
- Reduction of the political parties schemes that influence the long term sustainability of the Doiran Lake
- All-year-long activities to keep employees active and not have idle paid periods
- Inspection of use of drinking water for irrigation resulting with lower water pressure and supply
- Transit tourism can find a stopping point in Doiran Lake area, with restaurant and short-stay accommodation facilities (bed & breakfast)
- Road infrastructure
- Diversification of the tourist offerings
- Side-activities for preservation of the biodiversity and natural environment
- Merging of the municipality of Doiran with municipality of Bogdanci in order to reduce administrative costs and achieve greater efficiency
- Country-level relaxation of the conditions for foreign investments
- Erasmus+ and other projects that help build capacity among the intellectuals that can learn and try to implement best practices
- Establish a Center of culture, for theatres, concerts, …
- Have at least one Bank Branch
- Regulated parking places for the top tourist season
- A good narrative for promotion, inviting story, …
- Coastline beautification
- Organisation of cultural summers, festivals

- Regulation of stay in parks, procedures for waste collection of such visitors (Roma groups from Strumica and Radovis)
- Investments from local investors, not to have everything centralised from Skopje
- Higher level of hygiene, obligations, sanctions
- Restriction for heavy vehicles in peak hours, or ring road
- Best practices - Lake Como - Italy; Medulin - Croatia
- Better road signs, direction signs to be installed
- Regulation of supply of goods hours
- Historical landmarks and sites
- World War I historical sites - french and english tours
- Irrigation problem to be solved by the project 'Southern Vardar'
- Acquisition of waste management equipment (with Kilkis municipality)
- Wasteland clearance situated near habitat

8.2. SWOT analysis

SWOT ANALYSIS for DOIRAN and DOIRAN LAKE

STRENGTHS (+)	WEAKNESSES (-)
✓ Protected area under the Law on Nature Protection ✓ Dojran Lake - Monument of Nature (according of special law) ✓ Area of international importance under the Ramsar Convention ✓ Part of the Emerald Network (for areas of particular conservation interest) ✓ Identified as NATURA 2000 Area according to EU Birds and Habitats Directives ✓ Water bodies shared with a European country ✓ A wealth of plant species ✓ Rich biodiversity: - 5 habitats, - Source of 15 fish species, - About 94-96 birds, - High diversity of amphibian and reptile species in the Dojran region (73% of all amphibians and 69% of all reptiles recorded nationally) ✓ Important habitat for many (migratory) birds and endemic species ✓ Significant hydrological resource for settlements and agricultural land ✓ Traditional way of fishing with the help of birds in reed fences, the so-called Mandri ✓ Increasing numbers of tourists ✓ Warmest region- number of sunny days	✓ Drastic water level drop (water use for crop irrigation) ✓ Inadequate wastewater treatment ✓ Highly sensitive to climate and anthropogenic changes ✓ Serious changes in the structure of the Algal microflora ✓ Changes in the reed zone and other aquatic macrophytic vegetation ✓ Low-budget seasonal destination ✓ Disruption of the natural and ecological balance and biodiversity in the lake water ✓ Incomplete control over the use of water and natural resources ✓ Intensified coastal urbanization and accelerated adoption of Tourism Development Zones Plans ✓ There is no continuity in management, only partially through projects ✓ There is no body for transboundary management of water basins ✓ Active seismic area ✓ Water load with organic waste ✓ Low awareness of the importance of water habitat ✓ Concentrations of dissolved inorganic matter as well as accumulation of organic matter from extinct organisms ✓ Classified in poor environmental status ✓ Migration of youth

OPPORTUNITIES (+)	THREATS (-)
✓ Increasing the capacity of the Municipality to protect and improve lake conditions	✓ Legislation
✓ Programs and initiatives for increasing public awareness for importance of biodiversity	✓ Disrespect and non-implementation of projects, programs and strategies
✓ Supporting multi-stakeholder platforms	✓ Politicization
✓ Collaboration with Universities and Research Centers in the country	✓ Corruption
✓ Collaboration with ZOO garden	✓ Environmental pollution
✓ CSO activities and projects	✓ Political situation in the country and the region,
✓ Maintain a regional partnership for water resources management	✓ Economic crises at European and world level
✓ Develop Crowdfunding Campaigns	✓ Climate change and natural disasters
✓ Active use of active funds, prepared staff in the municipality	✓ Population aging
✓ Partnerships of the civil, public and business sectors,	✓ National management of natural resources
✓ Using technology and digitized database of cultural and natural heritage	✓ Migration of the population to other cities of the country and abroad
✓ Encouraging organic production	✓ Threats from natural origin
✓ Cooperation with foreign universities and visiting student groups	✓ Institutional awareness of the importance of the diversity
✓ Development of alternative tourism	✓ The National Biodiversity Information System and the national biodiversity monitoring system are not operational
✓ Development of internships for undergraduates or dispersed studies in biology	✓ Threat of contamination of the Lake biota with As, Cu and Ni
✓ Establishment of training centers	
✓ Establishing a database and mapping the tourism economy	
✓ Tourism related to the study of unique flora and fauna	
✓ Continuation of active cross-border cooperation with the Republic of Greece (establishment of a cross-border management body)	
✓ Active work on specific environmental issues	
✓ Conducting biological research.	

Figure 6 - SWOT analysis for Doiran Lake (Source: Authors)

Figure 6 is outlining the SWOT analysis findings for Doiran Lake, performed in encompassing but generic manner, to be useful for the further steps in the study and to initiate further in-depth investigation and potential analysis for any interested domain, party, stakeholder or researcher.

8.3. Identification of key strategies (must do & can do) and tactical management recommendations to policy-makers

When in position to identify the most necessary 'must do' and 'can do' derived from the strategic foresight as a point in the future where we would like to see scenario 4 'Nature & Nurture' happen, we are relying on our research findings, interviews, public consultations and discussions to prioritise and recommend. Here are the most urgent key components of the strategy for Doiran Lake along with the necessary **"must do's"**, which are incorporated into the tactical management recommendations further on:

A. Develop **transnational (cross-country)** standpoint & viewpoint on Lake Doiran touristic development and promote accordingly (not as two countries with separate amenities, but as one touristic destination/stopping point with things to offer, according the watershed boundary)

B. Activate all possible EU and global **knowhow**, **funding**, expertise and **networks and platforms (managerial, informational, of entities and experts, …)** to assist the lake to be salvaged from crossing the point of no return

C. Establish at least 5 new concepts for **alternative tourism** (where swimming is not the main focus or is omitted completely!) Such as eco-tourism, clean air, historical sightseeing, sports, walking, biking & hiking tours, conference tourism, winter tourism, sports teams preparations, country-tourism, dental tourism and medical tourism, paragliding, … and canoe, kayak, standup paddle board use of the lake

D. Examine **best practices** (Lake Como - Italy; Medulin - Croatia) and act accordingly in 'copy-paste special' (not 'copy-paste') manner to iterate towards improvement

E. Practice **participatory reasoning and action**, point out and praise **positive deviations** in order to overcome political short-term planning and action to be substituted with effective purpose and vision for the future of all in the ecosystem, facilitating co-evolution and co-creation

F. Agree on a **cross-country governing & overseeing body** that has sufficient authority to facilitate changes but relies on principles of mutual alignment and understanding

G. Regulate **infrastructure** for drinking water & waste water, as well as roads

H. **Educate, Engineer, Enforce preservation** of the lake water habitat and bio-diversity according high-level priorities and recommendations - primarily pollution and irrigation, and secondarily - activities in the lake; all this towards **restoration and sustainable future**

I. Establish **multidirectional stakeholder collaboration** and involvement on centralised and decentralised level in both countries and with EU

The following **"can do's"** directions can assist the strategic guidelines towards more effective activation but also motivation, visibility of positive change and stakeholder involvement in the Lake Doiran improvement:

J. Utilisation of limited resources according the sharing economy and the circular economy principles, on individual and collective level

K. Control of biggest pollutants and entities that are dropping waste-water directly into the lake

L. New Detailed Urbanistic Plan and regulation of urbanist activities and investments, complemented with rapid urbanisation effective workflow

M. State support (grants, funding, subsidies, …) and promotion

N. Deploy inspections and sanctioning as significant factor

O. Streamline tourist tax collection and proper and transparent use of public funds

P. Revision of the categorisation of tourist facilities (with professional principles)

Q. Regulate water use for irrigation on both sides

R. Introduce all-year-long activities to keep employees active and not have idle paid periods

S. Establish direct communication and collaboration with Kilkis region

T. Promote transit tourism can find a stopping point in Doiran Lake area, with restaurant and short-stay accommodation facilities (bed & breakfast)

U. Merging of the municipality of Doiran with municipality of Bogdanci in order to reduce administrative costs and achieve greater efficiency

V. Educate on funding in order to obtain cross-boundary projects that regulate aspects of the big-picture in cross-country manner

W. Establish a Center of culture, for theatres, concerts, …

X. Establish Bank Branches and facilities for regular tourists

Y. Maintain the cleanness and beautify the coastline through individual and collective efforts

Z. Promote historical landmarks and sites (World War I historical sites - french and english tours)

8.4. Goals

To be able to articulate and translate the vision, through the strategic directions with tactics into operational actions, we need to formulate them into comprehensive and understandable steps and components to be able to achieve the goals.

In general, the **goals** embody achieving step by step, iterative, system design, big-picture & context appropriate affirmative transnational action and collaboration, with priority to stopping further damage to the Lake biodiversity and ecosystem, and set the scene for sustainable restoration of the entire Doiran Lake area, involving, motivating and facilitation participation from step 0 and continuously of all stakeholders and countries.

The goal of the **visioning** is to answer the question: ***Where would we like Doiran to be in 2040?*** The answer is: in scenario IV - Nature & Nurture, as a Preferable and Feasible future.

To the question: *Which are the* **strategic choices** *and principles for getting there*, we would enlist:

- Sustainable water management of Dojran lake (water quality, level, usage)
- Restoring biodiversity and socio-technological-ecological integrity of the whole basin
- Approaching Doiran Lake as transboundary (cross-boundary) area where good collaboration is needed by all means

- Out of the rich offering of strategic management methods, we are suggesting the Problem Driven Iterative Adaptation - PDIA by Harvard University Center for International Development as strategy for complexity[10] (Andrews et al., 2017)

The next issue would be on **tactical management**: *How to configure ourselves to achieve the strategy?* And the tactical guidelines and goals would be:

- Transnational governance
- Activate all possible knowhow
- Alternative tourism predominantly near the lake (not in it)
- Capabilities: HR expertise, advisory and consultancy in best practices and copy-paste special approach
- Participatory reasoning and actions, positive deviations
- Infrastructure (water, roads, …)
- Educate, Engineer, Enforce preservation of the lake water habitat and biodiversity
- Multidirectional stakeholder collaboration
- Out of the scarce variety of managerial methods for complex problems, we are suggesting the DENICA method for tactical management (system of roles and accountabilities, information sensors, information emitters and risks) as applicable for implementation among multiple stakeholders and in projects, encompassing management, management information systems and complexity for the new era[11] (Petrevska Nechkoska, 2019)
- Sense-Interpret-Decide-Act Loop and Plan-Do-Check-Act Loop on each iteration

8.5. Action plans

The action plans need to have some structure and integrated capability of adaptability. It is important to iterate and revise in ongoing manner, since complex problems in complex adaptive systems cannot be planned and rigidly implemented but a lot of adaptation is needed.

The action plans suggested in this study, need to be further detailed and worked upon their operationalisation, while keeping the generic consistency.

Action plan steps:

✦Involve high level top experts (in environment, biodiversity, oceanology, environmental management, …) into comprehensive investigation on systemic design how to restore the lake biodiversity and water management

[10] https://bsc.cid.harvard.edu

[11] http://tactical-management-in-complexity.com

- ✦Appoint initially two entities from both countries to facilitate funding acquisition for the environmental priority (authority)
- ✦Involve all stakeholders in the activities, for inputs, evaluation, validation - gaining all on board (acceptance)
- ✦Obtain funding for the urgent project (ability, resources) and encourage quick wins and positive deviations
- ✦Establish transnational governing body
- ✦Build capacity on local, regional, national and international level among all stakeholder profiles by exploring best practices and copy-paste special context appropriate solutions and actions
- ✦Address simultaneously (not consecutively) the social, the technological and the environmental aspects
- ✦Establish horizontal, vertical, top-down, bottom-up and lateral communication among all stakeholders upon positive and negative developments to be able to reconfigure the managerial/governing system
- ✦Continuously check for acceptance, effects, problems, risks - to assess and reconfigure where necessary
- ✦Iterate towards nature & nurture scenario outcomes are visible and sustained

The Figure 7 below encompasses the recommendations from vision through strategy and tactics into actions.

VISION THROUGH STRATEGY AND TACTICS INTO ACTIONS
COMPONENTS & WORKFLOW

VISION	STRATEGY	TACTICS	ACTIONS
Where would we like Doiran to be in 2040?	**Strategic choices and principles for getting there?**	**How to configure ourselves to achieve the strategy? (DENICA method for tactical management)**	**What is the best way to do it? (Problem Driven Iterative Adaptation - PDIA strategy into action)**
Nature & Nurture	Sustainable water management of Dojran lake (water quality, level, usage)	Transnational governance	Involve high level top experts (in environment, biodiversity, oceanology, environmental management, ...) into comprehensive investigation on systemic design how to restore the lake biodiversity and water management
Scenario IV	Restoring biodiversity and socio-technological-ecological integrity of the whole basin	Activate all possible knowhow	Appoint initially two entities from both countries to facilitate funding acquisition for the environmental priority (authority)
Preferable	Approaching Doiran Lake as transboundary (cross-boundary) area where good collaboration is needed by all means	Alternative tourism predominantly near the lake (not in it)	Involve all stakeholders in the activities, for inputs, evaluation, validation - gaining all on board (acceptance)
Feasible		HR expertise, advisory and consultancy in best practices and copy-paste special approach	Obtain funding for the urgent project (ability, resources) and encourage quick wins and positive deviations
		Participatory reasoning and actions, positive deviations	Establish transnational governing body
		Infrastructure (water, roads, ...)	Build capacity on local, regional, national and international level among all stakeholder profiles by exploring best practices and copy-paste special context appropriate solutions and actions
		Educate, Engineer, Enforce preservation of the lake water habitat and biodiversity	Address simultaneously (not consecutively) the social, the technological and the environmental aspects
		Multidirectional stakeholder collaboration	Establish horizontal, vertical, top-down, bottom-up and lateral communication among all stakeholders upon positive and negative developments to be able to reconfigure the managerial/ governing system
		DENICA method for tactical management (system of roles and accountabilities, information sensors, information emitters and risks)	Continuously check for acceptance, effects, problems, risks - to assess and reconfigure where necessary
		Sense-Interpret-Decide-Act Loop and Plan-Do-Check-Act Loop on each iteration	Iterate towards nature & nurture scenario outcomes are visible and sustained

Figure 7 - Strategic, tactical and action plans (Source: Authors)

The action plans drafted are in direction of helping achieve the preferable scenario IV of 'Nature and Nurture' - meaning both human actors in individual and collective terms as well as the nature are doing their best to salvage and sustain Lake Doiran socio-economical-technical-environmental developments.

The outlined action plans are as follows:

- Action Plan 1 - **Top down governance impulse, lateral expertise with public consultations adjustments** (Figure 8)
- Action Plan 2 - **Education, Engineering, Enforcement, Environment - in action** (Figure 9)
- Action Plan 3 - **the Infrastructure of all** (Figure 10)
- Action Plan 4 - **All about the Lake water quality and biodiversity** (Figure 11)
- Action Plan 2 - **Alternative tourism alternatives** (Figure 12)

In each of the action plans the activities, the responsible actors, the expected outcomes, the annual and the total budget for the two decades (from 2020 till 2040) have been calculated, as well as a reference on duration, frequency, deadlines and recurrence, and reference to the key strategic components of the 'must do' and 'can do' strategic priorities from heading 8.3 have been enlisted.

These action plans need to be further on subject to public consultation with broad range of stakeholders and then reassessed and brought to life.

The final consultations with the stakeholders and the analysis input from DETRA to reflect priorities in the action plans, have been incorporated in this study, according the following findings:

First level priorities (must): Control of the biggest polluters that pollute the lake directly, New detailed urbanistic plan and regulation of the urbanistic plans and investments, State support; promotion, Active inspections and sanctioning, Regular collection and transparent use of the tourist tax, Regulation of water for irrigation, Activities throughout the year, Communication and direct collaboration with Kilkis and the entire region, Promotion of transite bed&breakfast tourism, Education of the municipality staff for grants, Center of culture, Bank branches, Coastline cleanness and beautification, General culture improvement, Care for the lake. **Second level priorities (should):** Use of the limited resources on individual and collective level and Revision of the categorisation of accommodation capacities, **while third level priorities (could)** enlist Merger of Doiran municipality with Bogdanci municipality and Promotion of amenities (such as the World War I front). The detailed process, analysis as well as individual surveys and interviews, conducted by DETRA are conducted by DETRA are in appendix of this report too.

Action Plan 1 - **Top down governance impulse, lateral expertise with public consultations adjustments**

Action Plan 1 - Top down governance impulse, lateral expertise with public consultations adjustments

Activity	Responsible	Annual budget	Total budget	Duration/ Frequency	Outcome	Key strategic components:	Deadline (visible effects)
Gather transboundary teams that worked in the past to discuss priorities	Governance stakeholders from North Macedonia and Greece, also from EU and Environmental global bodies	€ 30.000	€ 150.000	6 months per year (5 iterations in the upcoming 20 years)	Aligned priorities on country, bilateral, regional, EU and global level, Written report	A, B, D, E, F, I	December 2020 (Recurrent)
Public consultation for the proposed priorities (in person)	All stakeholders (according Fig. 1)	€ 15.000	€ 75.000	2 months per year (after each priority gathering)	Acceptance and adjustment ideas and recommendations for priorities	A, B, E, I	February 2021 (Recurrent)
Invite and gather relevant global and local experts from managerial, informational, environmental, and other connected profiles to outline methods and techniques for management and operationalisation of activities	Experts (global and local), transboundary team representatives, local stakeholders (municipality, businesses,	€ 30.000	€ 150.000	3 months per year (5 iterations in the upcoming 20 years)	Specific action plans aligned with the strategic priorities	A, B, D, E, H, I	May 2021 (Recurrent)
Public consultation for the proposed methods and techniques for management and operationalisation (in person)	All stakeholders (according Fig. 1)	€ 15.000	€ 75.000	2 months per year (after each expert gathering)	Acceptance and adjustment ideas and recommendations for priorities	A, B, E, I	July 2021 (Recurrent)
Assemble a transnational team of experts, policy-makers and local stakeholders to outline & re-assess alternative tourism directions	Experts, policy-makers and local stakeholders	€ 30.000	€ 300.000	3 months per year (10 iterations in the upcoming 20 years)	Alternative tourism guidelines for policy-makers	B, C, E, U	October 2021 (Recurrent)

Action Plan 1 - Top down governance impulse, lateral expertise with public consultations adjustments

Activity	Responsible	Annual budget	Total budget	Duration/ Frequency	Outcome	Key strategic components:	Deadline (visible effects)
Public consultation for the proposed methods and techniques for management and operationalisation (in person)	All stakeholders (according Fig. 1)	€ 15.000	€ 75.000	2 months per year (after each gathering)	Acceptance and adjustment ideas and recommendations for priorities	A, B, E, I	December 2021 (Recurrent)
Appoint team of relevant environmental experts, oceanologists, biologists, … to outline and address restoration of the Lake Doiran biodiversity and water quality	Experts	€ 24.000	€ 240.000	Monthly full-time and/or advisory relation	Reporting on as-is situation, outline of to-be in stages, reconfiguration upon changes in context and (un)desirable developments	A, B, D, H	From June 2020 onwards
Establishment of Doiran Lake cross-country governing and overseeing body (D.oiran CCG&OB)	Governmental (central and local) stakeholders from both countries and global institutional representatives as advisory board	€ 360.000	€ 3.600.000	Monthly full-time and/or advisory relation	Facilitation of actions and developments towards desired outcomes (managerial and informational)	A, B, C, D, E, F, G, H, I	From January 2021 onwards
Engage information systems engineers and management information systems engineers, practitioners (transnational) to investigate and make best approach for MIS on the entire ecosystem	Experts, policy-makers and local stakeholders	€ 120.000	€ 1.200.000	12 months	Blueprint for multimodal information system (managerial, environmental, technical) - up to date with big data, tactical data, strategic data and adaptability to changes	A, B, F, H	January 2022
Public consultation for the proposed IS and MIS concept	All stakeholders (according Fig. 1)	€ 15.000	€ 30.000	2 months per year (after alpha blueprint and after beta blueprint)	Acceptance and adjustment ideas and recommendations for the IS and MIS concept	A, B, E, I	June 2022 and January 2022

Action Plan 1 - Top down governance impulse, lateral expertise with public consultations adjustments

Activity	Responsible	Annual budget	Total budget	Duration/ Frequency	Outcome	Key strategic components:	Deadline (visible effects)
					MIS concept		
Design and implement information system and management information system for Doiran Lake transnational governance (basic package)	Experts, policy-makers and local stakeholders	€ 2.000.000	€ 2.000.000	36 months	Implemented IS and MIS transnational multi-stakeholder system	A, B, F, H	'January 2025
Public consultation for the proposed IS and MIS additional features and modules	All stakeholders (according Fig. 1)	€ 15.000	€ 30.000	2 months per year (after year 1 of use and after year 2 of use)	Acceptance and adjustment ideas and recommendations for the IS and MIS features and modules	A, B, E, I	June 2026 and January 2027
Design and implementation of additional features and modules of the information system and management information system for Doiran Lake transnational governance (basic package)	Experts, policy-makers and local stakeholders	€ 1.000.000	€ 1.000.000	36 months	Implemented IS and MIS transnational multi-stakeholder system	A, B, F, H	January 2025
Doiran Lake cross-country governing and overseeing body (D.oiran CCG&OB) outreach activities - conferences, forums, networks, …	All stakeholders (according Fig. 1)	€ 1.000.000	€ 1.000.000	Continuously during its existence	Outreach activities and artefacts	A, B, E, I	Continuously after establishment
Other unforeseen costs	Doiran Lake cross-country governing and overseeing body (D.oiran CCG&OB) and stakeholders	€ 4.000.000	€ 4.000.000	20 years overall	Adaptation, novel ideas, worst case scenarios, …	A-Z	20 years overall
TOTAL:			**€ 13.925.000**				

Figure 8 - Action Plan 1 details (Source: Authors)

Action Plan 2 - **Education, Engineering, Enforcement, Environment - in action**

Action Plan 2 - Education, Engineering, Enforcement, Environment - in action

Activity	Responsible	Annual budget	Total budget	Duration/ Frequency	Outcome	Key strategic components:	Deadline
Gather transboundary teams that worked in the past to discuss Educational, Engineering, Enforcement and Environmental aspects to carry out the transnational strategy for Doiran Lake	Governance stakeholders from North Macedonia and Greece, also from EU and Environmental global bodies	€ 30.000	€ 150.000	6 months per year (10 iterations in the upcoming 20 years)	Filtering the as-is situation in Political, Economical, Societal, Technological, Legal, Environmental (PESTLE) terms and outlining next steps	A-Z	December 2021 (Recurrent)
Public consultation for the proposed concepts (in person)	All stakeholders (according Fig. 1)	€ 15.000	€ 150.000	2 months per year (after each reconceptualisation)	Acceptance and adjustment ideas and recommendations for priorities	A-Z	February 2022 (Recurrent)
Educational activities in all directions	Experts (global and local), transboundary team representatives, local stakeholders (municipality, businesses, citizens, farmers, …)	€ 60.000	€ 1.080.000	Throughout all the year (in duration of 18 years)	Educational activities - trainings, workshops, conferences, e-learning courses and modules, coaching, twinning, …	A-I	From March 2022 onwards (Recurrent)
Engineering activities in all directions	Experts (global and local), transboundary team representatives, local stakeholders (municipality, businesses, citizens, farmers, …)	€ 60.000	€ 1.080.000	Throughout all the year (in duration of 18 years)	Engineering activities to facilitate fulfilment of conceptual plans (urban, societal, environmental, legal, …)	A-Z	From March 2022 onwards (Recurrent)
Enforcement activities in all directions	Experts (global and local), transboundary team representatives, local stakeholders (municipality, businesses, citizens, farmers, …)	€ 60.000	€ 1.080.000	Throughout all the year (in duration of 18 years)	Enforcement of sanctions, penalties, … to facilitate enforcement of rules, regulations, plans, engagements, acceptance, depolitisation, …	A-I	From March 2022 onwards (Recurrent)

Action Plan 2 - Education, Engineering, Enforcement, Environment - in action

Activity	Responsible	Annual budget	Total budget	Duration/ Frequency	Outcome	Key strategic components:	Deadline
	businesses, citizens, farmers, …)				legal, …)		
Enforcement activities in all directions	Experts (global and local), transboundary team representatives, local stakeholders (municipality, businesses, citizens, farmers, …)	€ 60.000	€ 1.080.000	Throughout all the year (in duration of 18 years)	Enforcement of sanctions, penalties, … to facilitate enforcement of rules, regulations, plans, engagements, acceptance, depolitisation, …	A-I	From March 2022 onwards (Recurrent)
Environmental component intervention in all reasoning and actions	Experts (global and local), transboundary team representatives, local stakeholders (municipality, businesses, citizens, farmers, …)	€ 60.000	€ 1.080.000	Throughout all the year (in duration of 18 years)	Environmental systemic, big-picture, long-term sustainable actions and reactions	A-Z	From March 2022 onwards (Recurrent)
Other unforeseen costs	Doiran Lake cross-country governing and overseeing body (D.oiran CCG&OB) and stakeholders	€ 4.000.000	€ 4.000.000	20 years overall	Adaptation, novel ideas, worst case scenarios, …	A-Z	20 years overall
TOTAL:			**€8.620.000**				

Figure 9 - Action Plan 2 details (Source: Authors)

Action Plan 3 - **the Infrastructure of all**

Action Plan 3 - the Infrastructure of all

Activity	Responsible	Annual budget	Total budget	Duration/ Frequency	Outcome	Key strategic components:	Deadline
Drinking water infrastructure concept	Relevant municipality and domain-specific engineers and experts, D.oiran CCG&OB representatives	€ 60.000	€ 60.000	4 months (once)	Concept for the drinking water infrastructure	G, J-Z	May 2021
Public consultation for the drinking water infrastructure concept	All stakeholders (according Fig. 1)	€ 15.000	€ 15.000	2 months	Acceptance and adjustment ideas and recommendations for drinking water concept	A, B, G, E, I	July 2021
Drinking water infrastructure alignment and reconfiguration	Doiran Lake cross-country governing and overseeing body (D.oiran CCG&OB)	€ 20.000	€ 380.000	1 month (yearly)	Drinking water infrastructure concept reassessment, reconfiguration and updates	G, J-Z	September 2021 (Recurrent)
Drinking water infrastructure construction and implementation	Appointed companies overseen by the D.oiran CCG&OB	€ 3.000.000	€ 15.000.000	During 5 years	Infrastructure with increased and appropriate drinking water capacity	G, J-Z	July 2026
Waste water infrastructure concept	Relevant municipality and domain-specific engineers and experts, D.oiran CCG&OB representatives	€ 100.000	€ 100.000	4 months (once)	Concept for the waste water infrastructure	G, J-Z	'May 2023
Public consultation for the waste water infrastructure concept	All stakeholders (according Fig. 1)	€ 15.000	€ 15.000	2 months	Acceptance and adjustment ideas and recommendations for waste water concept	A, B, G, E, I	'July 2023
Waste water infrastructure alignment and reconfiguration	Doiran Lake cross-country governing and overseeing body (D.oiran CCG&OB)	€ 20.000	€ 380.000	1 month (yearly)	Waste water infrastructure concept reassessment, reconfiguration and updates	G, J-Z	September 2023 (Recurrent)

Action Plan 3 - the Infrastructure of all

Activity	Responsible	Annual budget	Total budget	Duration/ Frequency	Outcome	Key strategic components:	Deadline
Waste water infrastructure construction and implementation	Appointed companies overseen by the D.oiran CCG&OB	€ 5.000.000	€ 25.000.000	During 5 years	Infrastructure with increased and appropriate waste water capacity	G, J-Z	July 2031
Road infrastructure concept	Relevant municipality and domain-specific engineers and experts, D.oiran CCG&OB representatives	€ 200.000	€ 200.000	4 months (once)	Concept for the road infrastructure	G, J-Z	'May 2023
Public consultation for the road infrastructure concept	All stakeholders (according Fig. 1)	€ 15.000	€ 15.000	2 months	Acceptance and adjustment ideas and recommendations for road infrastructure	A, B, G, E, I	'July 2023
Road infrastructure alignment and reconfiguration	Doiran Lake cross-country governing and overseeing body (D.oiran CCG&OB)	€ 50.000	€ 950.000	1 month (yearly)	Road infrastructure concept reassessment, reconfiguration and updates	G, J-Z	September 2023 (Recurrent)
Road infrastructure construction and implementation	Appointed companies overseen by the D.oiran CCG&OB	€10.000.000	€ 50.000.000	During 5 years	Highly functional road infrastructure	G, J-Z	July 2031
Reconfiguration and maintenance	Appointed companies overseen by the D.oiran CCG&OB	€ 100.000	€ 2.000.000	20 years	Reconfigured and up-to-standards infrastructure	G, J-Z	20 years overall
Other unforeseen costs	Doiran Lake cross-country governing and overseeing body (D.oiran CCG&OB) and stakeholders	€ 4.000.000	€ 4.000.000	20 years overall	Adaptation, novel ideas, worst case scenarios, …	A-Z	20 years overall
TOTAL:			**€98.115.000**				

Figure 10 - Action Plan 3 details (Source: Authors)

Action Plan 4 - **All about the Lake water quality and biodiversity**

Action Plan 4 - All about the Lake water quality and biodiversity

Activity	Responsible	Annual budget	Total budget	Duration/ Frequency	Outcome	Key strategic components:	Deadline
Concept for investment into nearby area to stop further devastation of the lake water and habitat	Relevant municipality and domain-specific engineers and experts, D.oiran CCG&OB representatives	€ 50.000	€ 300.000	2 months (every 3 years)	Concept for stopping further devastation of the lake water and habitat	A, E, F, H	March 2021
Public consultation for the concept	All stakeholders (according Fig. 1)	€ 15.000	€ 15.000	2 months (after every concept and reconfiguration)	Acceptance and adjustment ideas and recommendations for lake water concept	A, B, G, E, H, I	May 2021
Realisation of the concept for investment into nearby area to stop further devastation of the lake water and habitat	D.oiran CCG&OB appointed entities	€ 1.000.000	€ 6.000.000	10 months (every 3 years)	Regulated lake biodiversity and habitat - stopped from further devastation	A, E, F, H	March 2022 (recurrent)
Concept for investment into nearby area to sustain, restore and improve the lake water and habitat	Relevant municipality and domain-specific engineers and experts, D.oiran CCG&OB representatives	€ 50.000	€ 300.000	2 months (every 3 years)	Concept for sustainable restoration of the lake water concept	A, E, F, H	May 2022
Public consultation for the concept	All stakeholders (according Fig. 1)	€ 15.000	€ 15.000	2 months (after every concept and reconfiguration)	Acceptance and adjustment ideas and recommendations for lake water concept	A, B, G, E, H, I	July 2022
Realisation of the concept for investment into sustain, restore and improve the lake water and habitat	D.oiran CCG&OB appointed entities	€ 1.000.000	€ 6.000.000	10 months (every 3 years)	Regulated lake biodiversity and habitat - stopped from further devastation	A, E, F, H	March 2023 (recurrent)

Action Plan 4 - All about the Lake water quality and biodiversity

Activity	Responsible	Annual budget	Total budget	Duration/ Frequency	Outcome	Key strategic components:	Deadline
	1)			reconfiguration)	recommendations for lake water concept		
Realisation of the concept for investment into sustain, restore and improve the lake water and habitat	D.oiran CCG&OB appointed entities	€ 1.000.000	€ 6.000.000	10 months (every 3 years)	Regulated lake biodiversity and habitat - stopped from further devastation	A, E, F, H	March 2023 (recurrent)
Reconfiguration and maintenance	Appointed companies overseen by the D.oiran CCG&OB	€ 100.000	€ 2.000.000	20 years	Reconfigured and up-to-standards water quality and biodiversity systems	G, J-Z	20 years overall
Other unforeseen costs	Doiran Lake cross-country governing and overseeing body (D.oiran CCG&OB) and stakeholders	€ 4.000.000	€ 4.000.000	20 years overall	Adaptation, novel ideas, worst case scenarios, …	A-Z	20 years overall
TOTAL:			**€18.630.000**				

Figure 11 - Action Plan 4 details (Source: Authors)

Action Plan 5 - **Alternative tourism alternatives**

Action Plan 5 - Alternative tourism alternatives

Activity	Responsible	Annual budget	Total budget	Duration/ Frequency	Outcome	Key strategic components:	Deadline
Gather transboundary teams that worked in the past to discuss alternative tourism concepts	Governance stakeholders from North Macedonia and Greece, also from EU and Environmental global bodies	€ 30.000	€ 30.000	6 months	Aligned alternative tourism concept on country, bilateral, regional, EU and global level, Written report	A, B, C, D, E, F, I	June 2021
Public consultation for the proposed alternatives in alternative tourism (in person)	All stakeholders (according Fig. 1)	€ 15.000	€ 15.000	2 months	Acceptance and adjustment ideas and recommendations for alternative tourism alternatives	A, B, C, E, I	August 2021
Affirmative actions on alternatives in the alternative tourism direction 1	Experts (global and local), transboundary team representatives, local stakeholders (municipality, businesses,	€ 100.000	€ 400.000	Monthly (in duration of 4 years)	Buildings, events, communication, … for bringing to life of the planned alternatives	A, B, C, D, E, F, I, J-Z	From September 2021 (Recurrent)
Affirmative actions on alternatives in the alternative tourism direction 2	Experts (global and local), transboundary team representatives, local stakeholders (municipality, businesses,	€ 100.000	€ 400.000	Monthly (in duration of 4 years)	Buildings, events, communication, … for bringing to life of the planned alternatives	A, B, C, D, E, F, I, J-Z	From September 2021 (Recurrent)
Affirmative actions on alternatives in the alternative tourism direction 3	Experts (global and local), transboundary team representatives, local stakeholders (municipality, businesses,	€ 100.000	€ 400.000	Monthly (in duration of 4 years)	Buildings, events, communication, … for bringing to life of the planned alternatives	A, B, C, D, E, F, I, J-Z	From September 2021 (Recurrent)

Action Plan 5 - Alternative tourism alternatives

Activity	Responsible	Annual budget	Total budget	Duration/ Frequency	Outcome	Key strategic components:	Deadline
Affirmative actions on alternatives in the alternative tourism direction 4	Experts (global and local), transboundary team representatives, local stakeholders (municipality, businesses,	€ 100.000	€ 400.000	Monthly (in duration of 4 years)	Buildings, events, communication, … for bringing to life of the planned alternatives	A, B, C, D, E, F, I, J-Z	From September 2021 (Recurrent)
Affirmative actions on alternatives in the alternative tourism direction 5	Experts (global and local), transboundary team representatives, local stakeholders (municipality, businesses,	€ 100.000	€ 400.000	Monthly (in duration of 4 years)	Buildings, events, communication, … for bringing to life of the planned alternatives	A, B, C, D, E, F, I, J-Z	From September 2021 (Recurrent)
Public consultation for effects and reconfiguration needs of the alternative tourism alternatives	All stakeholders (according Fig. 1)	€ 15.000	€ 75.000	2 months per year (in duration of 4 years)	Acceptance and adjustment ideas and recommendations for priorities	A, B, C, D, E, F, I, J-Z	July 2021 (Recurrent)
Assemble a transnational team of experts, policy-makers and local stakeholders to outline & re-assess alternative tourism directions	Experts, policy-makers and local stakeholders	€ 30.000	€ 300.000	3 months per year (10 iterations in the upcoming 20 years)	Alternative tourism guidelines for policy-makers	A, B, C, D, E, F, I, J-Z	October 2021 (Recurrent)
Public consultation for the proposed methods and techniques for management and operationalisation (in person)	All stakeholders (according Fig. 1)	€ 15.000	€ 75.000	2 months per year (after each gathering)	Acceptance and adjustment ideas and recommendations for priorities	A, B, C, D, E, F, I, J-Z	December 2021 (Recurrent)

Action Plan 5 - Alternative tourism alternatives

Activity	Responsible	Annual budget	Total budget	Duration/ Frequency	Outcome	Key strategic components:	Deadline
n (in person)							
Appoint team of relevant environmental experts, oceanologists, biologists, … to outline and address restoration of the Lake Doiran biodiversity and water quality	Experts	€ 24.000	€ 240.000	Monthly full-time and/or advisory relation	Reporting on as-is situation, outline of to-be in stages, reconfiguration upon changes in context and (un)desirable developments	A, B, C, D, E, F, I, J-Z	From June 2020 onwards
Reconfiguration and maintenance	Appointed companies overseen by the D.oiran CCG&OB	€ 100.000	€ 2.000.000	20 years	Reconfigured and up-to-standards alternatives status	G, J-Z	20 years overall
Other unforeseen costs	Doiran Lake cross-country governing and overseeing body (D.oiran CCG&OB) and stakeholders	€ 4.000.000	€ 4.000.000	20 years overall	Adaptation, novel ideas, worst case scenarios, …	A-Z	20 years overall
TOTAL:			**€8.735.000**				

Figure 12 - Action Plan 5 details (Source: Authors)

Action plans overall mapping within strategy

Finally, the strategic foresight assisted by the prescribed strategies have enabled us to be able to contemplate the overall mapping of the strategy, tactics and operations in the study. The level is generic and context-appropriate, but also leaves space for greater detail (if and when needed) and, according the methodological standpoints of the author, to instigate component of adaptability, iterative strategic adaptation, contextual as well as global system perspective - which are the necessary components and mechanisms for effective action in complex environments and for complex problems.

Figure 13 is a recap of the preferred strategy towards Scenario IV - Nature and Nurture, while being carried out by the five action plans, each of which representing a pillar of top-down, bottom-up and lateral motivation, engagement and action.

Action plans realising the strategy through tactical and operational management

Scenario	**Scenario IV:** Systemic solutions in place (transboundary), Regulated ecosystem habitat	*Top down governance impulse, lateral expertise with public consultations adjustments*	*Education, Engineering, Enforcement, Environment - in action*	*the Infrastructure of all*	*All about the Lake water quality and biodiversity*	*Alternative tourism alternatives*
Expenditure item (technological, social, environmental, managerial)	**"Nature & Nurture"**	**Action plan 1**	**Action plan 2**	**Action plan 3**	**Action plan 4**	**Action plan 5**
Management/governance capacity and logistics - transnational	€ 10.000.000	Details in Figure 8	Details in Figure 9	Details in Figure 10	Details in Figure 11	Details in Figure 12
Information systems and equipment - transnational	€ 8.000.000	Details in Figure 8	Details in Figure 9	Details in Figure 10	Details in Figure 11	Details in Figure 12
Information systems and equipment - single country		Details in Figure 8	Details in Figure 9	Details in Figure 10	Details in Figure 11	Details in Figure 12
Expert and/or advisory HR capabilities	€ 10.000.000	Details in Figure 8	Details in Figure 9	Details in Figure 10	Details in Figure 11	Details in Figure 12
Alternative tourism investments	€ 40.000.000	Details in Figure 8	Details in Figure 9	Details in Figure 10	Details in Figure 11	Details in Figure 12
Infrastructure	€ 40.000.000	Details in Figure 8	Details in Figure 9	Details in Figure 10	Details in Figure 11	Details in Figure 12
TOTAL proximate costs/ budget for next 20 years (in EUR):	**€ 148.000.000**	**€ 13.925.000**	**€ 8.620.000**	**€ 98.115.000**	**€ 18.630.000**	**€ 8.735.000**
Total budget for realisation of the action plans (for 20 years) in EUR	Match	€				**148.025.000**

Figure 13 - Action Plans for achievement of strategic priority towards the preferred scenario IV - 'Nature and Nurture' (Source: Authors)

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