RESPONSIBLE RESEARCH AND INNOVATION IN TERRITORIES

LEADERS

Deliverable 4.2

Transformative Outlook for Western Macedonia

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Transformative Outlook for Western Macedonia

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P6	REGIONAL ASSOCIATION OF LOCAL GOVERNMENT OF WESTERN MACEDONIA	PERIFEREIAKI ENOSI DIMON DYTIKIS MAKEDONIAS	LGA-WM
P7	SOFIA DEVELOPMENT ASSOCIATION	АСОЦИАЦИЯ ЗА РАЗВИТИЕ НА СОФИЯ (ASSOTSIATSIA ZA RAZVITIE NA SOFIA)	SDA
P8	MUNICIPALITY OF THALWIL	GEMEINDE THALWIL	THA
P9	ECONOMIC DEVELOPMENT AGENCY OF SABADELL CITY COUNCIL	PROMOCIO ECONOMICA DE SABADELL	PES SL

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List of acronyms / abbreviations used in this document

AIRR – Anticipation, Inclusiveness, Reflexivity, Responsiveness
CRP – Citizen Review Panel
GVA – Gross Value Added
JDTP – Just Development Transition Programme
PPC – Public Power Corporation
R&I – Research and innovation
RCA – Revealed Comparative Advantage
RCI – Regional Competitiveness Index
RES – Renewable Energy Sources
RRI – Responsible Research and Innovation
RWM – Region of Western Macedonia
SEP – Stakeholder Engagement Strategy

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Executive Summary

The Transformative Outlook constitutes the cornerstone of the co-creation process for the effective implementation of the general policy focus of the Region of Western Macedonia (RWM), which is energy transition. It includes a set of actions with three major objectives and fifteen actions aiming at making energy transition more responsible, sustainable and democratic for RWM. More specifically, the region's policy focus is further specified in implementing a clean energy transition strategy based on stakeholder engagement, promoting efficient territorial governance and developing a methodology that is focused on achieving a smooth and innovative transition towards an alternative development 'paradigm'. The actions accrued from a co-creation process that contained a set of structured project activities. One of those is the Delphi Study that investigated the potential consensus by the participating stakeholders amongst specific actions. The Citizen Review Panel (CRP) increased the level of democratization of the project, by allowing citizens to assess the proposed policy actions and re-propose corrections and adjustments towards a more socially beneficial outcome. Finally in the Stakeholder Workshop the experts from the quadruple helix gave a final evaluation of the citizens' views and further proposed implementation measures for an even more effective embedment of the proposed policies.

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Preface

The RRI-LEADERS Project

RRI-LEADERS is a three-year EU-funded project (2021-2023) exploring the relevance of the principles for Responsible Research and Innovation (RRI) to territorial policymaking. The territories in RRI-LEADERS consist of three European cities and one region and act as demonstrators for the transformative potential of RRI-AIRR on a sub-national level. Through a co-creation process involving multiple stakeholders and citizens, each territory analyses and integrates RRI-AIRR to their chosen policy areas:

The city of Sofia (Bulgaria): Support for innovation; digital transition and new skills; youth employment and entrepreneurship; and sustainable urban development.

The municipality of Thalwil (Switzerland): Energy transitions and climate change responsiveness.

The city of Sabadell (Catalonia, Spain): Inclusiveness and alignment of the territorial innovation ecosystem with societal challenges considering sustainability, focused on the topic of active ageing.

The region of Western Macedonia (Greece): Economic transition to low-carbon economy, in particular a smooth and innovative transition from the coal value chain towards an alternative development paradigm.

The **Transformative Outlooks** are the final outputs of the co-creation process. These outlooks consist of an action plan with measures for implementing the intended transformation in each territory through the integration of RRI-AIRR as a framework for addressing territorially significant policy areas. The following is the Transformative Outlook for Thalwil.

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The RRI-AIRR Framework

Originally, Responsible Research and Innovation (RRI) is an approach used to align research and innovation processes and outcomes with societal needs and expectations, including ethical considerations, promotion of gender equality, and inclusion of perspectives from societal actors. Instead of applying the elements of RRI to research and innovation activities only, this project seeks to integrate RRI into territorial governance with the aim to foster a systematic approach to responsible, science evidence-based policymaking.

The project integrates two complementary understandings of RRI: The five RRI keys and the four AIRR dimensions – making up the RRI-AIRR Framework. The RRI keys are of different conceptual natures but can be understood as *policy agendas.* The five RRI keys are: public engagement, open access, gender equality and diversity, ethics, and science education. The AIRR dimensions can be seen as *process requirements*, outlining four characteristics of an RRI process. The four dimensions are: anticipation, inclusiveness, reflexivity, and responsiveness. (Klaassen et al., 2014)

The project adopts the following understanding of RRI: "*A transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products"* (von Schomberg, 2011).

The understanding of RRI diverges only slightly from this definition in that it does not promote the separation of innovators from the rest of the societal actors as mentioned above and instead seeks to include all societal actors as co-creators in the innovation processes. In doing so, RRI-LEADERS' interpretation of RRI draws heavily on the extension of the RRI framework proposed by Stilgoe, Owen and Macnaghten (2013), who emphasise the prospective notion of responsibility by introducing four dimensions of RRI – anticipation, inclusiveness, responsiveness, and reflexivity, largely known as the AIRR dimensions. RRI-LEADERS integrates these four dimensions into its methodological design and operational implementation.

RRI KEYS	
	Public Engagement is about bringing together researchers, policymakers, industry and civil society organisations and NGOs, as well as citizens, to deliberate on matters of science and technology.
	Open Access is about the practice of providing open access to scientific information that is free of charge to the user and is reusable.
♀♂	**Gender Equality and Diversity** is about overcoming all barriers associated with gender, age, race, ethnicity, disability, and socio-economic status, and making science, research, and innovation fully accessible to people from the widest range of backgrounds, perspectives, and experiences, across all scientific disciplines and at all hierarchical levels.

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	Ethics is about conducting research in such a way that allows others to have confidence and trust in the methods and findings of research.
	Science Education is about making science education and careers attractive for young people, targeting to drastically improve science and technology-literacy in our society.
AIRR DIMENSIONS	
	Anticipation is about systematic thinking on any known, likely, plausible, and possible implications of research, innovation, policy, or action.
	Inclusiveness is about the integration of perspectives from a wide range of societal actors (including non-organised and non-institutionalised citizens and community groups) and their involvement in multi-stage co-creation processes in a wide range of policy areas.
	Reflexivity is about critically scrutinising one's own activities, commitments, and assumptions, and being aware of the limits of one's knowledge. It implies a reflection about societal circumstances to reassess practices and adjust initiatives.
	Responsiveness is about placing societal needs in the focus of plans and actions of public leadership and governance, and engaging society in the processes of policy design and decision-making, as well as policy implementation, monitoring, and evaluation.

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The Co-Creation Process

During a period of three years, the RRI-LEADERS project has been through a co-creation process. The first step was an extensive mapping, focused on the state-of-play regarding the RRI-AIRR framework. Following this, stakeholders were engaged to develop ideas on the developments around the policy area and integration of the RRI-AIRR framework. Based on this input, the first draft of the Transformative Outlook was developed. Citizens were then engaged to review and validate the Transformative Outlook. Finally, the Transformative Outlook was presented to policymakers within the decision-making body.

Mapping 2021	The first stage of the co-creation process has mapped and analysed the state-of-play regarding the RRI-AIRR Framework, including representatives from science, public bodies, industry, and civil society. This has provided an overview of existing practices and policy developments that have already been integrated or will be able to integrate the RRI-AIRR Framework. 28 interviews were conducted in total, including interviews with business sector representatives, policy makers and representatives from the research sector from RWM. The interviews were about the general policy focus of energy transition in the region. After the interviews' stage, a focus group took place on May 14, 2021, with 10 members participating. The sectors of the research / academia and the policy making were represented, with a balanced mix between male and female representatives. Amongst participants' core suggestions, was the necessity to design RRI policies at the regional level in a way that takes into account the priorities and needs of the local community in energy transition. In that direction, technological innovations that may create new and sustainable jobs, must be followed by networking and synergies with other regions of Europe that have already experienced the lignite transition. The next stage of the mapping was the participatory workshop which was held in Kozani on July 19, 2021, with 13 participants representing academia and research organizations, the business sector, civil society organisations and local policy making bodies. The workshop participants noted that the RRI keys and AIRR principles are implemented to an adequate extent in the policymaking sector of the region, but also pointed out that there are several new policies and processes that RRI principles can be embedded on. Some of those practises should be the strengthening and promoting entrepreneurship as well as re-skilling of the local workforce, the connection of research and development with the modernisation of companies, the implementation of a "regional dialogue" by the local policy making sector and the promotion of a new "Support Structure" that may ease investments in the region. Finally, four additional focus groups were held with a total of 31 participants from the four helices (academia, businesses, policy-makers, citizens). Recommendations for integrating the majority of RRI keys and AIRR dimensions into defined strategic policy priorities were made by the participants, while changes must be made in order to

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	primarily promote effective public engagement and science education in the territorial RRI framework.
Stakeholder Engagement 2022	After this, an iterative Delphi survey was used to obtain opinions from experts on how RRI-AIRR can be implemented in each territory. The mapping was followed by a Delphi survey consisting of a set of three questionnaires that promoted stakeholders to create ideas and state consensus about possible future developments regarding the policy foci of the region as well as the integration of the RRI - AIRR framework. 62 stakeholders (21 men and 41 women) from the research and academia sector, from the policy making sector, from the industry / business sector and from the civil society were invited to participate in the Delphi's 3 rounds from February 6 to April 26. For Western Macedonia the total number of statements used in the questionnaire was 150. The focus was put on solutions regarding how to identify feasible future pathways to advance the policy areas in the territories and to form a basis for the development of transformational outlooks. The stakeholder engagement was followed by the World Café, an activity that was aiming at exchanging knowledge and opinions among top experts about the significance and practicability of the statements accrued from the Delphi study as well as any extra suggestions they might have. The World Café was held on June 30 in Kozani and attracted 30 participants (15 males and 15 females) from the four helices of the quadruple helix.
Citizen Engagement 2023	As the last step of the co-creation process, a Citizen Review Panel (CRP) reviewed and validated the Transformative Outlook, by expressing their views and suggesting modifications to the objectives and initial actions that had been accrued from the project so far. This citizen review panel was conducted in Kozani, in May 2023. 23 citizens from distinct socio-economic backgrounds and ages evaluated the acceptance and prioritizations of the actions and mutually developed proposals for improvement. In the stakeholder workshop that took place in July 2023, stakeholders formulated the comments and modifications of the citizens into directly implementable actions. These final actions are considered the core findings of the whole co-creation process.
Endorsement 2023	Finally, the Transformative Outlook will be formally presented and endorsed by the respective decision-making body of the Region of Western Macedonia which will be the Regional Council of Research and Innovation of Western Macedonia.

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Objectives and actions for the energy transition in Western Macedonia

The actions proposed in this section are the findings accrued from the RRI LEADERS project implementation in Western Macedonia. They constitute the core of the co-creation process. They consist of best practises and statements that have achieved a consensus in the previously conducted Delphi study and were concretised at a World Café with participants of the Delphi study and other stakeholders. Based on those findings, the project team formulated actions that were evaluated by the citizens of Western Macedonia. These assessments constituted the pillars for the structure of the final version of these actions.

This action plan is depicted in the following list. First, the results of the individual project steps are listed in a synthesis. Next, a series of objectives is depicted along with a group of actions. The integration of RRI keys is analyzed for each distinct objective. At the final stage, an analysis of AIRR dimensions, communication and dissemination activities are described.

Below is an illustration of the policy area and objectives and actions and the main RRI aspects for each objective.

Policy Area	Clean energy transition strategy based on stakeholder engagement, efficient territorial governance and development of a methodology aiming to a smooth and innovative transition towards an alternative development 'paradigm'
Objective 1	Putting forward an extensive upskilling of the local workforce through the creation of efficient, decentralised and innovative procedures, where the local research institutions will play a primary role.
Action 1.1	*Conduction of a Regional Foresight Study for re-and-upskilling that will set the exact educational and training needs of citizens that have been mostly affected by the energy transition.*
Action 1.2	*Establishment of a broad and inclusive upskilling programme that will be mainly focused to the citizens that have been mostly affected by the energy transition (miners, electricity production*
Action 1.3	*Integration of digital transformation infrastructure for easing and supporting effective upskilling that will be directed to all social backgrounds and offer high tech training solutions. This will include high-speed networking, user-friendly distance-learning platforms, scientific database for energy and other subjects, etc.*

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Action 1.4	*Creation of innovative energy-related upskilling entities such as a Hydrogen University Course.*
Action 1.5	*Extensive creation of infrastructures in the region.*
Action 1.6	*Installation of digital infrastructure in the Regional Authority.*
Action 1.7	*Creation of an industrial and alternative tourism plan.*
Main RRI Measures	*Open Access, Science Education, Anticipation, Inclusiveness, Reflexivity, Ethics*

Objective 2	Creation of an entrepreneurial ecosystem in the Region of Western Macedonia
Action 2.1	*Initiation of an Action Plan for entrepreneurial growth in the region by the regional authority, the municipalities, the university and the local professional chambers. The plan will foresee specific incentives and funding will accrue from the regional authority / municipalities.*
Action 2.2	*Establishment of an innovation zone.*
Action 2.3	*Creation of a spatial plan that will clearly foresee land usage and distinguish areas for major investments, RES infrastructures, agricultural activities and other usages.*
Main RRI Measures	*Open Access, Science Education, Anticipation, Inclusiveness, Responsiveness, Ethics*

Objective 3	Development of a regional energy efficiency model with the inclusion of actions towards the achievement of environmental sustainability
Action 3.1	*Programme for achieving regional energy efficiency on an industrial and consumption level in connection to the Just Development Transition Programme. The programme will include a foresight study for current and future energy needs per municipality in the region, taking into consideration major investment plans.*
Action 3.2	*Setting up a holistic action plan for environmental restoration of ex-mine lands.*
Action 3.3	*Create an environmental sustainability and circular economy university master degree course.*
Action 3.4	*Initiate an "environmental tariff" to non-green investments and environmental activities that will be exclusively used for environmental restoration purposes at a regional level.*
Action 3.5	*Creation of a Waste Management Plan and spatial planning of waste storage.*
Main RRI Measures	*Science Education, Inclusiveness, Responsiveness, Ethics*

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Introduction to Western Macedonia

RWM is a part of the north-western Greek area, bordering with North Macedonia and Albania. It occupies an area of 9,451 km^2, representing 7.2% of the country's total area and is the only land-locked Region in the whole of Greece. Because of its geographical position, it operates as a gateway for both Greece and the EU to the region of Western Balkans. Due to the recent national and trans-European transportation network improvements, Western Macedonia can play the role of a single Balkan area of cooperation and development.

The Region is playing a key role in the Hellenic economy as it is the highest electrical power provider in Greece. With a permanent population of 255.056 inhabitants according to the 2021 Census data, it is considered a sparsely populated region with approximately 32 inhabitants/km2. Moreover, the recent publication of the 2021 Census results shows a significant decline in population compared to the 2011 Census data, as the region nowadays has 27.046 less inhabitants.

RWM's financial status in terms of GDP in 2020, is EUR 3323.23 million. In the period of 2013 to 2018, the Region's GDP declined by 9%, being the highest percentage compared to the other regions of the country. In total a crucial loss of competitiveness has been recorded for the RWM, in terms of the size of the economy of the region.

The economy of the RWM has been in a transition process since 2013. The Revealed Comparative Advantage (RCA) index indicates high levels of specialisation in labour-intensive sectors and industries and a low level of diversified production structure. That implies that despite the increase in local demand, this does imply an increase in local supply (OECD). Furthermore, the RWM has a significantly low score in the composite Regional Competitiveness Index (RCI). The de-lignitisation of the economy is the most significant development. Lignite-related financial activity directly and indirectly contributes to the regional economy of by almost EUR 1.7 billion and affects the employment levels of approximately 17,000 habitants, constituting 30% of the jobs of the two regional units. Furthermore, it contributes to the operation of more than 800 companies, whose turnover is expected to exceed EUR 405 million (ESDAM Plan, data 2019). Taking into consideration the total effects, the de-lignitisation is expected to bring a decline of the Gross Value Added (GVA) of the regional parts of Kozani and Florina by EUR 1 billion and decrease employment levels by 10,000 workers approximately. Moreover, the number of firms and the turnover of the regional parts of Kozani and Florina, which is expected to be also decreased, amounts to EUR 610 million and EUR 319 million respectively (PDAM Plan). The challenges that arise from the above, necessitate total transformation of the regional production model to an innovative, smart and green paradigm, the conservation of the current employment along with the promotion of employment for the local workforce and the preservation of the local environment by promoting green and labor-intensive investments at the same time. More specifically the scheduled abandonment of the local lignite power plants will directly lead to the availability of a significant proportion of the local workforce that has to be absorbed in new, innovative and green financial activities. These workers have to be re-educated and re-trained in order to acquire innovative skills, based on RRI-based educational framework. The local university and regional; research organizations have to have the leading role in the aspects. Moreover, an effective spatial planning has to be designed and implemented in the region. This will allow and boost up the investment framework, securing green investments and an effective

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land usage. Furthermore, extensive financial support by the central policy makers has to be implemented taking into consideration an RRI-based investment logic that will respect environmental sustainability.

Introduction to Policy Area: Clean energy transition strategy based on stakeholder engagement, efficient territorial governance and development of a methodology aiming to a smooth and innovative transition towards an alternative development ‘paradigm'

Discussions towards this policy revealed that the RRI-AIRR approach has been largely integrated into both regional and national strategies. The Just Development Transition Plan (JDTP) is an operational framework that expresses the central government's public engagement to the energy, economic and social challenge of delignification and the reduction of oil dependence. In fact, energy transition in RWM is a huge process that foresees the abandonment of the locally-based lignite power units to Renewable Energy Sources (RES) and other energy sources. JDTP states that this abandonment will take place in such a way, securing local workforce and providing the region the necessary means to secure a sustainable, green and financially viable production model. The communication with all the stakeholders regarding the plan of delignification of the domestic power generation is one of its main goals. Therefore, public engagement, mainly through public consultation, was pointed out thorough the stages of project implementation, as a prime mean to formulate the methodology for the smooth transition. At this point, the active participation of many actors was emphasised, covering the quadruple helix, however, some participants expressed their objections to the active participation of civil society. Moreover, in JDTP as well as in most of the studies conducted for energy transition, experts have agreed that the dimension of responsiveness is quite evident, since they reflect an effort to meet the needs and expectations of society. In addition, as reflected in the conclusions from the questionnaires and the focus group conducted in May 2021, the dimension of reflexivity is directly linked to that of responsiveness, as the needs of society are constantly changing due to the energy transition and therefore a continuous analysis at social and economic level is needed so that policies meet the real needs.

A top priority issue of JDTP is to secure jobs and to utilise the high know-how of human resources in the designated areas. The problem of unemployment is one of the main challenges of the energy transition in Western Macedonia. The scheduled abandonment of the lignite power plants in RWM according to the Just Transition Development Plan will directly cause the immediate loss of more than 500 jobs in the region and much more in the medium and long-term. These workers who constitute a valuable capital of the local workforce of RWM have to be directed and absorbed to other employment directions that will be characterized with a sustainable, green and financially-viable footprint. Thus, the targeted smoothness to a new development paradigm is primarily based on the absorption and capitalization of the existing local workforce to new sustainable investments that will be attracted in RWM. The role of science education is considered crucial towards this challenge, since the local university and RWM’s research/training institutes will be the leaders in the upskilling and reskilling of the local workforce. Furthermore, there are a lot of other actions taking place, especially towards research and innovation activities in renewable energy sources as

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has been stressed by the academia participants, but they are not well communicated. In fact, the transformation of the local development paradigm is heavily based on the development of RES investments in RWM that will substitute the lignite-based energy power units., providing the necessary energy to the national power network. However, this may prevent from the exploitation of research results at the maximum level. Moreover, the potential of citizen science is something that needs to be studied and exploited, as it can be a key source of new ideas.

Moreover, regarding the development of a methodology for a smooth and innovative energy transition the participants also referred to the fact that there are a lot of similar regions in Europe now which are facing the same challenge as the region of Western Macedonia. There is a process called "regional dialogue" which is an action developed by the European Commission to develop partnerships between regions in energy transition. These synergies will help these regions with issues of growth and innovation as well as measures that will lead to a smoother transition. This is a very important action proposed in the region of Western Macedonia to follow it as in this way it will be able to have a more general, European picture, regarding the innovation trends in other regions and to receive ideas and solutions for its development

Finalising this section, other crucial activities foreseen in the JDTP such as effective spatial planning in RWM, the installation of labour-intensive investments and the transformation of the local governance model are also included as key reforms and top-priority issues in the policy area. In fact, an effective spatial plan that will clearly distinguish the specific land sections that industrial, agricultural, and civil activities can be implemented will boost the investment status in RWM. Moreover, the financial support of labor-intensive investments foreseen by the JDTP not only secure the local workforce but attract highly skilled workers from other regions of Greece and abroad.

Synthesis of Findings of the Individual Project Phases

Synthesis of Findings from Stakeholder Mapping and Analysis of Policy Discourse in Western Macedonia

In total, 4 major practises have been mapped regarding stakeholder relationships and interdependencies: Good Practice of working Team for Coal Platform of Western Macedonia, the DeCarb project, the Just Development Transition Programme Steering Committee and the Open courses of Entrepreneurship and Innovation. The aforementioned projects constitute proposed practises to shape the framework of stakeholders' relationships in RWM, set up the interrelationships and rules of engagement and present the procedures on implementing the policy focus of RWM. The most prominent challenges regarding the RRI implementation deal with the necessity to design responsible innovation policies at the regional level in a way that consider the needs and priorities of the local community in view of the energy transition. Moreover, the transformation of the existing production model to be sustainable requires innovative actions of critical size, that shall be anticipative in terms of predicting the needs of sustainable long-term development and inclusive in including all actors and most importantly the civil society actor.

Participation in the EU projects was pointed out as a significantly important lever for embedment of the RRI framework into the territorial governance mechanism. Regional and municipal authorities have been pointed out as familiar with the implementation of EU-funded projects and have started to recognise the merits of the RRI approach through their participation in RRI-related projects. However, the integration of the RRI

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approach by the territorial policy-makers is at low levels, so the participation to EU projects is even more critical.

Furthermore, the municipal/regional policy strategies have to be implemented according to the framework of an in-depth study of the needs of the local economy and the local community. Moreover, important groups of stakeholders such as civil society and business do not seem to be often involved in the process of strategies design so RRI logic, especially the direct implementation of the engagement key and inclusiveness dimension, could play a prominent role in that matter. Moreover, the development of distinct funding programmes for RWM that may address current policy challenges and priorities have to be promoted. Territorial authorities should be expected to support (either financially or through other means) the creation of synergies and partnerships between all stakeholder groups. The initiation of the ethical dimension in Just Transition as well as other development projects also has to be implemented on a priority basis, starting from the analysis of the expected benefits to local society by the Just Transition Plan and Program. In that framework, technological innovations should be promoted through extensive synergies between policy-makers, the academic and research community, and the business/industry sector.

Regarding the policy recommendations of RRI, 7 national-level and regional documents are examined. These were the National Energy and Climate Plan, the Just Transition Development Programme 2021-2027 (JDTP - PDAM), the Public Power Corporation (PPC) Strategic and Business Plan 2018-2022, the Map for a Managed Transition of Coal-Dependent Regions in Western Macedonia, the Regional Operational Programme for Western Macedonia, the Stakeholder Engagement Plan (SEP) for Western Macedonia and the Territorial Just Transition Development Plan of the Region of Western Macedonia. All the aforementioned documents constitute the basis for a policy recommendation framework that includes specific measures on sustainable investment promotion, financial support, reskilling of the local workforce, design of a spatial plan for RWM, and introduction of distinct measures that promote a democratic governance framework such as the initiation of open platforms, democratic procedures, etc. The promotion of entrepreneurship and re-skilling of human resources to combat the unemployment that will arise in the post-lignite era is of primary importance. In the sense, the application of scientific education can play a significant role in that matter. Furthermore, the connection of research and development with the modernisation of companies is also significant, since the research conducted in the region must follow the responsiveness of the local markets and vice versa, while local firms must adapt themselves to new trends in order to survive the complicated globalised market environment. Moreover, RWM should follow a responsive and accountable governance by participating in the “regional dialogue”. This is an action promoted by the European Commission to push forward collaborations between regions in energy transition which will help them with issues of growth and innovation, towards a course of smooth energy transition. Also, the implementation of the new Support Structure that has been developed in the region, can operate as a tool for integrating the RRI-approach towards a smooth and innovative transition from the coal value chain.

Synthesis of Findings from Delphi Study Conducted in Western Macedonia

Of all the answers, one that appear amongst the most prominent, and even led to 100% of consensus, are the need for creating effective and decentralised mechanisms that are able to identify education and retraining needs, in order to proceed with the upskilling of employees during the post-coal transition (Open Access, Responsive and Accountable Governance). The ulterior meaning of that statement is the need for initiating procedures and organizational mechanisms that are able to quickly identify the educational “gaps”

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in the current and distant-future production model of RWM and "fill" them at an effective way, quickly responding to the local needs. For instance, the need for teaching innovative RES technologies and skills, is aligned with the aim of the JDTP to implement such investments in the region and may absorb personnel from the local professional and research community. Full open access to such educational programs would boost the local professional expertise to a high level.

Furthermore, the statement of inclusion of all local bodies towards a continuous and more vigorous promotion of entrepreneurship has been scored as crucial for the transition phase in Western Macedonia in combination with a more flexible regulatory and tax framework for businesses, as well as with a cooperation framework between academia and business (Responsible and Accountable Governance). In fact, this statement implies the need for the regional organizations to become more "market-oriented". However, for organizations that are directly involved in the energy transition (such as the Regional Authority) is clearly critical to design their activities and interventions at a more "entrepreneurial-friendly" manner, adjusting their regulating framework to be less bureaucratic and directing their financial incentives to promote innovative and sustainable entrepreneurship at a local level.

Moreover, the statement of provision of free land by the region to local businesses for the creation of energy communities that can invest in renewable energies (Responsible and Accountable Governance) has also reached significantly high levels of consensus. Actually, the stakeholders indirectly state here the need for local businesses to invest in RES rather than promoting large companies and consortiums from outside RWM to invest in the region. The adoption of RES investments by locals could be an effective alternative mean for entrepreneurial engagement and employment. Such an approach should be promoted and supported by national and mostly regional/local authorities and bodies, and the provision of free land could be an immediate and drastically supporting measure that directly responds to the lack of financial resources by local entrepreneurs to build such investments.

The statement of integration of the RRI/AIRR concept in designing projects and creating sustainable mechanisms, considering the international experience (Anticipatory Governance) was also highlighted by the participating stakeholders. The international experience gained from similar (to energy transition) projects should be accumulated and used as a guideline for the energy transition in RWM. Successful project practises and adjusted policy measures should be adopted to RWM's case, especially those designed and implemented for coping with social cohesion, environmental sustainability, responsible research and innovation in the local production model. Those practises have already been implemented and tested, in terms of negative or contradicting outcomes, being a clear indication of anticipatory governance.

Finally, the statement of the integration of digital transformation infrastructure (Science Education) was also pointed out. In fact, the stakeholders state in this case that there is no possibility to implement any innovative production paradigm for RWM if there is no digitalization adopted to the maximum degree possible. Thus, extensive digital investments must take place in RWM, especially in the direction of professional and scientific education, as well as other digital infrastructure regarding networking, communication networks, database platforms, etc.

Taking into consideration the most prominent statements, the need for promoting Entrepreneurship in RWM appeared to be the most critical in obtaining the targeted policy focus. Other research outcomes that emerged, concerned the development of a framework for collaboration between the academic and research

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communities, the encouragement of start-up and spin-off companies to be activated in the region, and the establishment of an innovation zone. The existence of financial incentives and measures that strengthen start-ups was also rated of great importance. As it was stated by the participating experts, according to the Just Transition Development Plan[1], the vision for the "next day" in Western Macedonia is based on five principles, with Industry manufacturing activities and trade being one of them, therefore fostering entrepreneurship is considered to the Transformative Outlook for Western Macedonia. In fact, the majority of described statements were used as the main input of the eleven (11) initially proposed actions in the Citizens Review Panel, as the integral part of the Transformative Outlook for Western Macedonia's case.

Synthesis of Findings from the Citizen Review Panel and Stakeholder Workshop in Western Macedonia

The CRP in Western Macedonia was an eight-hour process where 23 citizens from distinctive age groups and backgrounds participated. They expressed their opinion regarding 11 initial policy actions from three general objectives. More specifically, they first evaluated the proposed policy actions, they then expressed their opinions about their potential improvement and they prioritized them according to three distinct criteria. At the final stage of the process, they proposed four new actions, regarding two specific objectives.

According to the findings of the initially proposed actions, citizens voted positively in the majority of the initially proposed actions. Regarding the most acceptable actions, action 2.2 – the establishment of an innovation zone - is considered the most acceptable action by the citizens. In the framework of Just Development Transition Programme (JDTP), plans for the creation of an innovation in RWM have already been put in place (Zervas et al., 2021). However, construction works have not been started and the citizens of the region reconfirm the necessity for the creation of such a project for the future of RWM in their comments and in their evaluation. A poly-thematic innovation zone may allow the development of the scientific capital in the region, along with the support to the regional entrepreneurial system with skilled workers and innovative applications. Action 3.3 - the creation of an Environmental sustainability and circular economy university master-degree course - received the 2nd highest number of positive votes. citizens considered that the local university should be more focused on university courses that touch the core of energy transition regarding the advanced and specialized knowledge they can offer. The majority of the rest of the actions – apart from the most rejected actions described later in the text – received a similar number of positive voting, indicating that they have been accepted in their current form with minor adjustments.

Referring to the most rejected actions, action 3.4 – the initiation of an environmental tariff – has received the highest number of negative votes, in all three criteria. By that statement, citizens seem to be reluctant about any potential financial bargains for future and current businesses, indicating that this is a highly anti-investment action. Instead of its initial phrasing, citizens proposed that the action should change to the direction of providing financial incentives to businesses no to pollute, rather than imposing tariffs and penalties. Likewise, actions 1.1 – the conduction of a foresight study for the upskilling needs of the local workforce and action 3.1 – the initiation of a programme for achieving regional energy efficiency have both

[1] Government Committee SDAM. Just Transition Development Plan—Current Situation and Prospect for Areas in Energy Transition in Greece. 2020. Available online: https://www.sdam.gr/sites/default/files/consultation/Current_situation_and_prospects_for_areas_in_energy_transition_in_Greece_EN.pdf.

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been appointed with the 2nd highest number of negative votes. According to this, a noteworthy percentage of citizens do not believe that the implementation of a Regional Foresight Study for re-and-upskilling of the local workforce will have a considerable impact in the development of RWM. Similarly, citizens do not consider regional energy efficiency as a crucial action in the sustainable development of the region. Action 1.2 – the establishment of a broad and inclusive upskilling programme that will be mainly focused on the citizens that have been mostly affected by energy transition, was also given a significant number of negative votes. Citizens consider that workers in RWM already have high expertise in specific professional areas and they do not need more training but support to find a new job or financially improve their current income.

In table 1, the prioritization of total actions is included, where citizens on which actions they believed to be the most important. In there, there are four new actions that have been proposed by the citizens: 1) the creation of transportation and 2) digital infrastructures, 3) the creation of an alternative tourism plan and 4) the initiation of a waste management plan. Amongst all actions, the creation of an extensive digital infrastructure in RWM received the highest number of total votes (action 1.3), followed by the implementation of an extensive upskilling program for the citizens mostly affected by the energy transition (action 1.2), the creation of an environmental sustainability and circular economy master degree course (action 3.3), creation of an innovative energy-related entities such as a Hydrogen University Course (action 1.4) and the establishment of an innovation zone (action 2.2). In total, citizens express their support for upskilling and infrastructure-related actions which according to their view can have the most significant developmental footprint in RWM.

In the stakeholder workshop with experts accruing from all stakeholder groups (businesses, science, civil society, and policy making) the comments and suggestions by the citizens were reformulated into implementable actions. Without objecting to the expression of the actions that accrued from the CRP, the stakeholders proposed specific implementation measures on how the actions can become more effective and socially responsible for the implementors. The basic proposals for the majority of the actions by the stakeholders are listed below:

Action 1.1 – Proposals:

- Update of data of professional bodies/unions.
- Creation of an observatory of employment could be added in the future.
- Creation of a database of upskilling material.

Action 1.2 – Proposals:

- The program must focus on entrepreneurship and find adequate funding.
- The program should not include plenty of skills and professions to be taught.

Action 1.4 – Proposals:

- A plethora of specialties must be avoided.
- A study must be performed first, and then the innovative training programs to follow.

Action 1.5 – Proposal:

- A network of transportation must be included specifically (specifically, lack of a railway network in the region, logistics facilities and hydroplanes must be underlined.

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Action 1.6 – Proposal:

- Everything should be wireless so there is no need for extended wired networks.

Action 1.7 – Proposal:

- A combination of creative industries, agri-food and culture services must be implemented as a priority.

Action 2.2 – Proposals:

- The completion of the action should be prioritized and accelerated.
- It could be separated into four distinct sections: Kozani – Polythematics, Ptolemaida – Hydrogen, Kastoria – Entrepreneurship, Grevena – tourism, Florina – agri-food

Action 3.1 – Proposals:

- The timetable should be strict for such an action.
- Support and promotion of energy communities (financial incentives, bureaucratic processes, legislation framework).
- It should take into consideration the energy poverty factor.

Action 3.2 – Proposals:

- It should be implanted according to the European policies that are related with carbon footprint and decrease of methane emissions.
- The public power corporation may fund such a plan.

Action 3.3 – Proposal:

Such a master degree should be exclusively in English.

Action 3.5 – Proposal:

- A distinction between garbage and taking financial advantage of garbage could make the action more effective.

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Table 1: Findings of the "the prioritization of actions" section of the CRP

Action No	Description	Votes	Action No.	Description	Votes	Action No.	Description	Votes
1.1	Conduction of a Regional Foresight Study for re-and-upskilling that will set the exact educational and training needs of citizens that have been mostly affected by energy transition.	5	2.1	Initiation of an Action Plan for entrepreneurial growth in the region by the regional authority, the municipalities, the university and the local professional chambers. The plan will foresee specific incentives and funding will accrue from the regional authority / municipalities.	7	3.1	Initiation of a Programme for achieving regional energy efficiency on an industrial and consumption level in connection to the Just Development Transition Programme. The programme will include a foresight study for current and future energy needs per municipality in the region, taking into consideration major investment plans.	5
1.2	Establishment of a broad and inclusive upskilling programme that will be mainly focused to the citizens that have been mostly affected by energy transition (miners, electricity production workers, etc). University of Western Macedonia will be the primary pillar of the action.	13	2.2	Establishment of an innovation zone.	11	3.2	Action 3.2: Setting up a holistic action plan for environmental restoration of ex-mine lands.	7
1.3	Integration of digital transformation infrastructure for easing and supporting effective upskilling that will be directed to all social backgrounds and offer high tech training solutions. This will include high-speed networking, user-friendly distance-learning platforms, scientific database for energy and other subjects, etc.	14	2.3	Creation of a spatial plan that will clearly foresee land usage and distinguish areas for major investments, RES infrastructures, agricultural activities and other usages.	4	3.3	Create an "Environmental sustainability and circular economy" university master-degree course.	14
1.4	Creation of innovative energy-related upskilling entities such as a Hydrogen University Course.	12				3.4	Initiate an "environmental tariff" to non-green investments and environmental activities that will be exclusively used for environmental restoration purposes at a regional level.	1
1.5 (New)	Extensive creation of infrastructures in the region	9				3.5 (New)	Creation og a Waste Management Plan and spatial planning of waste storage.	1
1.6 (New)	Installation of digital infrustucture in the Regional Authority	4						
1.7 (New)	Creation of an Industrial and anternative tourism plan.	3						

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Synthesis of Findings from Policy Learning Workshop in Western Macedonia

In the 1st policy learning workshop (PLW), various ways for incorporating RRI-AIRR concepts into territorial policy-making processes were debated. The goals were to gain knowledge of the RRI-AIRR experiences of the stakeholders from other territories, the RRI-AIRR best practices and how each participating territory may benefit from them, and the possible transformational effects of RRI-AIRR for each practice that was presented. There was also discussion of the possibilities for integrating RRI-AIRR in territorial policies, the advantages of doing so, and the steps/measures that may be taken to do so.

It also was noted that local governments were increasingly taking on the role of "orchestrators" when it came to launch specific requirements and initiatives for regional innovation. Overall, the RRI approach integration should rely on all the aforementioned factors as well as reflection and validation through research activities like the workshop that was held, illuminating many facets of RRI logic in the process. The final results of the 1st PLW show that innovation should address both the current socioeconomic concerns and the productivity gap. According to this notion, regions might serve as catalysts for innovation. Furthermore, in order to execute institutional reforms and empower policymakers to adopt RRI innovation strategies and practices, co-creation processes are required. In this regard, it has been emphasized that there is a critical need for flexible RRI policy development that takes social objectives and concerns into account through an inclusive viewpoint. Furthermore, inclusive programming, long-term scenarios, and broad public participation that includes the full range of stakeholders should also be utilized. In conclusion, it is recognized that RRI initiatives should advance "borderless" innovation policies and move beyond the realm of academia.

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Objective 1: Putting forward an extensive upskilling of the local workforce through the creation of efficient, decentralised and innovative procedures, where the local research institutions will play a primary role

OBJECTIVE AND ACTIONS	TIME FRAME
OBJECTIVE 1: Putting forward an extensive upskilling of the local workforce through the creation of efficient, decentralised and innovative procedures, where the local research institutions will play a primary role.	
Action 1.1: Conduction of Regional Foresight Study for re-and-upskilling that will set the exact educational and training needs of citizens that have been mostly affected by energy transition. The study will be primarily done by the university and the rest of the training organizations in the region. The experts will investigate the planned investments that are scheduled to be implemented in the JTDP, the current training programs and training personnel of upskilling organizations in RWM and the business sectors that will be most active in energy transition according to literature and policy practise. All the above factors will be considered in order to conduct a foresight study that will include the exact university and short-training courses that should be implemented in the coming years.	*2024 - 2025*
Action 1.2: Establishment of a broad and inclusive upskilling programme that will be mainly focused on the citizens that have been mostly affected by energy transition (miners, electricity production workers, etc). University of Western Macedonia will be the primary pillar of the action. The short training program will be conducted by the local University. It will consist of distinct short-training courses that will include specialties, skills and competences primarily related to renewable energy technologies, digital competences and innovative marketing skills. Since this program will be directed primarily to ex-workers from the PPC such as miners and electro-technicians, it will be adjusted to take advantage of their current knowledge background. The program will include specific courses such as RES installation, Hydrogen technologies, digital marketing, etc.	*2024 - 2027*
Action 1.3: Integration of digital transformation infrastructure for easing and supporting effective upskilling that will be directed to all social backgrounds and offer high tech training solutions. This will include high-speed networking, user-friendly distance-learning platforms, scientific database for energy and other subjects, etc.	*2024 - 2027*

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The action will include the installation of specific digital infrastructures exclusively for upskilling purposes that include high-speed cabled internet in the whole RWM (including remote villages and rural areas), open access digital databases including all the planned activities and investments foreseen in JDTP as well as scientific data of RES and energy-related studies, free cloud services for the local universities and research institutes.	
Action 1.4: Creation of innovative energy-related upskilling entities such as a Hydrogen University Course. The creation of a Bachelor and/or a Master Degree course that will be exclusively about the innovative energy form of Hydrogen is proposed in that case. A course with a title of "Hydrogen Engineering" or "RES Engineering in innovative technologies" implemented by the University of Western Macedonia will gather and promote the specific knowledge demanded for effective energy transition to alternative energy technologies.	*2024 - 2028*
Action 1.5: Extensive creation of infrastructures in the region. The kind of infrastructures proposed in the action are mainly transport infrastructures. RWM already has an adequate road network with direct connection to the highway of Egnatia for all major cities. However, a train connection of RWM's major cities to the national railway network should be established until 2028. Furthermore, a major logistics infrastructure investment is foreseen in the action, that will drastically support the current and future business environment. To be finished by 2028.	*2024-2028*
Action 1.6: Installation of digital infrastructure in the Regional Authority. This digital infrastructure will not be exclusively directed to scientific and research purposes such as action 1.3 foresees. This action includes the building-up of a network by the Regional Authority that will allow extra activities regarding the democratization of the policy making such as a public consultation digital platform that will allow public consultation for critical energy transition issues, and free access for internet for all the citizens of RWM, including the business sector.	*2024-2028*
Action 1.7: Creation of an Industrial and alternative tourism plan. A plan that will include alternative forms of tourist such as industrial tourism (primarily) and other forms (religious tourism). The plan will primarily include the necessary training in alternative forms of tourism and it will be implemented by the university and other research regional organizations and will include the exploitation of the extensive existing infrastructures of the ex-PPC industrial facilities as well as the wide variety of religious monuments existing in RWM.	*2024-2025*

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Elaboration and Justification

Upskilling programmes and strategies should be implemented in energy transition regions, in order to drastically strengthen energy transition magnitude towards a positive alternative developmental paradigm. Those “green jobs” include the training of the local and/or potential workforce to skills primarily related to alternative forms of green energy (Solar, Wind, Hydroelectric, Hydrogen) (Czako, 2022) and technologies related to the exploitation of RES technologies (e.g. energy storage in battery systems). In fact, the upskilling should start before the official energy transition period, and be intensified during it. Effective upskilling frameworks usually include innovative training programs, high-tech digital and physical infrastructures, collaboration of the local universities and research/training institutes with other important regional actors such as the Regional Authority and Local Authorities (Municipalities).

In order to putting forward an extensive upskilling of the local workforce through the creation of efficient, decentralised and innovative procedures, where the local research institutions will play a primary role, the following actions have been proposed:

- **Action 1.1:** Initiating a Regional Foresight Study for re-and-upskilling has the potential to set the exact educational and training needs of citizens that have been mostly affected by energy transition. By that way, efficient territorial governance will be implemented in the direction of directing local workforce to get more effectively engaged in professional activities that is needed in energy transition.
- **Action 1.2:** The establishment of an upskilling programme that will be mainly focused on the citizens that have been mostly affected by energy transition is a crucial subject that may positively affect the policy area. In particular, for specific worker groups such as the former employees of the Public Power Corporation (PPC), an extensive upskilling programme will be implemented, which will be focused on introducing them to new innovative competences and skills focused on RES technologies and other similar subjects. This programme may help them cope with the new development paradigm promoted in the region. More specifically PPC ex-workers that have already lost their jobs due to the decreased or even eliminated mining activity, would be drastically benefited by such a program, helping them to be financially re-activated and contribute to the regional income.
- **Action 1.3:** The initiation of digital infrastructures, specifically designed for science, research and upskilling/reskilling purposes will provide the local business sector and the citizens of RWM with the necessary skills that will help them drastically contribute to the development of an alternative paradigm. Infrastructures such as open research portals and scientific databases with specific subjects, primarily related to energy and digital marketing should be developed. After the foresight study and the upskilling programme, the construction of those infrastructures that will allow the implementation of action 1.1 and action 1.2 is of prominent importance.
- **Action 1.4:** As a fourth step that will be implemented in parallel with actions 1.1, 1.2 and 1.3, the upskilling programme has to be enriched with innovative and RES-related technologies that may allow RWM to make an extra step towards an effective energy transition. In this framework, innovative energy technologies such as Hydrogen, should be taught in the region, creating a distinct knowledge and research background that will provide the innovative framework under which the alternative energy paradigm can be based upon.

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- **Action 1.5:** In order to attract new investments with both an increased science/research footprint and an investment footprint, extensive building and transport infrastructures should take place in the region. For the attraction of students/researchers from other regions in Greece, as well as foreign students/researchers, the connection of RWM with the Greek railway network is required. Moreover, advanced logistics infrastructures are also required, with the build up of new facilities for research and study activities.
- **Action 1.6:** Apart from the digital infrastructures exclusively for upskilling/reskilling purposes described in action 1.3, the Municipal Authorities of Western Macedonia should go forward with the build-up of extensive communication infrastructures. High-speed cable internet is the most important of those, that should be developed within the boundaries of the five major cities of Western Macedonia (Kozani, Ptolemaida, Grevena, Kastoria, Florina) in order to allow all citizens to have free fast internet access.
- **Action 1.7:** Apart from its significant developmental footprint with a high financial impact for RWM, the creation of an Industrial and alternative tourism plan will drastically strengthen the knowledge background and the scientific/professional skills of the local businesses and the citizens in RWM. The exploitation of the current facilities of the lignite factories should be included in the alternative tourism plan, with the creation of schools and research institutes about alternative forms of tourism. Master degrees about alternative forms of tourism in the university and short courses are included in the action.

Relation to ongoing policy processes/strategies

Just Development Transition Programme (JDTP) foresees the abandonment of the coal-based energy production facilities and the implementation of new sustainable investments in the region of Western Macedonia. In detail, JDTP's Axis 4.1.2 *"Actions of counselling, upskilling and employment"* and Axis 4.3 – *"Upgrading skills and retraining of human resources"* contain funds for all upskilling activities. The up-skilling of the local workforce with new, innovative and market-oriented job skills is primarily important in order to allow these people to quickly re-enter employment. Thus, a regional foresight study for the re-and-upskilling of the local workforce foreseen in Action 1.1 will set the exact training objectives focused on new technologies and competences will greatly contribute onto that direction.

Furthermore, the increased involvement of local governance foreseen by JDTP forces local authorities to create assessment tools for monitoring and evaluation local governance procedures, in terms of decisions and plans' effectiveness and speed of decisions and activities' implementation. Considering that direction, the creation of an assessment tool that will evaluate the speed and effectiveness of decisions regarding just transition is primarily important. The tool foresees the usage of digital technologies, desk research, case studies, structured questionnaires, etc.

Moreover, the Integration of digital transformation infrastructure of RWM foreseen in Action 1.3 into the direction of providing high-speed digital networks, increased online services provided to local businesses and citizens, open science and research platforms as well as digital public information and consultation platforms will drastically empower the primary target of JDTP which is the sustainable development of the region to an alternative production paradigm.

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RRI Framework

RRI RELATED MEASURES	
Inclusiveness	Inclusiveness for all businesses and citizens of RWM in the upskilling programs as beneficiaries in action 1.3. Moreover, Municipalities and the Regional Authority will participate in implementing actions 1.5 and 1.6, along with the University.
Anticipation	Action 1.1 foresees the implementation of a study that will detect the precise educational and training needs regarding energy transition skills.
Reflexivity	Reflexivity may be integrated through the continuous assessment of the negative effects of the scheduled activities according to the Just transition Development Programme and the inclusion of specific teaching/training of implementation measures and activities that may ease any negative effects would promote reflexivity.
Ethics	The university ethics committee will be involved in implementation of actions 1.1, 1.2 and 1.4.
Gender	The university ethics committee will be directly involved in action 1.4, securing a balanced gender-wise availability of positions.
Open access	Action 1.3 foresees the initiation of open research portals and scientific database, regarding energy transition issues.
Science education	Science education is directly included in actions 1.1, 1.2, 1.3 and 1.4. From the conduction of the foresight study, to the implementation of the upskilling, to the completion of the proper digital infrastructures to the Hydrogen course.

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Objective 2: Creation of an entrepreneurial ecosystem in the Region of Western Macedonia

OBJECTIVE AND ACTIONS	TIME FRAME
OBJECTIVE 2: Creation of an entrepreneurial ecosystem in the Region of Western Macedonia.	
Action 2.1: Initiation of an Action Plan for entrepreneurial growth in the region by the regional authority, the municipalities, the university and the local professional chambers. The plan will foresee specific incentives and funding will accrue from the regional authority / municipalities. The plan will be implemented by the local and regional actors exclusively, which are also going to fund the supportive activities. The ulterior purpose of action 2.1, is to plan and implemente a regional entrepreneurial growth program, independently of the national programs foreseen in JDTP and other tools. The local chambers will set the needs of the local business world, and the Municipal and Regional Authorities will fund the supporting activities which will include financial direct subsidies, funding of energy and digital needs of the local businesses, usage of regional and municipal areas for investment purposes and others.	*2023 - 2025*
Action 2.2: Establishment of an innovation zone. The establishment of the innovation zone is a long-term goal for RWM and is expected to drastically contribute to regional science and businesses environment. The area will be provided by the Regional Authority and the University will have the main role. The Innovation Zone will be multi-thematic, including specific research and business sectors. Local scientists will be primarily attracted to build start-ups and spin-offs in those subjects.	*2023 - 2025*
Action 2.3: Creation of a spatial plan that will clearly foresee land usage and distinguish areas for major investments, RES infrastructures, agricultural activities and other usages. The spatial plan will distinguish the exact land usages for industrial activities (further separated into distinct pollution levels), RES installations, business activities, tourism activities, agricultural activities, farming activities and free-of-use land. The plan will be initiated by the Regional Authority with the help of the Municipal Authorities and the local University.	*2023 – 2025*

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Elaboration and Justification

The creation of an entrepreneurial ecosystem in the Region of Western Macedonia is a must in order to develop an alternative development paradigm. An entrepreneurial ecosystem will involve all the actors of RWM – businesses, academia, policy makers and NGOs – in shaping a multi-factorial framework that will help local businesses and coming investments to develop themeselves. In fact, the local entrepreneurial ecosystem consistutes the core element in implementing an effective energy transition (Sheng, 2020) and this action aims to set the detailed framework of embedding entrepreurship into the energy transition process of RWM.

Thus, in order to create an entrepreneurial ecosystem in the Region of Western Macedonia the following actions need to be implemented:

- **Action 2.1:** The creation of an action plan that will be specifically designed according to the points indicated by the local entrepreneurial community of RWM is foreseen in this particular action. The local chambers as the main representatives of the local businesses will set the detailed needs of such a plan. The action plan will mainly include financial incentives that are going to be provided by the Regional Authority. The Municipalities of the region will also contribute in providing indirect incentives such as areas for investments, financial coverage of municipal infrastructures and others.
- **Action 2.2:** The installation of an Innovation Zone will be done in a specific are provided by the Regional Authority and the Municipalities. The innovation zone will be separated into five distinct thematic axes, installed into the five major cities of RWM. More specifically, Kozani city will harbor the Polythematic section, Ptolemaida will harbor the Hydrogen section, in Kastoria the Entrepreneurship section will be based, in Grevena the tourism section and in Florina city the agri-food section.
- **Action 2.3:** A spatial plan could strengthen the entrepreneurial ecosystem in RWM by allowing investments to be implemented in a bureaucratic-free environment, with clear distinction amongst land usages. Stakeholders pointed out that the foreseen spatial plan should not include all activities but it will be exclusively including the land usages for the RES facilities. Since in RWM a huge amount of more that 11 GW have already been installed or planned to be installed in the near future, the spatial plan should specifically foresee that those investments should be based on inhabited areas or areas that may have any agriculture or other use. The spatial plan should be funded by both national and local authorities and all decision-making bodies of the region should participate in the public consultation regarding its initial plan. And the lands that are going to be engaged.

Relation to ongoing policy processes/strategies

JDTP foresees Axis 4.1.4 – *"Special Business Grant Programme for the employment of unemployed, former employees of companies affected by de-lignification"* and Axis 4.2.4 – *"Programmes to subsidise jobs for highly qualified personnel in the green energy".* Both Axes are directly connected to Action 2.1, foreseeing extensive funds for the supporting of entrepreneurship.

Furthermore, in Axis 2.1.1 – *"Strengthening and promoting entrepreneurship",* there is a specific plan for the creation of an Innovation Zone in Western Macedonia that should be completed until 2027 by the University of Western Macedonia and CERTH research organization. The plan in JDTP is for the Zone to be separated into three distinct pockets, the first pocket will be entitled "green and digital transformation" based in Kozani

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city, the second pocket will be entitled “Innovation Hub of Green Hydrogen” based in Ptolemaida and the third pocket will be entitled “Living lab of a Smart City”, based at a sparsely populated area of RWM. Stakeholders in Action 2.2 pointed out a slightly differentiated structure of this innovation zone, since it should be thematically and geographically separated into the five major cities of Western Macedonia, with the thematic of Hydrogen, Tourism, Agri-food, Tourism and Polythematic. The initiation of a spatial plan is foreseen in the same axis of the JDTP, however with slightly different provisions in comparison to those pointed out by the stakeholders. In the JDTP it is considered a secondary activity with no specific budget.

RRI RELATED MEASURES	
Inclusiveness	The action plan foreseen in action 2.1, involves the participation of the regional authority, the municipalities, the university and the local professional chambers, indicating the three out of the four helices of the quadruple helix will be included in the design of the tool and the implementation measures.
Anticipation	The spatial plan included in action 2.3 foresees exact land uses for RES installations and facilities. In that way it anticipates possible unauthorized land usages for RES investments or disputes between citizens and businesses over land usage.
Responsiveness	The initiation of the spatial plan comes in response to the resistance already observed by citizens in RWM, regarding the installation of RES facilities near residential areas. A RES-based action plan foreseen in action 2.3 will prevent installations of RES facilities to residential or agri-cultural areas, responding to the citizens’ expectations.
Open access	Action 2.3 foresees open access to the public consultation initial spatial plan that is expected to be published so every interested party will express its possible objections or contributions.
Ethics	Action 2.1 will be specifically designed according to the social/financial/environmental concerns, specifically indicated by the local entrepreneurial community of RWM. It constitutes an ethical expression of the point of view of the local entrepreneurs.
Science education	Innovation Zone foreseen in action 2.2, is a place of science and education by default. Scientific and research activities are implemented on a daily basis, resulting in innovative scientific results that can be commercialized. With the drastic support of the University and other research institutes in the region, science education will be further promoted by the Innovation Zone.

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Objective 3: Development of a regional energy efficiency model with the inclusion of actions towards the achievement of environmental sustainability

OBJECTIVE AND ACTIONS	TIME FRAME
OBJECTIVE 3: Development of a regional energy efficiency model with the inclusion of actions towards the achievement of environmental sustainability.	
Action 3.1: Programme for achieving regional energy efficiency on an industrial and consumption level in connection with the Just Development Transition Programme (JDTP). The programme will include a foresight study for current and future energy needs per municipality in the region, taking into consideration major investment plans. Action 3.1 first foresees the calculation of the current energy needs of local businesses and industry, as well as the needs of the foreseen investments in the JDTP. Next, an incentive program will be implemented by the local Municipalities, in partially funding the replacement of non-green energy sources of the business sector with RES and alternative energy sources that are green and contribute to a sustainable energy model for RWM.	*2024 - 2026*
Action 3.2: Setting up a holistic action plan for environmental restoration of ex-mine lands. The action plan will be conducted with the help of the local university, PPC and METAVASI A.E., which is the owning body of the mine lands. It will include specific activities for lands, depending on the production model of each area. Some areas will be used for industrial purposes, other for tourism activities and the rest for agricultural activities.	*2024 - 2027*
Action 3.3: Create an "Environmental sustainability and circular economy" university master-degree course. The university will have the primary role in designing the project. University departments of other energy transition regions will be also part of the course. The degree will involve the policy practise that has already been implemented into other regions that have already implemented energy transition with success.	*2023-2024*
Action 3.4: Initiate an "environmental tariff" to non-green investments and environmental activities that will be exclusively used for environmental restoration purposes at a regional level. The tariff will be imposed to the businesses that pollute over a specific level and the money gained will be returned to the region for sustainable activities such as land restorations, transportation infrastructures and others.	*2025-2026*

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Action 3.5: Creation of a Waste Management Plan and spatial planning of waste storage. The action will be conducted with the help of DIADYMA S.A., the regional body responsible for the recycling of the waste produced in the region. It will involve un-used areas of ex-mines that will be used for the implementation of the waste management and storage of waste materials.	*2024-2026*

Elaboration and Justification

Regional issues have been a crucial component of the circular economy. Due to the connection between the circular economy and sustainability, particular legislative initiatives are required to integrate social and technical as well as economic production drivers and re-evaluate energy management in order to promote circular principles. Public policies that have a regional focus such as the Just Development Transition Programme, adhere to the subsidiarity principle, and better match the externalities of economic activities by including environmental regional management and activities supporting entrepreneurship are required to support the circular economy and sustainability targets. The majority of existing circular economy strategies, however, do not include this regional component that this action will try to tackle.

In practise, energy transitions, renewable energy consumption, and natural resources improve environmental quality and bring economic growth (Khan et al., 2022). Thus, the development of a regional energy efficiency model with the inclusion of specific actions towards the achievement of environmental sustainability, may significantly accelerate effective energy transition. Energy efficiency may be achieved through the accomplishment of several indirect goals such as energy decrease from fossil-fuel sources, restoration of former industrial areas that already have been or going to be abandoned, initiation of environment and energy-related training courses, effective waste management and others.

For the development of an effective and inclusive regional efficiency model, the following actions need to be implemented:

- **Action 3.1:** The goal is to decrease energy consumption to industrial, business as well as private level in RWM. This programme should include specific measures for energy decrease, depending on the activity of each entity, based on RWM. Thus, a foresight study will be first implemented measuring the current energy needs of the industrial businesses based on RWM, followed by a calculation of the needs for the rest of the businesses and the needs of the households. Then, future energy needs of the major investments foreseen in JDTP unti 2023 will be also calculated, shaping a total estimation of the current and near future energy needs in RWM. A series of measures for decreasing energy needs that is customized to the characteristics of its organization (industrial, commercial, households) will be also developed. These will include financial incentives for businesses and households, the support and promotion of energy communities (financial incentives, bureaucratic processes, legislation framework) and the implementation of a programme of zero energy balance.
- **Action 3.2:** A large portion of lands, formerly used for mining purposes has already been abandoned in RWM. These lands have been transferred to METAVASI. S.A. a public company of private law. The environmental restoration of those lands, as well as the implementation of other usages with an

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increased environmental footprint is of primary importance. Action 3.2 constitutes a detailed plan of proposals on how the lands could be restored scientifically and what usages could be implemented. The University of Western Macedonia is expected to take the major role, with its scientifically specialized departments and scientists. The action plan will be implanted according to the European policies that are related with carbon footprint and decrease of methane emissions and there will be efforts towards the funding of the plan by PPC.

- **Action 3.3:** The region should update its scientific background with academic knowledge that is directly connected to the needs of the real economy. In that direction a specific university-level course that will analyze the specific interconnections and interactions of circular economy with environmental sustainability is considered especially important. The master-degree course could be also entitled an "energy transition" master-degree, that will scientifically analyze all the detailed financial opportunities that arise from the development of a green development model, constituting a guidance framework from policy makers, businesses and citizens of RWM, participating in energy transition.
- **Action 3.4:** The imposition of green taxes or tariffs has been a scientifically and politically debatable subject over the last three decades (Oates, 1995). The logic behind action 3.4 is to implement a green tariff for those industrial businesses that burden the regional environment over a specific level, and use the money accrued from the tax exclusively for sustainable activities in RWM. This action has faced objections by both experts and citizens, pointing out the action should be limited to only large companies that excessively pollute and for smaller companies a (financial) motive not to pollute should be provided instead.
- **Action 3.5:** The creation of a holistic a Waste Management Plan that will include the management of any kind of waste at a mass level is considered a top priority. RWM is lucky to have one of the most innovative companies in Greece in the sector of waste management – DIADYMA S.A. With its help, the Regional Authority of RWM can first set a distinct area where the Waste Management facility will be developed. Next, a management industrial process for recycling and exploiting high-tech materials such as REV components (Photovoltaic Panels and Wind Turbine components) will be implemented, initiating a high-tech waste mechanism that will bring high value income to the region. University of Western Macedonia and the regional research bodies such as CERTH will contribute with their knowledge background.

Relation to ongoing policy processes/strategies

As Action 3.1 foresees, the initiation of an Action Plan for achieving regional energy efficiency on an industrial and consumption level in connection with the Just Development Transition Programme sets the technical actions that need to be taken in achieving energy independency based on RES and alternative energy sources. In fact, the abandonment of the fossil fuel-oriented energy sources is the primary aim of JTDP. In parallel with the JDTP's principles and actions, a techno-financial study conducted by the local university that will clear up the technical solutions that may be used in order to switch to energy efficiency and lower power consumption.

JDTP Axis 4.3.1 – *"Developing new and upgrading existing human resources skills in areas such as renewable energy, environmental remediation and waste and waste management as well as in industrial specialisations",* is directly relevant to Action 3.2, Action 3.3 and Action 3.5, in terms of setting the need for

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environmental restoration and its training, as well as the need for the training onto the direction of Waste Management. Likewise, Axis 4.7.2 – *"Upgrading of social welfare structures, modernisation of equipment and adaptation of operating hours to the needs of workers"* connects Action 3.1, 3.2, 3,.3 and 3.5 to the major goals of JDTP.

Moreover, DIADYMA S.A. implements a wide variety of national and European projects regarding Waste Management in the region as well as waste management and recycling activities. Mixed Municipal Solid Waste Management, Recyclable Materials Management, Electrical & Electronic Waste Management, Biowaste Management, Bulky and Green Waste Management and Non-hazardous Waste Management are just some of the services the company offers. Project's experts plan to use DIADYMA's expertise in order to create a Waste Management Plan exclusively customized to the energy transition's needs.

RRI RELATED MEASURES	
Inclusiveness	The Programme for achieving regional efficiency in Action 3.1 will include norms and rules according to which, all societal segments and representatives from the 4 helices of the quadruple helix from the region can participate and benefit. For instance, research and academia shall be subsidized to change all their lighting and heating devices to low-energy devices, households will be subsidized to replace their heating lighting/heating devices, public authorities will also implement similar programs and industrial companies will decrease their energy footprint.
Responsiveness	Action 3.2 – the environmental restoration of ex-mine lands – comes as significant need to financially and socially exploit the former-mine lands has been emerged in RWM at a society level. The project responds to the ongoing public consultation about the usages of mine lands, taking place right now in RWM.
Ethics	University ethics committee will be directly involved in Action 3.3.
Open Access	Open Access will be drastically promoted through actions 3.1, 3.2 and 3.3. The data of the energy efficiency programme, the plan for environmental restoration and the science results of the master degree course will be fully available through digital platforms and open databases.
Science education	The Master-Degree program in Action 3.3 will mobilize university scientists and regional scientists to uncover the most effective versions of circular economy.

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AIRR reflections

Participation

LGA-WM as a public body represents the 13 Municipalities of the Region of Western Macedonia (RWM). This representation is directed to either the citizens of RWM or the central (government) policy makers. Taking this into consideration, the drastic involvement of all societal actors (including citizens, researchers, policymakers, industry, civil society organisations and NGOs) is intensely promoted by LGA-WM, showing the necessary levels of inclusiveness. This is done through a series of measures such as the organization of public events where crucial legislations concerning RWM are presented, the implementation of research projects about the main policy foci of the region which benefit all 4 helices at the local level, the promotion of key local policy issues to central policy makers and other measure into that direction. Those activities are also considered as means of anticipation, since they foresee possible implications of policy actions, specifically regarding the main policy area of energy transition.

Amongst LGA's primary activities is to respond to hot ongoing societal issues and problems and propose effective measures to the municipal authorities in coping with those issues, attributing the necessary levels of reflexivity. For instance, regarding principles of the JTDP, LGA-WM has proposed specific implementation measures about monitoring transition through a Just Transition Observatory and secure just outcomes for the local community. This is a clear sign of reflexivity to local society needs from the organization's side.

Moreover, the citizens of the local community may respond to the knowledge gained, by participating in informative events, training courses and research project activities on how to implement energy transition based on the RRI principles. Implementing in practise a responsive policy, towards effective research and innovation, LGA-WM and other research facilities in RWM may promote means and structures that can ease these processes such as digital platforms, public consultation platforms and other, while the personnel of those organizations may promote an RRI-based development paradigm model, by training and teaching citizens and business representatives its principles and implementation measures. Public debates organized and promoted by LGA-WM and similar organizations can gather attention of local and central makers, in terms of the public interest that they will concentrate and the outcomes they might reach. In that sense, those organizations can further contribute to an RRI-based accountable governance.

Communication and Dissemination

Regional policy makers who have participated in the project's deliverables have communicated the results in their organizations. More than five press releasees have been published, following the activities of University of Western Macedonia and the Local Government Association of Western Macedonia, regarding the project deliverables and activities The Citizens Review Panel has been followed by a press release and a live interview in TOP regional TV channel and a press release in regional websites, communicating the results to the wider public. LGA's website has posted all project activities, from the participation to the implementation. Moreover, one scientific publication with project's results has already been submitted to the Journal of Responsible Innovation (Submission ID - No. TJRI-2023-0100 234973691).

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Regarding the scheduled actions, action 1.4 and 3.3 foresee a university publication in the institution's website. All actions will be supported with press releases with the time of their operational use.

After the finalization of the project, all RRI-LEADERS deliverables will be uploaded to the LGA-WM's portal, in order to allow scientists and policy makers to have permanent access to the findings. Furthermore, since the project has a policy focus on energy transition, LGA-WM will keep presenting the project and its results to the numerous informative activities it is going to participate, regarding the organization's practical involvement to energy transition.

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