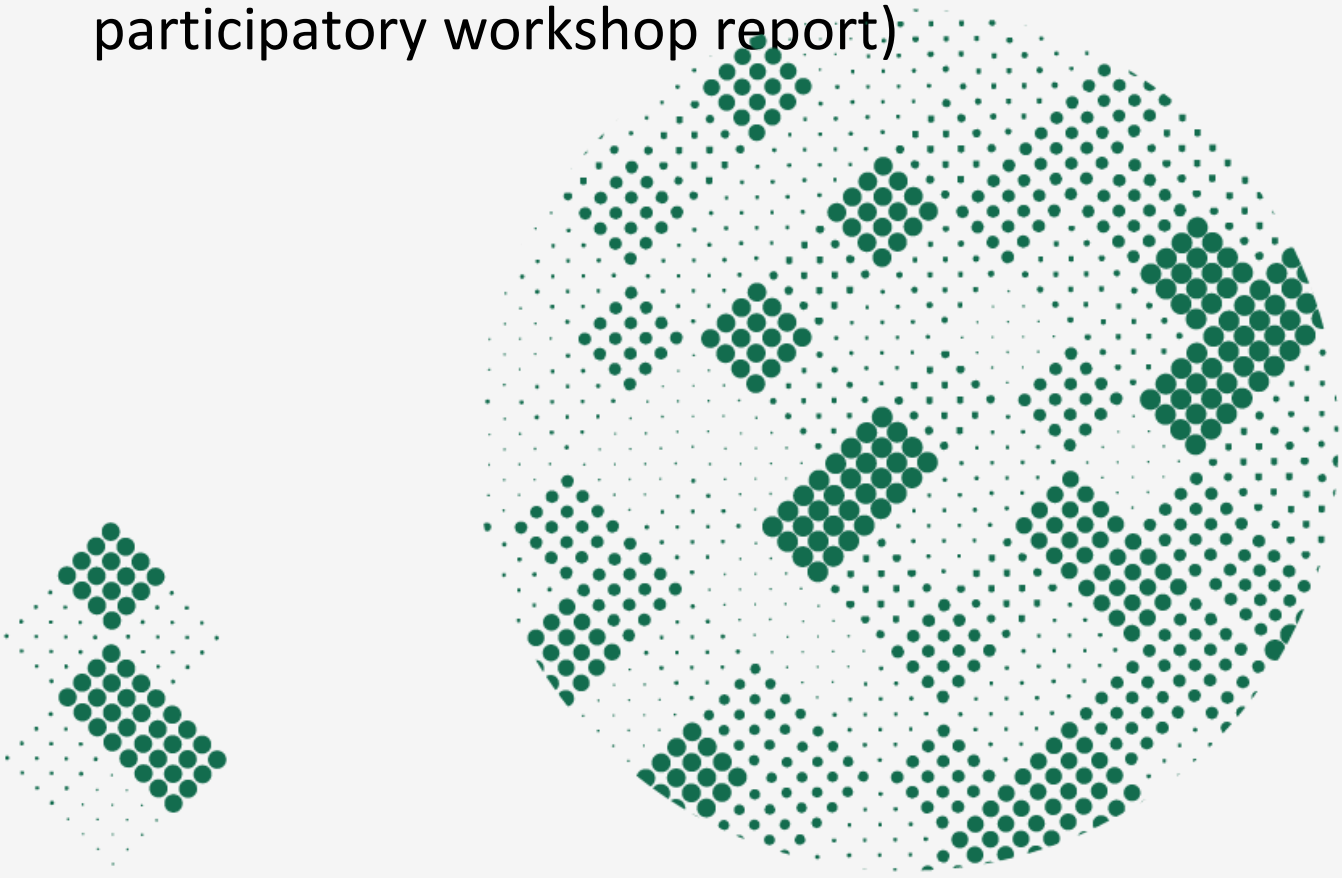
RESPONSIBLE RESEARCH AND INNOVATION IN TERRITORIES

RRI LEADERS

Task 2.2.

Territorial Report – Municipality of Thalwil, Switzerland

(Documentary analysis and participatory workshop report)



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Task 2.2.

Territorial report – Municipality of Thalwil, Switzerland (documentary analysis and participatory workshop report)

Deliverable leader	Partner 2 - UNIVERSITY OF WESTERN MACEDONIA
Lead author	Dr. Richard Blaese (ZHAW)
Contributors	Benjamin Ueltschi (Municipality of Thalwil) Martin Schulz (Municipality of Thalwil)
Editors	
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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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Introduction

This document consists of four main parts:

1. Methodological overview with a brief outline of the main RRI-AIRR definitions and concepts.
2. Documentary analysis of the relevant national legislation, strategies, and programmes related to RRI.
3. Documentary analysis of the territorial legislation and local strategies and programmes relating to the policy focus of the Municipality of Thalwil.
4. Summary of discussions from the participatory workshop on mapping of RRI systems discourse in the involved territories – an event with participation of relevant territorial stakeholders.

The concluding part offers some findings and reflections on the embeddedness of the RRI-AIRR approach in territorial policies with a particular focus on the chosen policy areas.

This report completes the preparatory mapping of the territorial context regarding the embeddedness of the RRI keys in Thalwil's policy and strategic framework documents. The first two steps of the mapping procedure included semi-structured interviews and a focus group. Nineteen interviews were conducted with representatives from the municipal and state administration, non-governmental organisations, research and academia, as well as the business sector. The interview questionnaires were adapted to the policy topics chosen by the Municipality of Thalwil. The findings of the interviews were subsequently summarised per quadruple helix model: research and academia, policy-makers, NGOs, and business. Following the interviews, a focus group meeting was held with representatives of various organisations. Participants pointed out many important issues regarding the compatibility of the RRI keys and the AIRR dimensions with the objectives and actions envisaged in the strategies and actions plans for the selected policy areas in Thalwil. The results are presented in "Deliverable 2.1: Map on stakeholder relationships and interdependencies and report on stakeholders' needs, interests, power, and influence."

The current document supplements these findings with an analysis of relevant national and municipal documents, and the inputs from a participatory workshop with experts from all stakeholder groups. The workshop participants discussed possibilities to integrate the RRI-AIRR approach in the city's policies, in particular concerning the energy transition.

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Methodology

The first part of this report is based on desk research and analysis of the existing policy documents at the national and municipal levels. The second part summarises the discussions held in the participatory workshop in July 2021.

Regarding implementation of the energy transition, Thalwil has no specific energy and climate concept. Instead, there are various concepts and plans, such as a municipal structure plan[1] and a municipal energy plan[2], which address individual policy aspects.

The report starts by providing an orientation on the city's current measures to reduce greenhouse gas emissions and energy consumption based on its municipal energy and guideline plans. These issues are evaluated in greater detail, among others in a catalogue of measures for the re-audit of the "Energiestadt Thalwil" label marking the city as a so-called "energy city"[3]. To account for different aspects of energy planning, some examples of the municipality's status quo in terms of planning are given in the following chapter (as of August 2021).

The report includes recommendations to local policy- and decision-makers on how to identify opportunities/policy areas for integration of the RRI-AIRR approach for future policymaking and the strategic development of the municipality.

The following **cantonal documents** are reviewed:

- **Cantonal structure plan of Zurich**[4]

The following **municipal documents** are reviewed:

- **Legislative goals of the Municipality of Thalwil**[5] (2018-2022)
- **Municipal structure plan** (28 October, 2015)
- **Municipal energy plan** (2015, October)

[1] Kommunaler Richtplan Thalwil 2015. Retrieved from https://www.thalwil.ch/_docn/625844/1_KRP_TeilA_FestlegungenErlauterungen.pdf
[2] Kommunaler Energieplan 2015. Retrieved from https://www.thalwil.ch/_docn/3033500/Plan_Kommunaler_Energieplan_2015.pdf
[3] Re-Audit Energiestadt Thalwil – Aktivitätenprogramm 2018-2022 (internal document)
[4] Kantonaler Richtplan Zürich (2019, October). Retrieved from https://www.zh.ch/content/dam/zhweb/bilder-dokumente/themen/planen-bauen/raumplanung/dokumente/richtplaene/Besch_KR_Richtplantext.pdf
[5] Legislaturziele Gemeinde Thalwil (2018-2022). Retrieved from https://www.thalwil.ch/aktuellesinformationen/1063433

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DOCUMENTARY ANALYSIS OF CANTONAL STRATEGIC DOCUMENTS

The cantonal structure plan of Zurich (2019) defines the directions of spatial development, which the canton of Zurich wants to take and specifies minimum requirements for all structure plans of the cantonal municipalities. The document is drafted by the cantonal government and approved by the cantonal parliament. Once it has been approved by the federal government, the specifications of the cantonal structure plan of Zurich become binding for all municipal authorities. This strategic document covers the following areas: spatial concept, settlement, landscape, transportation, utilities, waste management, and public buildings and facilities. The cantonal structure plan contains binding specifications for the authorities at all levels of governance but is neither parcel-specific nor binding for landowners.

AIRR principles reflected in the cantonal structure plan

Anticipatory governance: The cantonal structure plan of Zurich addresses guidelines and measures in the above-mentioned areas, on the one hand, based on future scenarios and the application of new technologies (for example, in the field of mobility or building insulation) and, on the other hand, against the background of a growing number of people with various needs related to energy consumption in the Canton of Zurich. Another indication of anticipatory governance is the assessment of risks in specific areas. Thus, in the area of settlement development, the document identifies some sources of potential disruption, such as floods or technical faults, and emphasises the coordination of settlement development and accident prevention. This way, costly, ecologically and aesthetically unsatisfactory protective structures and object protection measures can be largely dispensed with.

Inclusiveness: The strategy document integrates the perspectives of a large number of societal stakeholders, such as, for example, in the area of non-motorised transportation. Since pedestrian and bicycle traffic rely on safe and accessible connections, the strategy aims to promote a cohesive and continuous network of bike lanes with connections to public transport. In particular, the cantonal structure plan calls for a coordinated network of pedestrian and bicycle paths across municipalities, including historic transportation routes and wheelchair-accessible paths. Another example of inclusiveness can be found in the field of agriculture. The interests of farmers are to be protected and high demands are made on the balancing of interests in the context of the approval of planning measures affecting agricultural zones. In order to preserve agricultural land, high cantonal hurdles are set against the conversion of fertile land into building land. The cantonal structure plan presupposes the protection of certain interest groups from the point of view of the protection of the environment.

RRI thematic keys reflected in the cantonal structure plan of Zurich

Open access: The aim is to make data available to users free of charge. According to the cantonal structure plan of Zurich, specific data and maps must be made available to the public. In addition, the spatial planning authorities make their own maps publicly available. The structure plan specifies a variety of data that can be

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accessed online via the GIS-SERVER[6]. Another example are the cycling and hiking paths. In the municipal structure plans, cycling, walking, riding and hiking trails, in particular, must be defined, taking account of historical traffic routes.

An important instrument for promoting open access is the further development and expansion of the communications infrastructure. Communications systems should be further expanded. These include facilities in the telecommunications sector and other line and non-line data and message transmission systems (e.g., radio). They have to be coordinated with the needs in the individual areas and settlement development goals, and an area-wide basic supply must be guaranteed, in principle.

Documentary Analysis of Municipal Strategic Documents

The reduction of energy consumption is a goal firmly established in the Municipality of Thalwil and is being addressed with targeted measures. As part of the mission statement enshrined in the municipality's bylaws, sustainable development has become a key component of Thalwil's policies. Since 2010, the municipality has been listed as an "Energy City"[7], a title awarded by the European Energy Award Programme[8]. The "Energy City" label programme is a tool for communities, offering planning stability and assistance in the sustainable energy transformation process. The goals and measures for the energy transition and thus for the reduction of greenhouse gas emissions in Thalwil are set out in several documents at the municipal level. A selection of the most important documents is analysed in more detail below against the background of the policy framework of RRI.

(A) Legislative goals of the municipality in 2018-2022[9]: At the end of September 2018, the municipal council, with the support of the heads of the municipal service centres[10], finalised a set of 12 legislative goals and priorities for the following four years that are set out in this document. Legislative goals concern important strategic projects linked to overriding requirements that the municipality must fulfil (e.g., CO_2 reduction).

[6] The GIS-SERVER can be accessed via http://maps.zh.ch/?scale=336995&srid=2056&topic=KantRiZH&x=2692500&y=1252500.

[7] An Energy City is a municipality that is continuously committed to the efficient use of energy, climate protection, and renewable energies, as well as environmentally compatible mobility. The "Energy City" label is awarded every four years by the supporting association. Together with an accredited energy city consultant, an initial inventory with potential analysis is carried out. Based on this analysis, the municipality defines specific and customised energy and climate policy measures for the following four years through a program of activities. Once 50 % of the possible measures have been implemented, the municipality can apply for a review by the independent label commission of the Energy City Association. For further explanation, please visit https://www.local-energy.swiss/dam/jcr:0b72fbeb-4b5f-4369-b884-d5b6a3c0d6b2/Einfuehrung_Label_Energiestadt__August_2016_.pdf

[8] Energy City Switzerland. Retrieved from https://energy-cities.eu/vision-mission/

[9] Legislaturziele 2018-2022. (2018, November). Retrieved from https://www.thalwil.ch/_docn/2311342/Legislaturziele_2018-_2022_Zusammenstellung_nach_Klausur_genehmigt.pdf

[10] Dienstleistungszentren (DLZ). For an overview of the Thalwil service centers and their scopes of responsibility, please visit https://www.thalwil.ch/departemente.

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AIRR principles reflected in the municipality's legislative goals

Responsive and accountable governance*:* Currently, two of the 12 legislative goals of the municipality for the 2018-2022 period are directly linked to sustainable development or the energy transition. Thus, local policies set the direction for the energy transition and regulate the implementation of measures at the municipal level. Furthermore, Article 8 of the legislative goals calls on schools to promote environmental awareness and future-oriented thinking. Article 10 is about the general reduction of greenhouse gas emissions, the continuous development of renewable energy implementation, and efforts to keep the "Energy City" label. Responsible for this are two municipal service centres: community (DLZ Gesellschaft) and construction, energy, and the environment (DLZ Bau, Energie und Umwelt). In terms of responsive and accountable governance, Thalwil began fostering sustainable development in different municipal areas as early as 1998 (e.g., in energy consumption and education). For the last 20 years, sustainability has become a key policy component, deeply anchored within the legislative goals of the municipality**.**

Inclusiveness**:** First and foremost, the development of a strategy document ensures the integration of the perspectives of a wide range of societal and political actors. On the one hand, all parties represented in the municipal council were involved in document development, as were the heads of the various service centres. On the other hand, in the various legislative goals for the implementation of certain issues and measures, the document calls on other actors, such as societal players or administration and industry players, to take an active role and provide support. For example, specific classes at Thalwil public school are supported by Oekopolis - an important societal player in the municipality.

RRI thematic keys reflected in the legislative goals of the municipality:

Science education: This is an important element of Thalwil's legislative goals, especially in terms of sustainability and the energy transition, a key policy focus area. The second legislative goal explicitly addresses the topic of further (sustainable) development and education of public employees (including administrative and janitorial staff), which makes this issue a core task of the administration by providing support and measures for implementation. In order to evaluate effectiveness, a survey tool is being employed to ensure continuous applied evaluation and suitable training opportunities. The next employee survey will be conducted in 2022.

Promoting the science education of children: The eighth legislative goal is the promotion of environmentally conscious and future-oriented thinking and acting in Thalwil's public school. In addition to sustainable development, environmental topics should be included in the curricula of all school sections[11]. The municipality and its stakeholders (e.g., the infrastructure and society service centres (DLZ Bau, Energie und Umwelt and DLZ Gesellschaft), the energy officers, and Oekopolis[12]) must ensure that local and global environmental topics are covered in class. Furthermore, at all levels from kindergarten to 9th grade, environmental education is promoted

[11] The new curricula "Lehrplan21" embeds sustainable development as integrated part for both the primary and the secondary section of the Swiss school system.
[12] For more information about Oekopolis, visit https://www.oekopolis.ch.

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by "PUSCH – Practical Environmental Protection"[13]. While completing their compulsory education, students are taught in an age-appropriate manner with sequences on waste and consumption, water and energy, and the climate .

Open access: The third legislative goal reflects the need to simplify and increase digitalisation and in turn the accessibility of municipal administration data. To achieve this, new services have to be created and existing ones expanded. A strategy across municipalities needs to be explored to identify needs and develop measures and potential synergies for the implementation of new digital services.

Recommendations regarding the inclusion of RRI and AIRR

- More detailed measures and elements related to RRI keys, such as public engagement and gender equality, should be included.
- The legislative goals could be more directly linked to scientific sources to facilitate evaluation and reflection in order to expand **reflexive governance**. In addition, the Sustainability Steering Group - a strategic body that reviews key issues and projects for sustainability - could become involved in the implementation and review of legislative goals.

(B) The municipal structure plan (2015) outlining particular projects to be implemented over the next decades must be developed further according to the strategy. The municipal structure plan of the municipality of Thalwil consists of several sub-structure plans: settlement, landscape, traffic, infrastructure, and public buildings & facilities. In it, Thalwil reaffirms its commitment to sustainability and seeks a balance between economic, ecological, and social aspects in its decisions. The municipal structure plan is a good, long-term management tool for the municipality The municipal structure plan was first introduced in 1997 and is revised every 15 to 20 years. Usually, existing targets are further developed and where necessary, new targets are introduced.. During implementation, it is a matter of working out options and realising sustainably justifiable solutions. Among the topics covered under the plan's sub-areas (e.g., building, mobility, and transportation planning) is the development of concrete strategies, taking into account economic and environmental sustainability.

AIRR principles reflected in the municipal structure plan

Anticipatory governance*:* The municipal structure plan is determined by the municipal council and requires the approval of the cantonal department of planning. The structure plan serves to coordinate spatial activities within the municipality, as well as with neighbouring municipalities and the region. Current and planned projects are included in the municipal structure plan and coordinated with each other. The objectives of the municipal structure plan are binding for all authorities. The municipal council and the administration must adhere to the guidelines of the municipal structure plan within the scope of their discretion. The measures formulated in the

[13] For more information about PUSCH, visit https://www.pusch.ch

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document are approached, implemented, and periodically updated by the authorities in accordance with the instructions for action.

Based on current construction activity in Thalwil, a population growth of 6 % by about 1,100 inhabitants is expected by 2025 (18,500 as of 2019). The strategies addressed by the municipal structure plan have been developed against the backdrop of a growing population. Examining and developing future policies in the light of various disciplines and population trends is indicative of forward-looking governance. For example, the document identifies specific regions that are to be built up more densely in the future to preserve recreational areas in the community. Thus, the document examines and anticipates certain future scenarios considering a growing population.

***Inclusiveness**:* Objectives and measures are formulated to ensure the integration and participation of the various stakeholders, such as local businesses and agriculture. The document therefore promotes concrete measures to support agricultural ventures in the municipality. The strategic document highlights the need to support and protect the livelihood of the local farming community. It encourages the production of local produce from an ecological point of view because agriculture makes a valuable contribution to the environmental education of the population of Thalwil.

***Responsive and accountable governance**:* According to the municipal structure plan, there is limited scope for the creation of affordable housing. Opening the school facilities to the population and creating new open spaces in the settlement area will lead to an improvement in residents' quality of life. Care facilities for the sick and elderly are being further expanded.

To ensure ***reflexive governance as well as responsive and accountable governance*** in the implementation of the municipal structure plan, a simple control system needs to be established, e.g. by monitoring a set of criteria.

Recommendations regarding the inclusion of RRI and AIRR

- More detailed measures related to RRI keys, especially public engagement, science education, and open data, should be included. However, with respect to the RRI thematic keys, further details and specific measures are presented below when describing the status quo of the implementation of the municipal energy plan.

(C) Municipal Energy Plan (2015): The municipal energy plan analysed the local heat supplyand the available energy potential. The energy targets were adapted to the current energy policy prerequisites and higher-level targets and supplemented with an actionable list of measures. The general goals are an economical and environmentally friendly heat supply for the local building stock, as well as a significant reduction of greenhouse gas emissions by an increased use of ambient heat and renewable energy. Thus, the main objective of the document is to explore Thalwil's thermal heat supply and associated CO_2 emissions. The

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municipal energy plan is based on the requirements of the Canton of Zurich energy policy[14] and on the guidelines of the above-mentioned "Energy City" label and was developed with the help of a group of energy experts representing the stakeholders in the areas of politics, society, research, and industry.

AIRR principles reflected in the municipal energy plan

***Responsive and accountable governance**:* On the one hand, Thalwil's municipal energy plan makes concrete recommendations for measures such as the use of ambient heat, geothermal energy, solar energy and natural gas. On the other hand, it specifies concrete energy targets to be reached by further measures yet to be developed. Setting, implementing, and evaluating long-term goals that are supported by the entire community is a sign of responsive and accountable governance. Also, the municipality's energy plan of 2004 already went in that direction. The 2004 energy plan set ambitious targets concerning energy consumption (1990: 249 GWh per capita -> equivalent to 16 MWh per capita; 2015: 226 GWh per capita --> equivalent to 12.7 MWh/cap. The 2004 energy plan was revised in 2012 to align it with the current goals of the Swiss federal government and the Canton of Zurich. The municipal target is an energy reduction by 30 % and a reduction in the use of fossil fuels to 55 % by 2035 (municipal council resolution, 2014).

In general, Thalwil's municipal energy plan (2015) highlights the following status quo:

- The residential heating requirement per inhabitant in Thalwil is 6 % above the national average due to an above-average, specific residential space requirement.
- The potential for energy savings through building renovations is high.
- The heating requirement per workplace is significantly below the national average (low proportion of manufacturing industry).
- Despite a good natural gas supply, 38 % of the heat in Thalwil is still generated with heating oil.

***Inclusiveness*:** The municipal energy plan explicitly establishes policies and guidelines to meet the energy consumption, heating, and cooling needs of various stakeholders, including residents and industry, and designates specific zones for this purpose.

RRI-thematic key areas reflected in the municipal energy plan

Open access: Thalwil has a solar power cadastre[15], which surveys the suitability of individual roof surfaces and shows their potential for solar power. With an information campaign, among other things, it promotes the use of both solar energy and photovoltaic systems. Interested property owners receive advice and detailed support

[14] The underlying assumptions are based on cantonal energy law (Art. 1 EnG, March 2011), which stipulates that CO_2 emissions from heat and power supply as well as mobility must be limited to 2.2 t per person by 2050. This target corresponds to the "Progress" scenario of the Energy 2050 vision for the Canton of Zurich. The corresponding interim target for 2035 is to reduce total CO_2 emissions to 3.5 t per person. Converted to the heat supply, this means that only about 1.4 t CO_2 per person may be emitted.

[15] For further explanations of the project, please visit https:// www.gis.thalwil.ch

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for corresponding projects, and the Thalwil promotion programme provides targeted information and motivation, all of which serves as a good example of open access.

Public engagement: Various sections of the municipal energy plan suggest that feasibility studies should be conducted in cooperation with property owners. This could include topics such as the need for cooling (waste heat), choice of energy sources, optimal size for the first stage with expansion options, and economic viability. These studies should be based on scientific methods (in line with RRI key ethics) to provide information that will help community planning, in particular to develop measures that consider the needs and individual energy consumption of residents.

Science education: The municipality plans to offer training courses to raise the awareness of janitorial and building maintenance staff and make building operations more sustainable. To develop a suitable training programme, employee interviews are conducted in a systematic way to identify the need for further training in energy management and conservation.

REPORT FROM THE PARTICIPATORY WORKSHOP IN THALWIL

The participatory workshop was jointly organised by the Municipality of Thalwil and the Zurich University of Applied Sciences on 14 July 2021. The online event discussed the energy transition in Thalwil and the role of the RRI-AIRR approach in local policymaking. A total of fifteen stakeholders shared their knowledge about key areas of Thalwil's climate policy and also listened to a keynote speech on net-zero strategies of the neighbouring city of Zurich. They discussed the five thematic RRI keys and AIRR dimensions relevant to improving Thalwil's climate policy, as well as concrete measures that could be implemented to achieve the established municipal policy objectives. The half-day workshop yielded useful input on two of the most critical policy areas of Thalwil – mobility and buildings, both of which account for a large share of direct greenhouse gas emissions.

METHODOLOGY

The workshop explored how territorial stakeholders perceive the municipality's responsibility with regard to research and innovation in the light of the five thematic RRI keys and four AIRR dimensions, and their relevance to policy development. Another goal of the workshop was to achieve a common understanding among participants about the benefits of the European Commission's RRI policy framework for the energy transition in Thalwil. A brief introduction on the objectives of the EU project RRI-LEADERS was followed by a keynote speech on the climate strategy of the nearby city of Zurich and a discussion round. Next, the objectives of Thalwil's energy transition were presented, as well as the policies currently being implemented. For this purpose, the workshop continued in two breakout rooms, with participants collaborating virtually on MIRO[16]. The first room discussed the RRI policy framework as it relates to mobility issues and their relevance to the energy transition, while the second group focused on energy issues related to buildings. Discussions in each group were structured around a pre-defined questionnaire, which included questions about the integration of RRI thematic keys and

[16] MIRO is a virtual platform for collaboration and group work // miro.com

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AIRR dimensions and the current state of municipal policymaking. Findings were summarised by the moderators of each group and presented to the participants in a plenary session.

KEYNOTE SPEECH

The city of Zurich has a far-reaching influence, both politically and economically, on the surrounding municipalities, including Thalwil. Zurich has always been a forerunner in Swiss climate policy and is, therefore, of particular interest in the context of the energy transition in Thalwil. In line with the Paris Agreement, Zurich has taken several steps to reduce its carbon footprint. After a successful popular vote on the "2000-Watt-Gesellschaft"[17], the city's latest goal is a net-zero pledge, i.e., reducing all direct emissions within the city's borders by 2040. This represents approximately 25% of total greenhouse gas emissions in Zurich. Furthermore, Zurich has defined all the steps necessary to reach its ambitious goal – decarbonisation of its building stock and the entire public service vehicle fleet, 100% renewable energy generation, and the general reduction of indirect emissions from products and services. Besides this, the strategy also requires carbon sinks such as carbon capture and storage from waste incineration. Zurich estimates the cost of achieving net-zero by 2040 to be around 20% higher when compared to an investment baseline and expects benefits such as the creation of new jobs, local added value, technological advantages, and a better quality of life. The net-zero framework of the city of Zurich is fully in line with its municipal climate objectives.

THEMATIC RRI KEYS AND AIRR DIMENSIONS

The lively discussions in the breakout rooms demonstrated the significance of the RRI-AIRR approach in tackling the energy transition in Thalwil. Although the RRI framework was new to most of the participants, their responses to a series of RRI-related questions yielded valuable insights for moving the project forward. This includes the involvement of all stakeholder groups along the quadruple helix but also the consideration of specific group needs and interests. The discussions also showed that most RRI keys are considered beneficial for future action in the energy sector, i.e. mobility and housing.

Participants focused on the AIRR dimension **inclusiveness**, in particular, perhaps because of the political landscape of Switzerland with its direct democratic system. Usually, the consensus of a majority is required for a political motion to be successful. Therefore, the inclusion of stakeholders at an early stage is almost a prerequisite for any form of political change. Furthermore, the approach of **anticipatory governance** characterises many proposed ideas and inputs. Municipalities are obliged to anticipate the impact of their policies and counteract adverse effects on society at an early stage. Except for **gender equality**, all thematic RRI keys were part of the discussions. As indicated by the interviews, the workshop seems to confirm the notion that gender issues are not relevant in Thalwil's energy transition. While participants did acknowledge the importance of gender equality for other policy fields when asked, they consistently found it to be irrelevant for this particular policy focus. **Open access**, on the other hand was a recurring issue in all subtopics discussed. Some participants perceived the availability of information and existing tools and platforms as insufficient in some

[17] The "2000-Watt-Gesellschaft" (2000-watt society) is a Swiss climate policy goal to reduce the per capita primary energy demand to 2000 watt of continuous power. Additionally, the concept includes net-zero and a fully renewable energy system by 2050.

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cases. Others pointed out that the problem is a lack of knowledge rather than a lack of information and that there is plenty of information available on topics surrounding the energy transition at the federal, cantonal, and municipal levels. While talking about open access, participants raised other concerns, such as changing laws and insufficient monitoring of energy data. It was proposed that the municipality should improve concerning the access to data by the community and the publication of key energy statistics. It was also felt that proper monitoring was needed for existing activities and goals to be more meaningful.

The above issues obviously require more scientific education to promote a broader discourse on the topic among the general population. Indeed, many participants felt that the topic has arrived in the mainstream media and is becoming increasingly important, yet misconceptions and outdated information continue to confuse people and influence their opinion of the benefits of renewable energy technologies. A more sceptical participant stated that the topic may simply be too complex for some. It was felt that **science education** should already start in elementary school, but that, at the same time, the municipality could also do a lot more. In this context, **public engagement** and the need for more awareness were brought up. Participants suggested a public information campaign to make existing tools and platforms more accessible and for demonstration systems to display renewable energy technologies. One participant remarked that the topic is of little concern to the broad public. **Ethics** was mentioned in connection with the social justice debate, and there was a dispute about the need for financial incentives, i.e., a carbon tax. Some participants regarded this as essential in order to further support renewable energy technologies, on the one hand, and to create incentives, on the other. Other participants were worried about increasing social segregation.

BREAKOUT ROOMS

The main part of the workshop was the interaction with participants by means of discussions in two breakout rooms. Each room covered a major policy area for the energy transition in Thalwil. The first room discussed mobility-related issues and the significance of mobility for the transition process. The other group focused on buildings-related energy topics. Discussions in each group were structured around questions about the pre-defined policy areas and about the integration of the RRI keys and AIRR dimensions[18]. Before starting the discussions on the specific policy topics, the moderators asked two introductory questions. The first question was about the perception of the term “energy transition”, the second one about the expected benefits of the transition process for the municipality.

The following paragraphs summarise the discussions in the breakout rooms while indicating embedded elements of the RRI-AIRR approach as well as potential integration for the five thematic RRI keys and four AIRR dimensions.

[18] Since the RRI-AIRR framework is rather new to the Swiss policy landscape, it was particularly challenging to consider the RRI keys and dimensions while not becoming too theoretical in order not to confuse the participants. In the course of the workshop preparation phase, this issue was discussed several times. As a result, the RRI keys and dimensions were transcribed into a set of questions to be asked by the moderators during the breakout-room session. In this way, the RRI framework could be addressed adequately without compromising the nature of the workshop.

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Perception of the term "energy transition"

The first introductory question aimed to show potential deviations from a shared understanding of the term "energy transition". While some participants perceived it as an excellent opportunity for the technological development of the municipality, including the expansion of digitalisation, others expressed concerns about social issues. Two participants mentioned a connection with the global climate system, i.e., climate protection and net-zero emissions. It was also proposed that the energy transition is all about renewable energy technologies (reduction or abandonment of fossil fuels, renewable heating, etc.). For one person, energy transition meant strengthening local value chains.

Benefits of energy transition for the Municipality of Thalwil

The second introductory question was concerned with the expected benefits from the energy transition in Thalwil. Participants identified a broad spectrum of potential benefits linked to all sustainability pillars: technological (energy independence, a self-sufficient energy system, and a local heat and power supply), economic (job creation, the attractiveness of the location, and more innovation), social (less noise pollution and local added value), and ecological (better air quality, reduction of local emissions, and climate preservation).

Non-motorised transport

Regarding non-motorised transport, various measures were discussed that related to bicycle traffic. To travel shorter distances, participants considered bicycles to be a good substitute for cars. In view of the rather hilly topography, the preferred choice is e-bikes, which are already popular in Thalwil. The municipality, it was felt, could promote cycling further through sharing concepts or the construction of additional cycling lanes and parking space. However, participants were divided as to whether this topic falls within the authority of the municipality or should be the domain of private companies. The group further discussed the establishment of car-free zones and restricted speed zones ("Tempo-30"[19]). The population of Thalwil had previously rejected a proposal calling for such a plan by means of a public referendum (indicating **reflexive governance**). One participant suggested temporary "Tempo-30" zones to apply at weekends only in order to convince the population of the many advantages of such a measure (reflecting **responsive and accountable governance**). Participants next deliberated on how to encourage pedestrian mobility, and the construction of additional pavements was suggested. Urban planners were called on to consider the topography of the region and the different needs of various groups of residents, in particular elderly citizens struggling to cover longer distances (reflecting **anticipatory governance**). While the car is expected to remain important for many residents, new services could reduce the need to rely on it for everything and better support the specific needs of the elderly, people with disabilities, etc. (indicating a need to integrate **inclusiveness** according to the **AIRR dimensions**).

E-mobility

Participants agreed that e-mobility is an essential issue in the energy transition and that technological progress will naturally replace combustion engines. In Thalwil, e-mobility has been growing on an annual basis. Nevertheless, it was felt that the municipality should continue to support e-mobility in the future. A discussion followed on the extent to which the thematic key of public engagement plays an important role in integrating new technologies. Public engagement is about bringing together policymakers, industry and civil society

[19] In residential areas of Swiss municipalities, the speed limit is usually 30 km/h (in so-called "encounter areas" even 20 km/h). Some cities, including Thalwil, have been calling for an extension of this speed limit within city limits.

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organisations, as well as NGOs and citizens, to deliberate on matters of science and technology. The discussion showed that it is important to discuss the technological resources and the needs of the different stakeholders. Despite a growing number of public charging stations for electric cars, there is still a general lack of sufficient charging infrastructure. Furthermore, electric supply capacities are not sufficient in all parts of the municipality and thus new power lines may have to be constructed. In addition, participants thought the municipality might support drivers who do not have access to a private charging stations (hinting at the AIRR dimension of **inclusiveness**). The suggestion was made to successively replace all municipal vehicles by a fully electric fleet. With a view to future innovations and technological progress, projects that further develop autonomous driving should be promoted (**anticipatory governance**) - especially in the case of public transportation, where autonomous driving could really be a "game changer". With **anticipatory governance** as a leading principle, the community can better integrate and plan for technological innovations involving mobility and build costly infrastructure over time.

Energy efficiency

Participants discussed the difficulties involved in making a building envelope more energy-efficient, such as long lifecycles for buildings, relatively high investments required, and lengthy payback periods, all of which decreases the attractiveness for investors. Therefore, homeowners must plan long-term measures and consider their real estate holistically, e.g. through consideration of full-cost accounting and lifecycle assessments (**science education**). One approach could be a mandatory renewal fund for homeowners (**anticipatory governance**). This would require regulatory changes at the cantonal level in order to be politically feasible (**anticipatory governance**). For energy-related restoration, professional energy consultants would be helpful (**inclusiveness**). However, in some cases, this is not realistic, and a complete renovation turn might be more practical.

District heating

Renewable district heating networks face several implementation challenges. Besides the high investments needed, they may lack the competitiveness of other heating solutions, be only suitable for dense settlement areas, and simultaneously require an increased number of connections. Some homeowners might be discouraged by the potential dependency on a contractor firm from joining a district heating network. Energy contractors need to increase their cost competitiveness and should consider the increasing demand for district cooling into their services. With several networks in place, district heating in Thalwil has some popularity but faces conflicts of interest with the revenue-generating communal gas business (**anticipatory governance**). Therefore, the municipality should communicate their gas strategy openly and consider future gas and district heating networks as a whole (**transparency** and **open access**). Consumers need to be addressed at an early stage of a heating replacement process (**anticipatory governance**). At the same time, a healthy contracting environment should be established, where actual competition between the contractor firms would improve the market situation (**inclusiveness**).

Boiler replacement

Concerning the replacement of old, fossil-fuelled boilers, several issues were raised. Despite considerable progress, renewable heating systems, especially geothermal energy systems, can still be more expensive than conventional boilers. To compare different heating systems objectively, costs should be considered over their entire lifespan, including all capital and operational expenditures. The implementation of heat pumps may be

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hindered by complex approval procedures (**responsive and accountable governance**) and, in some cases, heat pumps are simply not compatible with the pre-existing heating systems. Furthermore, unfounded scepticism about the effectiveness of heat pump technology still exists (**science education**). While energy consultants usually recommend renewable systems, heating installers may continue to advocate fossil fuel-based systems, whether out of habit, lack of technological competence (**science education**), or simply because of the much lower cost of traditional boilers. Participants agreed about the way renewable heating should be promoted. Besides providing more information for homeowners (**open access**) and making temporary heating systems available, financial incentives such as larger tax benefits and higher subsidies were suggested. Targeted information campaigns based on the Swiss heating cadastre[20] could attract homeowners who may be facing an imminent boiler replacement (**public engagement**). The gradual change from gas and oil heating to renewable systems, based on ambient heat or biomass, affects employees of all kinds. Therefore, it is crucial to address threats and opportunities associated with these changes in the heating sector (indicating the RRI key **ethics**).

Photovoltaics

Generally, participants were optimistic about the development of energy generation from photovoltaics (PV). However, many homeowners are still unaware that PV may be a viable option or sometimes even a real business case (**science education**). Many rooftops are only partially covered by PV to generate enough power for self-use. If they were fully covered, the surplus could be sold to neighbouring properties. One participant suggested that the ZEV concept [21] could be extended to a municipal level (**anticipatory governance**), a de-facto detachment from the monopoly of the regional energy supplier. However, the utility company's role was regarded as crucial for planning and constructing medium-size plants and acting as a general contractor (**inclusiveness**). Other concepts, such as a self-construction cooperative, were mentioned (**inclusiveness**). Generally, a PV plant is less complex than replacing a boiler, and information is readily available. With increasing PV capacity, PV compete with solar thermal heat for rooftop areas. It was felt that Thalwil should lead by example and support the construction of new PV plants on public buildings (**responsive and accountable governance**). Furthermore, stronger collaboration between homeowners and investors was perceived as an enabling factor for a faster expansion of PV (**public engagement**).

SUMMARY REMARKS

The participant workshop involved stakeholders from a wide range of the quadruple helix, to further elaborate on the impact of the RRI framework concerning the energy transition in Thalwil. Two breakout rooms covered key topics for policymaking in Thalwil: mobility and housing. Both sectors account for a large share of direct emissions and, therefore, their reduction pathways are important. Besides the discussion about actual reduction measures, the workshop explored the relevance of the RRI framework concerning the policy focus in great detail.

[20] The Swiss heating cadastre aggregates nationally available heating parameters (e.g. fuel type, heating technology) on Swiss buildings.

[21] ZEV = "Zusammenschluss zum Eigenverbrauch" (merger for one's own use) allows homeowners to sell their surplus electricity to neighbouring homes, thus increasing the motivation to install larger PV plants. Usually, the surplus is sold to the local utility company at rather a low price. This is a win-win situation, as the investor receives a better return on his or her investment, while the neighbourhood profits from lower energy prices.

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In summary, the results of the stakeholder workshop correspond largely with the findings from the interviews and the focus group. While the RRI framework was new to most stakeholders, the RRI keys and AIRR dimensions were considered important and relevant. Although not implemented in the municipal administration, many of the inherent principles and values of the RRI framework are expressed in current policymaking: RRI dimensions are an integral part of the municipal code, RRI keys accompany topics surrounding the energy transition, and it is a fact that different stakeholder groups represent different intentions and interests.

While most RRI keys were recognised by the workshop participants as important, the top two were public engagement and science education - in particular the municipality's need to engage actively and vigorously in the climate debate to close the knowledge gap of residents in the light of the extensive information on renewable energy technologies available. The municipality was asked to make its data more transparent and open to the public, following the RRI principle of open access.

Given the policy focus, anticipatory governance and thus planning over long periods is a necessity. Furthermore, the municipality should lead by example, following an approach of responsive and accountable governance. Regarding further AIRR dimensions, the debate centred around the need for public involvement and inclusion. This approach of inclusive governance, as propagated by the RRI framework, has a long tradition in Switzerland. In a direct democratic state, inclusion and the need to convince the people have always been crucial for political success. When talking about specific measures for Thalwil, the need for a wide consensus is intuitive and was, therefore, apparent at all stages of the discussion. The RRI framework makes this intuitive approach a lot more tangible.

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CONCLUSIONS

Sustainability and renewable energy have been on the political agenda of the Municipality of Thalwil for almost 20 years. With the policy focus to transition its energy system, Thalwil aims to reduce local greenhouse gas emissions substantially. This report analyses the integration of the RRI thematic keys and AIRR dimensions in relevant policy documents and explores the awareness for the RRI framework with a stakeholder workshop.

RRI keys and AIRR dimensions were found to be relevant for all analysed documents. Inclusiveness was the major AIRR principle reflected in all documents. This is not surprising, as the federalist system in Switzerland is centred around a political bottom-up approach, where issues are generally solved at the lowest level, i.e. the municipalities, whereby higher authorities, i.e. the federal government or the cantons, only define a political framework. Furthermore, both the cantonal and the municipal structure plan featured many aspects of anticipatory governance. This is rather evident, as spatial planning is usually done over long time periods. In regards of the RRI thematic keys, open access was a recurring theme.

Besides the municipal energy plan, which has a strong focus on renewable heating for the city's buildings, the "Energy City" label plays a key role in communal energy strategy. Cities bearing this international label are re-evaluated every four years with regard to a wide range of energy policies in a total of six aspects: spatial energy planning, communal buildings and sites, waste disposal, mobility, internal organisation, and communication. These aspects are rated and show the progress over time. The two aspects with the most potential: mobility and housing are also the policy areas most promising in terms of the energy transition.

At the participatory workshop, various stakeholders discussed two crucial policy areas in Thalwil's energy transition: mobility and housing. While all RRI keys were recognised as relevant, public engagement and science education were found particularly important. Furthermore, most stakeholders emphasised the relevance of both inclusive and anticipatory governance, confirming the findings of the documentary analysis.

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