Master thesis

Assessing the Effectiveness of the Energiestadt Label

Papaefthymiou Maria-Eleni

Master of Science in Engineering

Lucerne University of Applied Sciences and Arts
School of Engineering and Architecture

Lucerne, 18.06.2021

Masters's thesis at the Lucerne School of Engineering and Architecture

Title	**Assessing the Effectiveness of the Energiestadt Label**
Student	**Papaefthymiou Maria-Eleni**
Master's degree program	**Master of Science in Engineering**
Semester	**spring semester 21**
Lecturer	**Wagner Claas**
External examiner	**Gizzi William**

Abstract German
-

Abstract English
Rapid urbanization and the increasing environmental footprint of urban areas have resulted in recognising the importance of cities in achieving environmental targets. Certification schemes, such as the Energiestadt label, start becoming more common and provide guidance for local level action. Energiestadt specifically, certifies cities and municipalities which commit to a sustainable energy and climate policy. By now, the label is well-established and it currently counts more than 460 certified cities in Switzerland. The thesis investigates the overall structure of Energiestadt label and critically analyses the effectiveness of its indicators by assessing three areas: the design of the indicators' system and how this compares to other similar labels; the alignment of the indicators with the national strategy; and the performance of a municipality against certain Energiestadt indicators. The results suggest that the label's indicators are well-aligned with the direction of the national energy strategy. However, improvements can be made with respect to the number of qualitative indicators, as well as the way the label assesses municipalities which are more advanced with regard to their energy and climate policy.

Place, date Lucerne, 18.06.2021

Table of contents

1 Introduction 1

2 Methodology 3

3 Theoretical Background 6

3.1 The Role of Cities and Certifications in Sustainable Development 6

3.2 Development and Structure of Certification Systems 8

3.3 Examples of City-Level Certifications and Indices 11

3.3.1 European Green City Index 11

3.3.2 European Green Capital Award 12

3.3.3 Urban Sustainability Indicator 12

3.3.4 Urban Sustainability Index 13

4 Analysis and Results 15

4.1 The Energiestadt Label 15

4.1.1 Overview of the label 15

4.1.2 Certification process 16

4.1.3 Structure of the indicators' system 18

4.1.4 Motivation for acquiring the label 19

4.2 Indicators 21

4.3 Comparison with City-Level certifications 25

4.4 Alignment with the Swiss Energy Strategy 26

4.5 Municipality Case Study 31

5 Discussion 34

5.1 Discussion on the Structure and Content 34

5.2 Assessing the Effectiveness of Energiestadt Label 36

5.3 Recommendations *37*

5.4 Research Limitations *39*

6 Conclusion **40**

7 Reference list ..... **vii**

Appendix A: List of Energiestadt indicators ..... **x**

Appendix B: Original list of Energiestadt indicators ..... **x**

List of tables

Table 1: Theoretical and practical considerations of importance when constructing or analysis and assessment system. Source: Malmqvist & Glaumann (2006)..... 10

Table 2: Indicators of the Urban Sustainability Index. Source: Xiao, Xue, & Woetzel (2010)..... 13

Table 3: Levels of applicability of labels and standards. Source: NNBS (2016)..... 20

Table 4: Overview and description of the indicators' categories used for the analysis.. 21

Table 5: Overview of the different labels in comparison to the thematic areas they cover 26

Table 6: Overview of energy- and climate-related targets as outlined by the Energy Strategy Monitoring Report 2020. Source: Swiss Federal Office of Energy (2020) 28

Table 7: Overview of the Sustainable Development Strategy 2030 directions. Source: Swiss Federal Council (2020)..... 28

Table 8: Energiestadt indicators that correspond to the strategic directions of the Energy Strategy and Sustainable Development Strategy..... 30

Table 9: Recommended set of indicators for the assessment of "gold" certified municipalities..... 38

List of figures

Figure 1: Overview of the methodological approach. 3

Figure 2: Assessment results of the city of Zurich for the European Green City Index. Source: Economist Intelligence Unit (2009) 11

Figure 3: Municipalities awarded with the Energiestadt label as of 2019. Source: Trägerverein Energiestadt (2019). 16

Figure 4: Certification process. Adjusted from https://www.energiestadt.ch. 17

Figure 5: Number of Energiestadt indicators per assessed category. 22

Figure 6: Visual representation of the Energiestadt indicators. The colour indicates the type of indicator, red for qualitative and blue for quantitative, and the number depicts the indicator's weight. 23

Figure 7: Maximum achievable points per category and weighting group. 24

Figure 8: Results of the Energiestadt assessment for the city of Lucerne in 2017. Source: Energiestadt association 32

Figure 9: Greenhouse gas emissions in tonnes of CO_2-equivalent per capita for the municipality of Lucerne in comparison to the emissions per capita of Switzerland. Source: ECOSPEED calculator results Stadt Luzern, Energiestadt Association (2017); Bundesamt für Umwelt (2021) 33

Figure 10: Primary energy consumption for the city of Lucerne in Watt per capita, 1990-2015. Source: ECOSPEED calculator results Stadt Luzern, Energiestadt Association (2017) 33

1 Introduction

The rapid growth of cities and their relatively large environmental footprint have led to recognising them as being of great importance for achieving environmental sustainability. Urbanisation has significant implications for climate change; air quality; water quality; land use; and waste management (Fuhr, Hickmann, & Kern, 2018). Whilst cities occupy just three percent of earth's land, they account for 60 to 80 percent of energy consumption and at least 70 percent of global carbon emissions (UNDP, 2020). Consequently, the way cities are planned and managed has a determined effect on sustainability outcomes (World Bank, 2020).

Local governments have a key position in the transformation towards sustainability. Their proximity to the causes of negative externalities indicates that local measures, such as regulations on transportation, building construction, spatial planning, and waste management, can directly affect the environmental impact. Additionally, due to their close contact with citizens and local businesses, local governments can influence consumer behaviour by implementing emission-reduction policies at the urban level, based on their knowledge of local conditions and capabilities (OECD, 2014).

A way to provide guidance for local level action is through labels and certification systems, which can act as a third-party evaluation against a set of pre-defined criteria. As such, they can incentivise cities to set, monitor and work towards their sustainability targets (Wangel, Wallhagen, Malmqvist, & Finnveden, 2016). While there are numerous sustainability certification schemes available on a building level, similar certifications for the urban level are rare. This gap is also noticeable in the research literature, where most of the articles focus on building-level certifications. However, the share of cities in global energy consumption and emissions, as well as their ability to directly impact sustainability issues, suggest that it is fundamental to expand the system boundary and raise attention on city-level certifications.

In Switzerland, Energiestadt is the only label on a local level in its field. It certifies cities and municipalities which commit to a sustainable energy and climate policy. Since its foundation in 1991, the label has become nationally well-established with currently 461

certified cities. The evaluation of the cities is done with a standardised list of 56 indicator. The indicators are weighted with a maximum number of points, which can be adjusted depending on the municipality's size, structure, and competencies. The label covers 6 main activity areas: development and spatial planning strategy; municipal buildings and facilities; supply and disposal; mobility; internal organisation; communication and cooperation.

This thesis adds to the discussion of local-level certification schemes by assessing the Energiestadt label. Its purpose is to investigate how effective the label is in supporting municipalities with their energy and climate policy. In order to provide answers to the research question, the thesis examines the current design and use of the label's indicators; compares those with other similar labels, as well as with the targets of the Swiss Energy Strategy; and analysis the performance of a certified municipality.

The report comprises six chapters including this introductory chapter. Chapter 2 describes the methodological approach of the thesis. Chapter 3 presents the relevant theoretical background. Chapter 4 describes the analysis and presents the analysis results. Finally, chapters 5 and 6 discuss the results and provide concluding remarks.

2 Methodology

The purpose of this chapter is to present the methodological approach that is followed for providing answers to the research question. It discusses the methods and techniques employed to acquire and analyse the data and explains how conclusions are derived to address the research problem. Figure 1 provides an overview of the methodological approach.

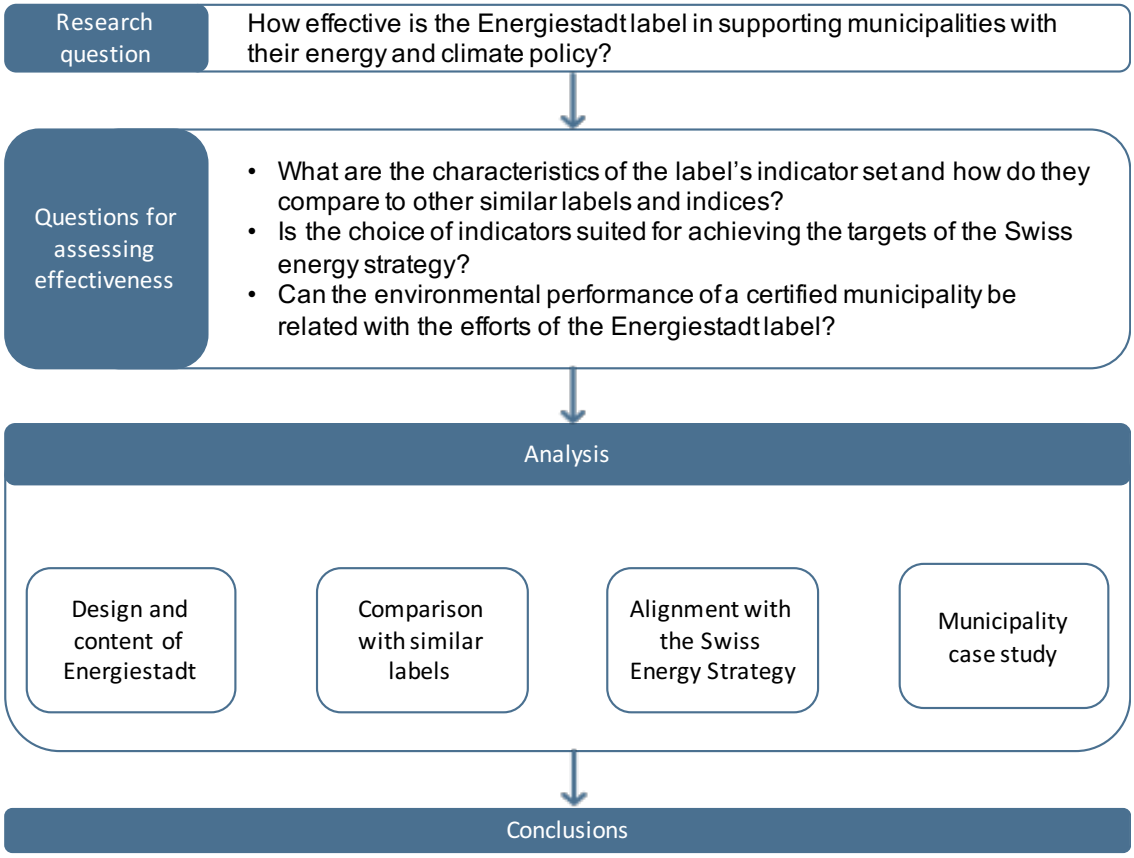

Figure 1: Overview of the methodological approach.

The goal of the thesis is to investigate how effective the Energiestadt label is in supporting municipalities with their energy and climate policy. To assess the label's effectiveness, the research question is decomposed in three parts, which aim to answer the following:

- What are the characteristics of the label's indicator set and how do they compare to other similar labels and indices?

- Is the choice of indicators suited for achieving the targets of the Swiss energy strategy?
- Can the environmental performance of a certified municipality be related with the efforts of the Energiestadt label?

To begin with, data are collected through a literature review. The purpose of this literature research is threefold. First, articles which have performed similar assessments for labels and certification systems are reviewed in order to acquire knowledge about the design and the content of labels. Second, information about the Energiestadt label is collected through its website, related articles, as well as reports which explain the label's aim, structure, assessment criteria and certification process. Third, labels similar to Energiestadt are identified. The aim here is to collect labels which have a similar scope as Energiestadt and, therefore, can be included in the analysis. Their primary focus, thus, must be to measure the environmental sustainability of cities.

To complement the literature findings, primary data are collected through semi-structured interviews. The interviews are conducted with members of the Energiestadt association and municipality representatives. The questions are grouped around three themes: the design and content of the label; the certification process; and the experience of the municipalities.

The collected data are analysed to provide answers to the research questions. First the insights from the literature and the interviews about the Energiestadt label are decomposed in order to understand its structure and content. The indicators of the label are analysed with respect to their type (qualitative or quantitative), the assessment area they cover and their weighting. The characteristics of the label and its indicators are then compared with those of similar labels and conclusions from this analysis are derived. Afterwards, the indicators and thematic areas covered by the label are compared with the targets of the Swiss Energy Strategy 2050 and the Swiss Sustainable Development Strategy 2030. This part of the analysis provides evidence on the importance of each indicator and draws conclusions concerning the alignment of the label with the national strategy.

The last part of the analysis takes the example of a municipality and analyses how it has been performing on a selected group of Energiestadt indicators. The goal is to examine

whether the environmental performance of the municipality is in alignment with the areas that Energiestadt aims to improve. The indicators to be observed are chosen based on three criteria. First, they have to be quantitative, second, data have to be available and accessible, and third, priority is given to the indicators with the highest weights. Finally, the results are critically reviewed in order to derive conclusions with respect to the content and the effectiveness of the label.

3 Theoretical Background

This chapter aims to introduce the relevant theoretical background necessary for answering the research questions. It is organised in three topics. First, it discusses the role of cities, as well as local-level certifications in achieving sustainable development. Second, the literature findings with respect to the development and structure of certifications are presented. The final section presents four examples of labels and indices which are later used for the analysis chapter.

3.1 The Role of Cities and Certifications in Sustainable Development

While people have historically lived in small towns or villages, the proportion of the world's population, has rapidly grown over the last two centuries. As such, around 55% of the world's population lives currently in cities. As this trend is expected to continue, it is estimated that by 2050, urban population will be more than double its current size, meaning that 7 out of 10 people will be living in cities (World Bank, 2020). Urbanisation is generally not bad per se. Cities are associated with economic growth and social prosperity, bringing economies of scale, development of markets, job creation and encourage economic activities to grow (United Nations - Department of Economic and Social Affairs - Population Division, 2019). On the other hand, rapid urbanisation brings a chain of causal reactions; larger population means increased land use, a need for more infrastructure and ultimately increased use of energy and resources. Cities, as nodes of energy and material consumption, are linked to the acceleration of global ecological decline (Burnett, 2007).

However, is this rapid urbanisation going to be another proof of the fact that economic growth cannot be aligned with environmental sustainability? According to Haapio (2012), even though urban areas disrupt regional ecosystems, the fact that the population and, therefore, the consumption is concentrated can have its benefit with regards to global sustainability. For instance, a well-established public transportation system can reduce the dependency on cars, or high population density can reduce the cost per capita of water and waste systems, as well as offer greater possibilities for recycling and waste management. Thus, local level efforts can play a major role in helping to achieve sustainable development on a global level (Burnett, 2007).

The recognition of cities as being of fundamental importance for achieving sustainable development becomes prominent through the increasing appearance of certification systems and assessment tools for urban communities. Earlier, the focus was on single buildings, which is noticeable through the numerous building environmental assessment tools and certifications that have been developed. These aim to assist decision making and improve the environmental performance of buildings (Haapio, 2012). Certification systems for sustainable communities started to emerge after the Agenda 21, resulting from the Rio Summit in 1992, and as a continuation of the certification systems for buildings (Wangel et al., 2016). Here, Article 28 of Agenda 21, which recognised the importance of action at the local scale, led to the creation of a "local Agenda 21" adopted by several municipalities around the world (United Nations Commission on Sustainable Development, 2002).

Yet, when it comes to the certification of urban areas, the question remains: why to certify them and what do these certifications have to offer? At their core, they function as a third-party evaluation against a set of pre-defined criteria (Wangel et al., 2016). In this way, they incentivise municipalities to set sustainability targets and work towards them, as well as highlight sustainability issues that otherwise might have been overlooked. Additionally, the certification provides a platform for communication and collaboration between stakeholder groups and promotes a common understanding of the goals and their outcome (Wangel et al., 2016). The network created between the certified cities can also trigger discussions and help them learn from each other. Furthermore, many agree that city certifications and rankings aiming to measure local environmental sustainability may contribute to the evaluation and development of urban environmental policy (Meijering, Kern, & Tobi, 2014).

Ultimately, as stated by Wangel et al. (2016), certification systems can be considered as environmental management tools, which aim to continuously improve urban sustainability practices. This would mean that each certification cycle is viewed as a combination of interim targets and follows a "plan-do-check-act" process. Nevertheless, the authors continue and mention that "for this to be an effective way of pursuing sustainable development, there is a need for continuous development of the certification system, so that it does not start acting as conservative rather than progressive force".

3.2 Development and Structure of Certification Systems

Before explaining how certifications and labels are developed and structured, clarification of some commonly used terms is necessary. Indicators are distinguished from data or variables as the latter become indicators once their role in the evaluation of a phenomenon has been established. Sustainability indicators specifically are "tools that allow city planners and policy makers to assess the socio-economic and environmental impact of urban designs, infrastructures, policies, waste disposal systems, pollution and access to services by citizens" (European Commission DG Environment, 2018). They also allow cities to monitor the success and impact of sustainability interventions. An index is a synthesis of several indicators (Tanguay, Rajaonson, Lefebvre, & Lanoie, 2010). In many articles the terms indices, certification systems, labels and rankings are used interchangeably.

Certification systems assess an area using a predefined set of indicators. In doing so, they should also provide a precise definition of what they exactly aim to assess. The credits gained for the assessed indicators are then aggregated, sometimes involving weighting, in order to provide a certificate or label (Meijering et al., 2014). This certificate can also have different grades, for example "gold" or "excellent" (Wangel et al., 2016). In the following paragraphs, the aspects that contribute to designing a label are explained, along with identified gaps and criticism as described in the existing literature. These aspects are the definition of the assessed attribute, the selection, aggregation and weighting of the indicators, and the data collection method.

In order to measure a city's performance on an attribute (e.g., on sustainability), this needs to be decomposed into indicators. From the analysis of five European local level certifications, including Energiestadt, Meijering et al. (2014) found out that most indices fail to provide a clear definition of the overall certification purpose on their website, in the assessment report, and in the methodological background documents. Consequently, without a clear definition of what it is assessed, it might be difficult to determine if the appropriate indicators have been selected.

The selection of indicators is usually justified by the use of stakeholder or experts. The experts could be either from within the label organisation or independent, with the latter considered to be less biased. The selected indicators might also depend on political and

practical considerations. As a result, some labels may choose to be aligned with certain policy frameworks or discard indicators for which data are not available (Meijering et al., 2014). Some common indicators for sustainable cities include the reduction of ecological footprint, sustainable land use, the reduction of noise and air pollution, the availability of open spaces, improved mobility and transportation, as well as the reduction of emissions (Burnett, 2007).

With respect to the number of indicators, several studies agree that there is a lack of consensus on the selection and optimal number of indicators (Meijering et al., 2014; Tanguay et al., 2010). The same study that analysed the five European certifications revealed that the number of indicators ranged from 4 to 79, with the largest amount attributed to Energiestadt at the time of the study. Furthermore, none of the labels provided a clear explanation of how indicators were chosen. They were based partially on former indices and partially on experts' opinion, however, none of them based the selection on a theoretical background.

Afterwards, the selected indicators are aggregated into a composite index. This aggregation can be thematic, meaning that the indicators are grouped according to different themes, such as air, water, energy and waste (Tanguay et al., 2010). When aggregating indicators, weights may be used to reflect the importance of each indicator. Although the easiest way is to use equal weighting, the assumption that all indicators are equally important is not preferable. Ideally, weighting is based on a theoretical framework, but it is also possible to determine weights based on experts' and stakeholders' opinion (Burnett, 2007). This approach has drawn much criticism as the lack of transparency on how weights are defined gives the impression that it is an arbitrary process where no weighting structure can rationally justify the attribution of weights to an indicator (Haapio, 2012; Tanguay et al., 2010; Wangel et al., 2016).

The data collected for the assessment are either quantitative or qualitative in nature. Quantitative data are usually acquired from official institutions, such as national statistical offices. In case it is difficult to find indicators for which comparable quantitative data are available, qualitative data are collected instead (Meijering et al., 2014). When this happens, it is important to define how these data are assessed and how their quality is checked, for instance, through experts or/and by following a predefined guide (Tanguay et al., 2010).

Overall, criticism of the certification systems includes the lack of transparency about the methodological characteristics of their assessment. Several studies showed that some of the methodological issues that certifications have concern, among others, the definition of the assessment purpose, the selection of indicators and the way in which aggregation and weighting are performed.

To avoid such problems, Malmqvist & Glaumann (2006) suggest a number of theoretical and practical considerations when constructing certification or, generally, assessment systems. These considerations can be used as guidance when choosing indicators (i.e., developing the content of the label), but also as evaluation system for the resulted label. It is important to note that these considerations are sometimes conflicting with each other, therefore, a compromise in some cases might be needed. The theoretical considerations focus on developing indicators that are rational and statistical appropriate. These include the validity, repeatability and accuracy of the assessment system. The practical considerations focus on how indicators are related to the processes of design, planning and governance. They include the criteria of simplicity, influence and intelligibility of the assessment system. Table 1 provides an overview of the above-mentioned considerations and their definitions.

Table 1: Theoretical and practical considerations of importance when constructing or analysis and assessment system. Source: Malmqvist & Glaumann (2006)

Considerations	**Definitions**
Validity	To what extent is the end-point problem / opportunity properly measured
Repeatability	Would repeating the measurements produce the same result
Accuracy	How accurate is the aspect measured
Simplicity	How costly, complicated or competence demanding is it to collect data and calculate the indicator
Influence	To what extent can users of the assessment system influence the aspect measured by the indicator
Intelligibility	How easy is it to communicate the indicator

3.3 Examples of City-Level Certifications and Indices

There is an abundance of articles analysing labels and indices for buildings and lately for communities and neighbourhoods. The system boundaries of the latter go beyond the ones of a single building, however they mainly focus on the built environment. For that reason, these indices are not presented here. Instead, this section provides an overview of the currently available indicator tools for sustainable cities, focusing on the environmental dimension. The tools summarised here were chosen due to their overlap with Energiestadt in terms of the system boundary they cover. For indices that cover not only environmental but also social and economic aspect, only the environmental-related indicators are listed.

3.3.1 European Green City Index

The European Green City Index is an evaluation of the environmental sustainability of 30 European cities with various population sizes. The evaluation was developed by a panel of experts, and it is conducted by the Economist Intelligence Unit in cooperation with Siemens. Figure 2 shows the overview of the groups of indicators (CO_2, energy, buildings, transport, waste and land use, air quality, environmental governance) on the example of Zurich city.

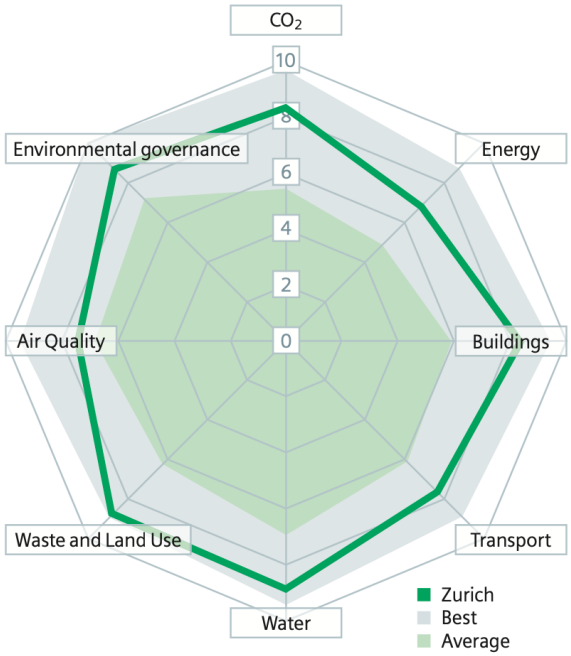

Figure 2: Assessment results of the city of Zurich for the European Green City Index. Source: Economist Intelligence Unit (2009)

The indicator set covers major areas of urban environmental sustainability, with a particular emphasis on energy and CO_2 emissions. The indicators are divided into quantitative indicators, which measure the cities' current performance, and qualitative indicators which cover the aspirations and commitments of a city to sustainable practices. The indicator set is structured to use publicly available data and each indicator is normalised to allow for a comparison between cities (Economist Intelligence Unit, 2009).

3.3.2 European Green Capital Award

The European Green Capital Award is an annual award that recognises one European city for its outstanding commitment to environmental practices. Participant cities are required to have at least 100'000 inhabitants. The cities are judged on an evolving set of indicators, which mainly cover environmental categories. The award is less focused on the economic and social dimensions of sustainability. The emphasis is on long-term strategies, as well as concrete strategies that have been prepared in a systematic way with all stakeholders involved (Berrini & Bono, 2011).

The 12 indicators for the 2021 award cycle are the following:

1. Climate change: mitigation
2. Climate change: adaptation
3. Sustainable urban mobility
4. Sustainable land use
5. Nature and biodiversity
6. Air quality
7. Noise
8. Waste
9. Water
10. Green growth and eco-innovation
11. Energy performance
12. Governance

3.3.3 Urban Sustainability Indicator

The Urban Sustainability Indicator framework was developed by the European Foundation for the Improvement of Living and Working Conditions, based on the commitments laid out in the Charter of European Sustainable Cities and Towns, also

known as the Aarlborg commitments (European Commission DG Environment, 2018). The selected indicators cover all aspects of urban sustainability, with a special focus on measures for environmental health.

The set of indicators has been tested on a number of European cities and includes the following environmental-related indicators:

- global climate
- air quality
- acidification
- ecosystem toxification
- urban mobility / clean transport
- waste management
- energy consumption
- water consumption
- nuisance
- green and public spaces

3.3.4 Urban Sustainability Index

The Urban Sustainability Index is a report which assesses the sustainability of nearly 200 Chinese cities. The tool is extremely scalable as it was developed for cities ranging from 200'000 to 20 million people. An overview of its indicators can be seen in Table 2.

Table 2: Indicators of the Urban Sustainability Index. Source: Xiao, Xue, & Woetzel (2010)

Categories	Definition	Indicators	Description of the indicators
Basic needs	▪ Access to safe water, living conditions, education and health services	▪ Water supply ▪ Housing ▪ Health ▪ Education	▪ Water access rate (%) ▪ Living space (sq.m per capita) ▪ Doctors per capita ▪ Student teacher ratio (primary school)
Resource efficiency	▪ Efficient use of energy, power and water; waste recycling	▪ Power ▪ Water demand ▪ Waste recycling ▪ % GDP from heavy industry	▪ Total electricity consumption (kwh per GDP) ▪ Water consumption (Liters per capita) ▪ Rate of industrial waste recycled and utilized (%) ▪ Heavy industry GDP/ Total GDP (bln RMB)
Environmental cleanliness	▪ Clean air and water ▪ Waste management	▪ Air pollution ▪ Industrial pollution ▪ Waste water treatment ▪ Waste management	▪ Concentration of SOx, NOx, PM10 (mg/cu.m) ▪ Industrial SO2 discharged per GDP (T/ RMB) ▪ Wastewater treatment rate (%) ▪ Domestic waste collected & transported (10,000 T per capita)
Built environment	▪ Dense, transit-oriented, green, efficient design	▪ Urban density ▪ Mass transit usage ▪ Public green space ▪ Building efficiency	▪ Persons per square kilometer of urban area ▪ Passengers using public transit (bus, trolley) ▪ Public green space per capita (sq.m per capita) ▪ Building heating efficiency
Commitment to future sustainability	▪ Investment in human and physical assets	▪ Green jobs ▪ Investment on environmental protection	▪ # of environmental professionals per capita ▪ Amount of environmental sanitation funds per GDP

The emphasis of the indicators is on the social and environmental dimension of sustainability. The environmental indicators include energy efficiency, water consumption, air pollution, waste management and recycling (Xiao et al., 2010).

4 Analysis and Results

This chapter is built around the research questions as outlined in the introduction chapter. It reports the research findings in order to provide answer to the degree of effectiveness of the Energiestadt label in supporting municipalities with their energy and climate policy. In this attempt of assessing effectiveness, the assessment is examining three areas. First, it gives an introduction to the label, analyses its characteristics and compares it to other similar labels and indices. Second, it examines whether the label's indicators are aligned with the targets of the Swiss Energy Strategy. Last, with an example of a municipality, it assesses how a city has been performing with respect to the label's indicators.

4.1 The Energiestadt Label

4.1.1 Overview of the label

The Energiestadt program, managed by the homonymous association, was founded in 1991 and aims to promote a sustainable energy and climate policy at a local level. The label is awarded to municipalities or cities that continuously advocate the efficient use of energy, climate protection, the use of renewable energy and environmentally friendly mobility. It is a sign that cities have reached a certain level of their energy policy. In addition to the Energiestadt program, the association accredits "Energy Schools" for their commitment to sustainable use of resources and it is the official certification body of the "2000W Areale" program (Energiestadt, 2021).

As of 2019, 648 municipalities were members of the association and 445 of them hold the Energiestadt label (Figure 3). This number accounts for approximately one quarter of all the municipalities in Switzerland, however, covers an area were 60% of the population lives. Smaller municipalities have the possibility to be combined (maximum 12), forming an "Energy Region" and jointly apply for the certification.

Overall, the purpose of the label is not only to reward the municipalities that excel with respect to their energy and climate goals, but also to offer the tools that can support them in their planning and monitoring activities. As the label director of the East Switzerland region, S. Huber, stated, "we see Energiestadt as a management system for energy and

climate policy, [similar to] the EU Eco-Management and Audit Scheme (EMAS) and the ISO 14001" (personal communication, 11.03.2021).

To achieve its purpose, the association works closely with the cantons and the Swiss Federal Office of Energy (SFOE). Until 2020, SFOE was providing financial support and starting from 2021 the label will be fully implemented and funded by the Energiestadt association. This means that, in addition to the certification and quality assurance of the label, all marketing-related activities, the coordination and support of the consultants, as well as the content-related development of the label are now carried out by the association itself (S. Huber, personal communication, 11.03.2021; Trägerverein Energiestadt, 2020)

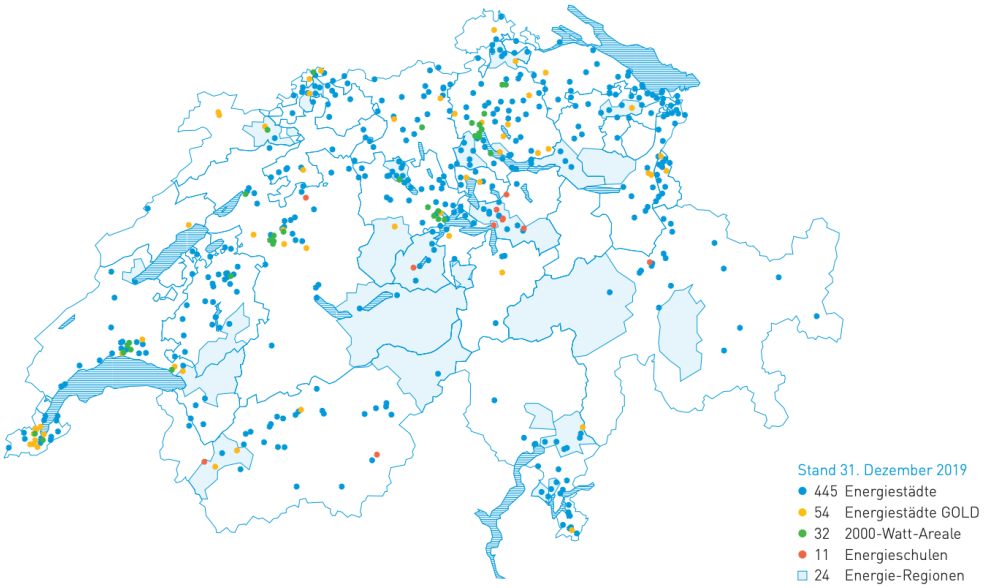

Figure 3: Municipalities awarded with the Energiestadt label as of 2019. Source: Trägerverein Energiestadt (2019).

4.1.2 Certification process

The process of receiving the label follows a continuous cycle of four steps, as shown in Figure 4. The prerequisite and the first step towards becoming an Energiestadt is the membership in the Energiestadt association. The members of the association are part of the network and have access to the tools and helping material offered by the program.

Afterwards, the municipalities choose an accredited consultant who supports them along their work of developing their energy policy. Currently, there are around 100 independent consultants across Switzerland. After an initial assessment of the status quo in the municipality, a targeted strategy and concrete action plan are defined for the next four years. After implementing the agreed measures, an evaluation is performed using the standardised list of 56 indicators. Each indicator is allocated a maximum number of potential points, which can be adjusted depending on the municipality's scope of action, which in turn is determined by its size, structure, and competences. If enough measures are successfully implemented, meaning achieving a score of more than 50% of the potential points, the municipality receives the Energiestadt label for a period of four years. Municipalities with a degree of fulfilment higher than 75% receive an Energiestadt Gold award. A quality check meeting with the consultant is carried out annually, and a re-audit takes place every four years.

This is the usual procedure, however, there are municipalities which are more advanced when it comes to the implemented energy and climate measures. These municipalities can submit their own action plan and directly request the certification (e.g., as was the case for the municipality of Basel city for receiving the Energiestadt Gold) (S. Huber, personal communication, 11.03.2021).

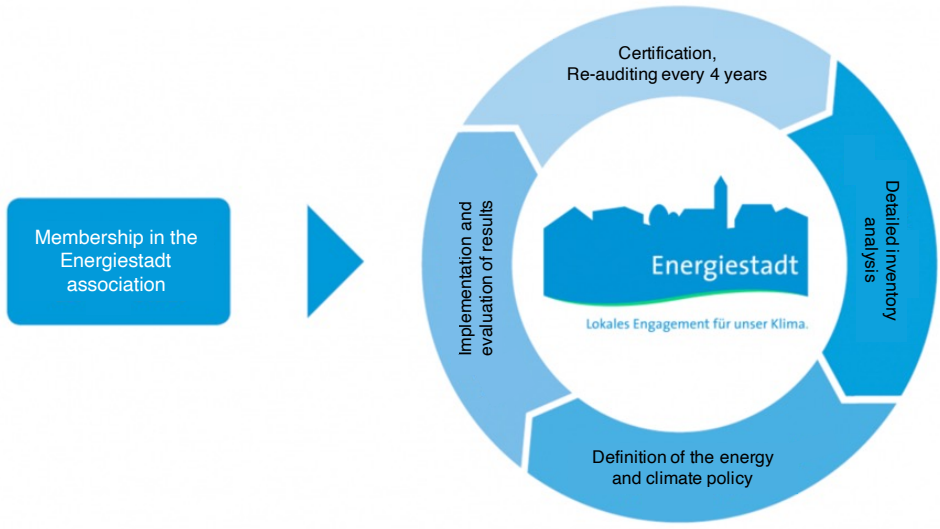

Figure 4: Certification process. Adjusted from https://www.energiestadt.ch.

4.1.3 Structure of the indicators' system

The list of indicators consists of 56 measures (indicators) divided in 6 assessment areas. These areas are the following:

1. **Development and spatial planning strategy:** this area includes indicators related to energy planning, mobility planning and building procedures. (10 indicators, 84 points)
2. **Municipal buildings and facilities:** the indicators here are related to the energy and water management in municipal buildings and facilities. This is also one of the most important areas, since the municipality has a direct impact on the indicators (S. Huber, personal communication, 11.03.2021). (11 indicators, 76 points)
3. **Supply and disposal:** referring to energy, water, wastewater, and waste management in the municipality. (9 indicators, 104 points)
4. **Mobility:** including indicators related to public transport and non-motorised mobility (9 indicators, 96 points)
5. **Internal organisation:** the indicators under this area concern aspects such as creating a team dedicated to energy policy, further development and training of the municipality employees on energy topics, or criteria for procurement in the municipality (i.e., criteria for purchasing new equipment). (6 indicators, 44 points)
6. **Communication and cooperation:** these indicators refer to cooperation with relevant actors, such as universities, companies and other communities, as well as information distribution and organisation of events and activities for informing the general public. (11 indicators, 96 points)

For each of the 56 indicators, there is a defined maximum number of points. These 6 categories result in a total of 500 maximum points that a municipality can reach by fulfilling all the indicators. However, the label seeks to assess its community based on their outstanding achievements. Therefore, if a measure is already fulfilled on a cantonal level, the points for this indicator are diminished. Additionally, the number of possible points is also adjusted depending on the characteristics of the municipality (size, structure, competences). This means that the maximum amount points differ for every municipality.

As mentioned by R. Rigassi, member of the association and responsible for the quantification aspects of Energiestadt, the label is always seeking to improve on the aspect of quantification of its indicators. R. Rigassi himself is working on new methods for making the assessment more efficient, especially for larger municipalities which already have sufficient internal processes in place for planning and monitoring, and they excel in most of the categories (personal communication, 06.04.2021).

The importance of each measure is indicated by the maximum points that can be achieved. For this, there are six groups of weights: indicators that can reach up to 15 points, 12 points, 10 points, 8 points, 6 and 4 points. The indicators' list and weighting system is reviewed and adapted every 4 years, by adding or increasing/decreasing points, according to the new technological developments, new methods, and political awareness. Overall, the purpose of the weighting system is to assign points to areas in which municipalities can have direct impact on their territory (e.g., the consumption of renewable heat and electricity on the municipality buildings and facilities).

A closer look on the indicators and their weights is given in the following sections of the chapter.

4.1.4 Motivation for acquiring the label

As concluded by the report from the Sustainable Construction Network of Switzerland (NNBS) and as mentioned by S.Huber, in contrary to the plethora of labels on a building level, Energiestadt is the only, or at least the most popular sign for ambitious climate and energy policy on a municipality level (Table 3). Thus, on a political level, it acts as an effective tool for requesting an ambitious and regularly updated energy policy. As mentioned during an interview with G. Bessire, nature and environmental protection officer at the municipality of Horw, for many municipalities the most important aspect is the goal setting process and the evaluation of the results occurred by the applied energy policy, and not the label itself (personal communication, 21.04.2021).

Another reason is the financial support that Energiestadt municipalities receive from the cantons and the SFOE. Some cantons cover fully or partially the costs of the certification process. These costs can reach between 600 to 2'600 CHF for the annual membership depending on the size of the municipality, between 18'000 and 24'000 CHF for the

consultant – including the whole process and the certification – and roughly 8’000 to 12’000 CHF for the certification for the whole 4-year cycle. The argument is that these costs could also occur if they want to implement the same measures without the support of the Energiestadt label. Additionally, the SFOE pays a premium of 4’000 CHF per year for every certified municipality achieving up to 70% of the points and 10’000 CHF for municipalities that reach more than 70% (Trägerverein Energiestadt, 2020).

Finally, some of the larger certified cities decide to be part of the label, even if they are further with their policies, not as they need the label, but rather to incentivise others (S. Huber, personal communication, 11.03.2021).

Table 3: Levels of applicability of labels and standards. Source: NNBS (2016).

	Region	Stadt/ Gemeinde	Quartier/ Areal	Gebäude	Bauteil	Bauprodukt	Prozesse
Standard SNBS Hochbau				■			
LEED v4							
LEED für Neubauten und Sanierungen*				■			
LEED für Rohbauten**				■			
DGNB							
DGNB für Gebäude				■			
DGNB für Neubau Stadtquartiere			■				
BREEAM							
BREEAM Neubau				■			
BREEAM Bestand				■			■
WELL				■			
MINERGIE (-P/-A)				■			
MINERGIE (-P/-A)-ECO				■			
GEAK/ GEAK Plus				■			
Gutes Innenraumklima				■			
Natur im Siedlungsraum			■				
Energiestadt		■					
2000-Watt-Areale							
2000-Watt-Areale in Entwicklung / in Betrieb			■				
2000-Watt-Areale in Transformation			■				
SméO							
SméO für Gebäude				■			
SméO für Quartiere (NaQu by SméO)			■				
SIA Merkblatt 2040, SIA-Effizienzpfad Energie				■			
ECO-BKP Merkblätter ökologisches Bauen					■	■	■

Originalbezeichnungen:
* LEED BD+C: New Construction and Major Renovation
** LEED BD+C: Core and shell development

4.2 Indicators

As mentioned, the Energiestadt label uses 56 indicators across six categories. Approximately half the indicators are quantitative (43%), using data such as share of renewable energy, energy efficiency, water consumption and greenhouse gas (GHG) emissions. The remaining 57% are qualitative assessments of the city's energy policies, such as the development of energy and climate goals, the mobility and transport planning and the communication planning. The maximum points a municipality can collect are also equally distributed between qualitative and quantitative indicators, respectively 268 and 232 points.

Figure 6 is a visual representation of the label's indicators. The first level of the graph depicts the thematic areas. The second level depicts each indicator, and the number indicates the maximum points. The colours represent the type of the indicators, red for qualitative and blue for quantitative. The detailed list of indicators can be found in the Appendices. Appendix A contains the analysed list of indicators and appendix B contains the original list retrieved from Energiestadt.

To analyse the content and facilitate comparability with other labels, different codes have been assigned to each of the indicators. These codes represent the thematic areas covered by the indicators and have been derived from the reviewed labels. All labels cover similar areas which can be summarised in the following eight categories (Table 4):

Table 4: Overview and description of the indicators' categories used for the analysis.

Categories	Description
Governance	indicators related to the creation of an action plan, management of environmental issues, communication, engagement, and public participation
Energy	energy-related indicators such as energy consumption for heating and electricity, energy efficiency, energy-related greenhouse gas emissions
Mobility	mobility-related indicators, such as public transport, mobility planning, mobility-related greenhouse gas emissions

Buildings	including indicators such as energy efficient building standards and initiatives
Water	indicators related to water consumption, wastewater treatment and water efficiency
Waste	indicators related to waste produced in the municipality area and recycling rate
Green spaces	including indicators such as percentage of green areas in the city
Air quality	indicators related to level of pollutants in the air

Figure 5 illustrates the result after assigning the above-mentioned codes to the 56 indicators of the Energiestadt label. Most of the indicators fall into the governance category, while the energy, mobility and buildings categories have twelve, ten and eight indicators respectively. Water, waste and green spaces have the least amount of indicators with three, two and one indicators respectively.

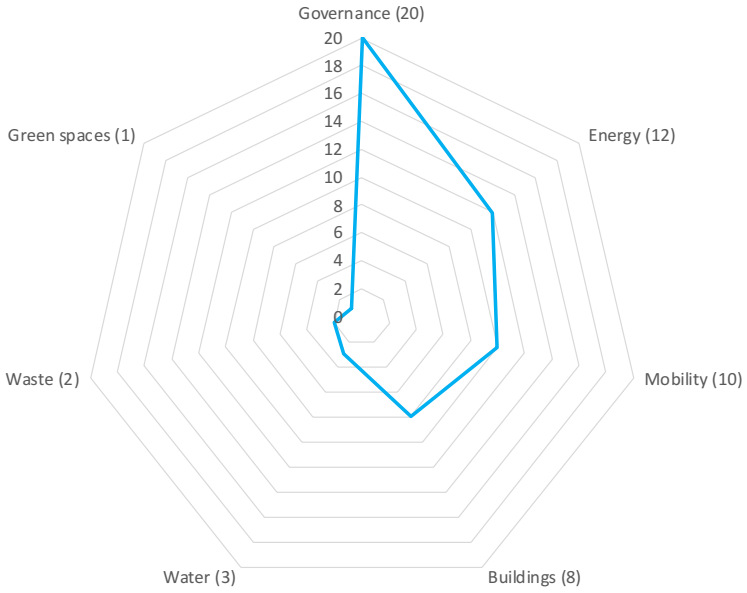

Figure 5: Number of Energiestadt indicators per assessed category.

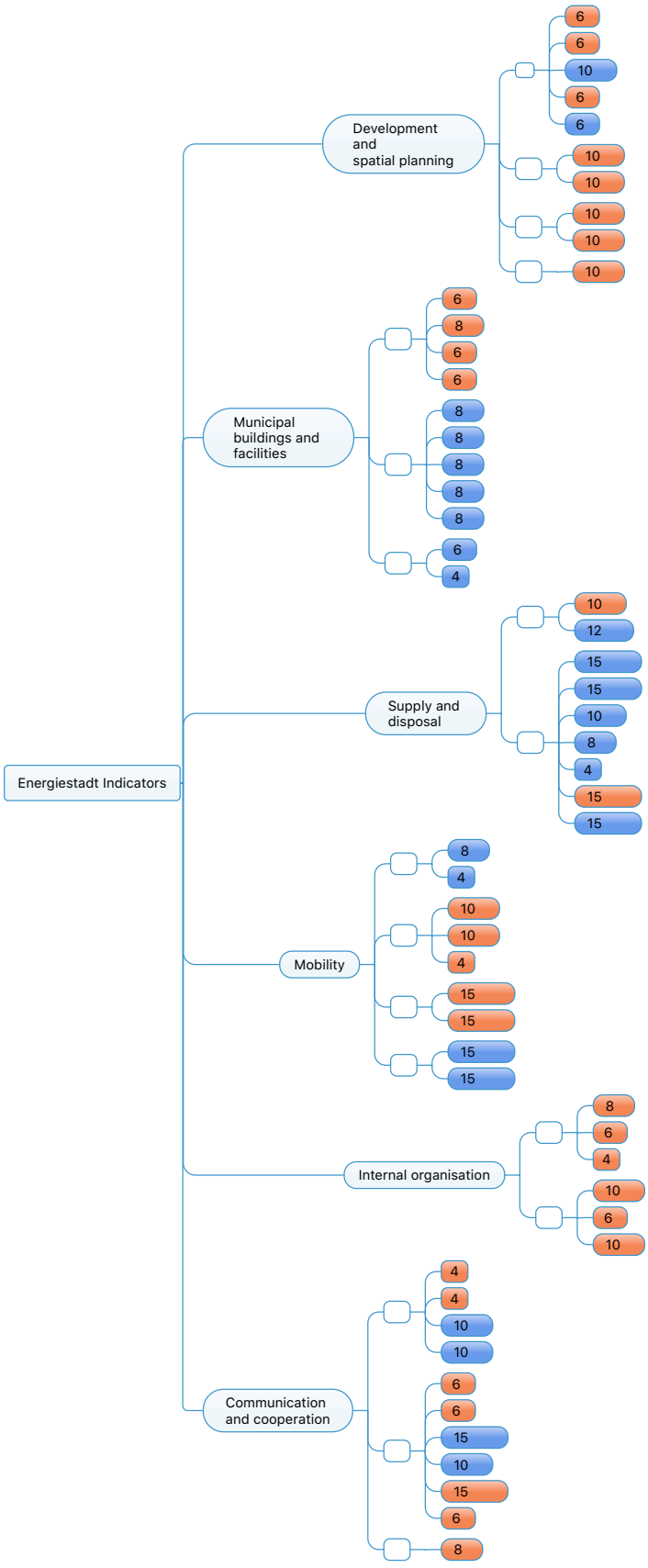

Figure 6: Visual representation of the Energiestadt indicators. The colour indicates the type of indicator, red for qualitative and blue for quantitative, and the number depicts the indicator's weight.

Figure 7 depicts the total amount of points a municipality can receive from each of the categories. The colour gradients of the graph show the distribution of points with respect to the weights of the indicators. For instance, in the governance category, 12 points can be achieved from indicators that are weighted with 4 points each, while 30 of the points in the same category can be gained by indicators which weight 15 points each. Similarly, most of the points are given for governance-related indicators, followed by energy, mobility and buildings.

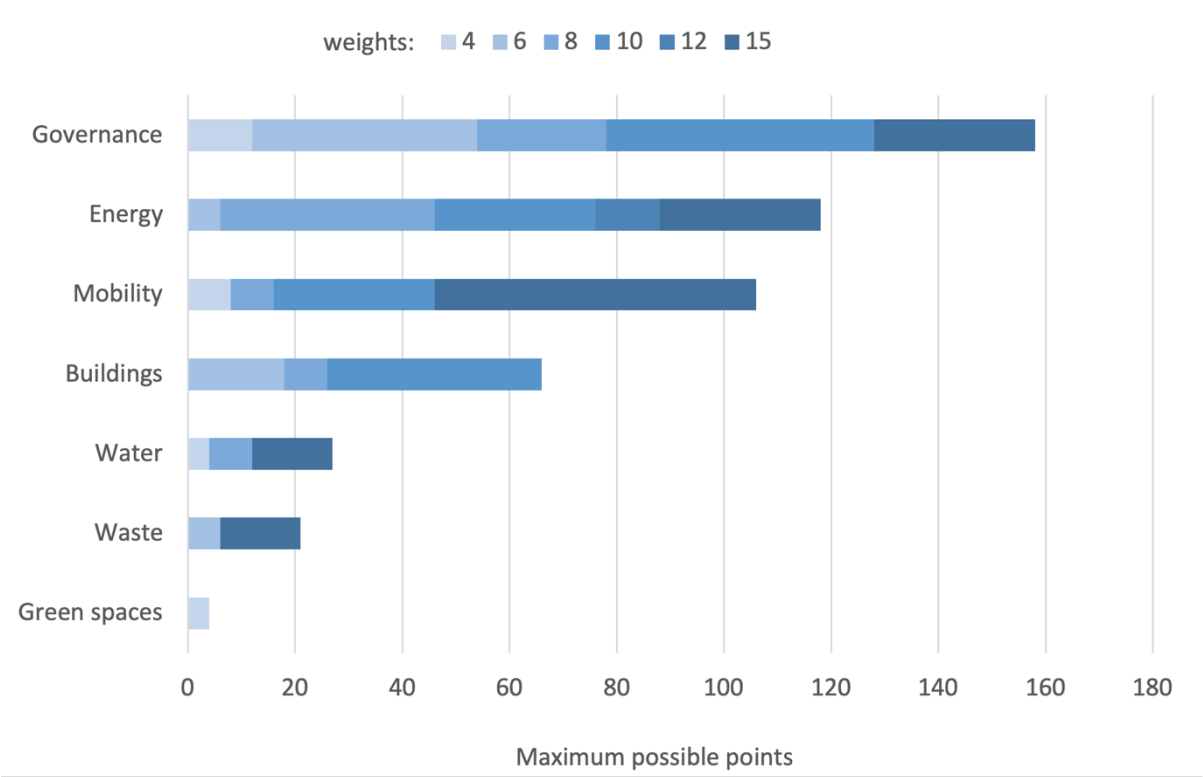

Figure 7: Maximum achievable points per category and weighting group.

The focus of the label, with respect to the number of indicators and the maximum available points, is on the governance aspects, while most of the indicators under this category are qualitative. This result is to be expected and confirmed by all the interview partners who stated that the label represents a quality sign for an active energy and climate policy. Thus, it puts emphasis on qualitative aspects and rewards municipalities that have a competent energy governance.

From Figure 7 it can also be seen that, although the weights are in their greater part equally distributed between the categories, the mobility category has the largest amount of highly weighted indicators. This could be due to the fact that mobility is one of the key areas where cities have a direct ability to influence the choice that residents make, for example, through the extensiveness of public transport or the provision of cycling paths (Economist Intelligence Unit, 2009). On the contrary, as mentioned by G. Bessire, mobility and more precisely public transport is one of the indicators that are difficult to be influenced by the municipality, as they are managed by an external organisation (e.g., in the case of Lucerne and Horw, managed by vbl). Another indicator with a similar difficulty is the waste and wastewater management, which is managed by REAL (Recycling Entsorgung Abwasser Luzern), not by the municipality itself.

4.3 Comparison with City-Level certifications

To give context to these numbers, the indicators are compared with those of similar labels and indices, which have been analysed using the same group of codes. Some of these labels have a wider spectrum of indicators, focusing also on general sustainability topics, including economic and social aspects. For the assessment, only the indicators relevant to the energy and climate policy are considered. Furthermore, several labels have a group of indicators dedicated to CO_2 and GHG emissions. However, for the analysis, this group is considered as a sub-category of the energy and mobility categories. Hence, the indicators related to GHG emissions are attributed equally under these two categories. For example, the indicator "total CO_2 emissions per capita" is counted twice in the analysis, once in the energy category and once in the mobility category.

Table 5 illustrates the areas covered by each of the analysed labels. The choice of the scale is made in a way that facilitates the visual presentation of every label in a concise manner. Starting from the darker shade, "strongly covered" indicates that more than 50% of the indicators fall into one of the categories, which in practice does not occur to any of the labels. "Considerably covered" shows that 30% to 50% of the indicators belong to a certain category, whilst for "moderately covered", 10% to 30% of the indicators are present in a specific category. "Slightly covered" represents that less than 10% of the indicators are in a category. The drawback with this illustration is that there is a sharp cut between the different classifications. For example, if the difference between the

categories is just one additional indicator, it might be depicted as if the one category is "slightly covered" and the other is "moderately covered". Nevertheless, the figure exhibits the range and the focus of each label and allows for comparison.

Overall, the indicators are equally distributed among the categories for most of the labels. Once again, the strong governance focus of Energiestadt is evident. Furthermore, it is the only label with such a high number of indicators, along with the European Green Capital Award. This is possibly due to the fact that both these labels are of the same nature (i.e., awards). Additionally, Energiestadt is the label with the largest number of qualitative indicators. Finally, with respect to the covered categories, Energiestadt does not contain indicators related to air quality, as is done by all other labels.

Table 5: Overview of the different labels in comparison to the thematic areas they cover

Categories	Energiestadt	Green City Index	European Green Capital Award	Urban Sustainability Indicators	Urban Sustainability Index
Water					
Waste					
Mobility					
Green spaces					
Governance					
Energy					
Buildings					
Air quality					

slightly covered
moderately
considerably
strongly

4.4 Alignment with the Swiss Energy Strategy

This part of the analysis examines the alignment of the Energiestadt label with the targets of the Swiss Energy Strategy 2050 and the Swiss Sustainable Development Strategy 2030. This comparison also provides evidence on the importance of each indicator. Table

6 and Table 7 present the targets relevant for the local level derived from the Energy Strategy 2050, the Energy and CO_2 Acts and the Sustainable Development Strategy 2030.

The overall intention of the Energy Strategy 2050 is to significantly increase the energy efficiency and the share of renewable energy used in the energy mix, reduce the amount of CO_2 emissions from energy sources, as well as withdraw form nuclear power (Swiss Federal Council, 2013). The legal basis of the Swiss energy and climate policy are the Energy and the CO_2 Act respectively, which sets targets, instruments and responsibilities for implementation and enforcement.

The Energy Act compiles the main objectives of the Energy Strategy 2050 and therefore an important pillar of energy legislation. Its targets concern the reduction of the final energy and electricity consumption and the increase of electricity production from renewable energies (Swiss Federal Council, 2018). The CO_2 law is the main political instrument at the national level for achieving the country's emissions objectives. It also transposes the international obligations (i.e., Paris Climate Agreement) into national law. Within this, Switzerland has committed to cutting GHG emissions by half in comparison to 1990 levels, by 2030, while the long-term goal is to become climate neutral by 2050. In 2020, a complete revision of the currently valid CO_2 Act was adopted which – subject to the outcome of the referendum of 13th June 2021 – is set to enter into force in 2022. Building on the current measures, the revised rules include measures targeting road vehicles, air traffic, industrial emissions and the renovation of buildings (Swiss Federal Council, 2021).

In the Sustainable Development Strategy 2030, Switzerland defines the guiding principles for its sustainable development policy for the next ten years. The goals apply primarily to the federal level, but cantons and municipalities are encouraged to contribute through their own goal setting. Therefore, considering this strategy in the analysis is also relevant. Since this strategy takes a holistic view on sustainability, the analysis takes into consideration only the Climate and Energy sub-topic. The strategy is currently under consultation, therefore the final version and action plan are not published yet, however, the draft gives a general direction of the important points. The strategy focuses on 3 topics as priorities, namely: sustainable consumption and production; climate, energy and biodiversity; and equal opportunities (Swiss Federal Council, 2020).

Table 6: Overview of energy- and climate-related targets as outlined by the Energy Strategy Monitoring Report 2020. Source: Swiss Federal Office of Energy (2020)

Strategic topics	**Monitored indicators**	**Guideline 2035**
Energy consumption and production	Final energy consumption per person per year (per capita energy consumption)	43% reduction compared to 2000
	Electricity consumption per person and year (per capita electricity consumption)	13% reduction compared to 2000
	Electricity production from renewable energies	11'400 GWh
	Electricity production from hydropower	37'400 GWh
CO_2 emissions	Per capita CO_2 emissions from energy sources	50% reduction of CO2 emissions compared to 1990 level (climate neutrality by 2050)
	CO_2 emissions from energy sources overall and by sector	

Table 7: Overview of the Sustainable Development Strategy 2030 directions. Source: Swiss Federal Council (2020)

Challenge	**Goal**	**Strategic direction**
Reduce greenhouse gas emission and manage climate-related impacts	• GHG emissions reduced by 50% compared to 1990 • 75% of the reduction achieved through domestic measures • GHG emission are reduced to net zero by 2050 at the latest	**Reduce all GHG emissions** quickly and significantly
	• climate-related risks are minimised • opportunities are exploited • the population, the environment, material assets and natural livelihoods are protected • the resilience of society, the economy and the environment to these risks are increased	Managing the **impact of climate change** in a coordinated and sustainable way
	• the number of damage events decreases • and their impact decreases compared to the period 2005-2015	**Sustainable and resilient** areas

	• the population has adequate information and skills to reduce their GHG emissions and adapt to climate change	Improve **awareness and sensitization**; promote competencies
Reduce energy consumption, use energy more efficiently and expand renewable energies	• reduce energy consumption per capita per year by 43% until 2035 compared to 2000 levels • reduce electricity consumption by 13%	**Reduce energy consumption**
	• guarantee economical and environmentally compatible energy supply • guarantee resilient infrastructure	
	• increasing the share of cost-efficient renewable energies • hydropower: production level of at least 37'400 GWh in 2035. • electricity production from other renewables: production level of at least 11'400 GWh in 2035	Rapidly **expand renewable energies**; reduce non-renewables; and maintain **security of supply**

By gathering all the targeted areas from the above tables, the national strategic directions relevant for the analysis can be abridged to the following five:

1. reducing GHG emissions
2. reducing energy consumption
3. increasing the share of renewable energy
4. managing the impact of climate change
5. improving public awareness

Table 8 presents the Energiestadt indicators which corresponds to the national targets. On the left column of the table, the national targets are outlined, and on the right side, the corresponding indicators of the label are listed. It is concluded that the label is well-aligned with the targets of the national energy strategy. However, the points assigned to GHG reduction, renewable energies and climate change mitigation are relatively low, especially when taking into consideration that these aspects are central elements of the national strategy.

Table 8: Energiestadt indicators that correspond to the strategic directions of the Energy Strategy and Sustainable Development Strategy.

National direction	Energiestadt indicator	Points	Measurable indicator	Units
reducing GHG emissions	2.2.5 CO2 and greenhouse gas emissions	8	specific GHG emissions (electricity) from public buildings and facilities	kg CO_2-eq/m^2
			specific GHG emissions (heat) from public buildings and facilities	kg CO_2-eq/m^3
reducing energy consumption	1.1.3 Balance sheet, indicator systems	10	GHG emissions per capita	t CO_2-eq /capita
			consumption of heating/cooling per capita	kWh/capita
			electricity consumption per capita	kWh/capita
increasing the share of renewable energies	3.2.3 Renewable heat production and use in the municipality (individual plants)	10	share of heating/cooling from renewables in the final consumption of heating/cooling	% renewables
	2.2.1 Renewable energy - Heating (and cooling)	8	share of heat from renewables in final heat consumption in public properties	% renewables
	2.2.2 Renewable energy - Electricity	8	share of electricity from renewable resources in the electricity consumption in public buildings	% renewables
	3.1.2 Offering, selling, and using sustainable products and services	12	share of renewables in the total electricity sales	% renewables
managing the impact of climate change	1.1.4 Adaptation to climate change	6	qualitative assessment	-

improving public awareness	6.2.5 Communication with the general public	15	qualitative assessment	-

4.5 Municipality Case Study

The last part of the analysis examines how the municipality of Lucerne has been performing on a selected group of Energiestadt indicators. The purpose of this is to examine in which direction the municipality is developing and whether this is in alignment with the areas that Energiestadt is aiming to improve. The indicators to be observed are chosen based on the following criteria. First, they must be quantitative and thus observable and comparable over time. Second, data must be available and accessible, and third, priority is given to the indicators with the most points and those indicated from the analysis of the national strategy. Additionally, due to the fact that finding consistent data for a single municipality over time is challenging, the indicators presented here are the following:

- GHG emissions per inhabitant (t CO_2-eq per capita)
- primary energy consumption (Watt per capita)

The city of Lucerne has been receiving the Energiestadt label since 1999 and the Energiestadt Gold since 2009. The last certification cycle was in 2017 and the next one is planned for 2021. In the last assessment, Lucerne achieved 85.7% of the maximum possible points, becoming the best-rated “gold” certified city in Switzerland for that period. The spider diagram (Figure 8) shows the results of the Energiestadt assessment. For every of the six thematic areas, it depicts what proportion of its energy policy potential the city of Lucerne is achieving.

Figure 9 and Figure 10 show the development of the selected indicators over the years 1990-2015. The data have been gathered from the Energiestadt assessment report to which access was granted through the Energiestadt association. Due to the fact that the last assessment was in 2017, the last available data are from 2015. Figure 9 shows that from 2005 there is a steeper decrease of the city’s GHG emissions, which follows the national trend. Similarly, Figure 10 shows the fluctuation of the primary energy

consumption, with the most noticeable decrease occurring since 2012. Although it seems that the measures in place start showing some results in the last years, it cannot be concluded that there is a correlation between these results and the acquisition of the Energiestadt label. Furthermore, as mentioned earlier, the label is rewarding municipalities for their intention to follow a sustainable and proactive policy. As a result, many of the points are acquired due to the strategies and action plans in place.

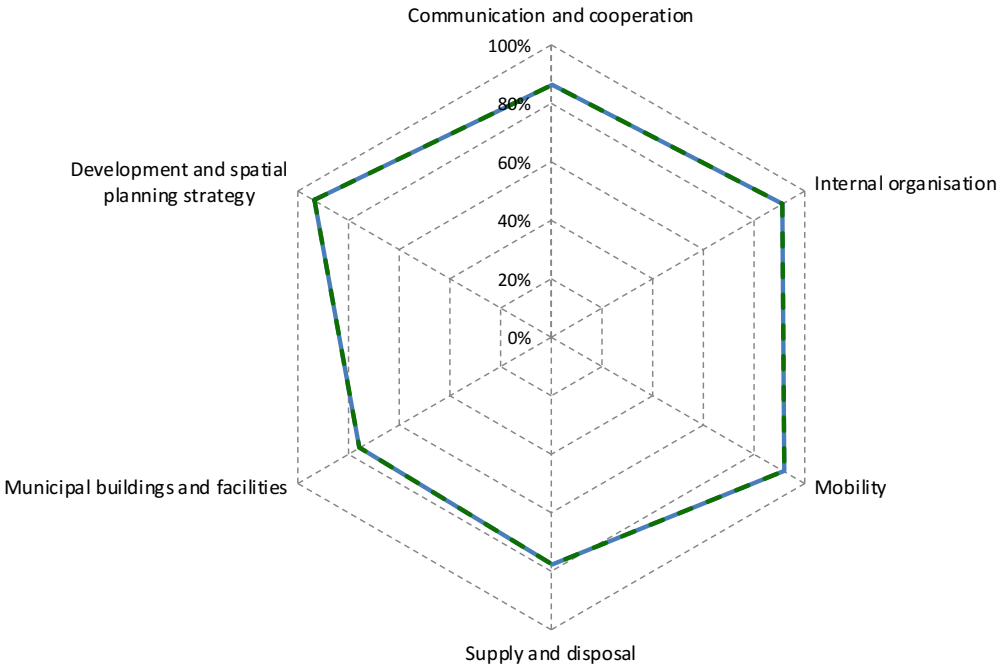

Figure 8: Results of the Energiestadt assessment for the city of Lucerne in 2017. Source: Energiestadt association

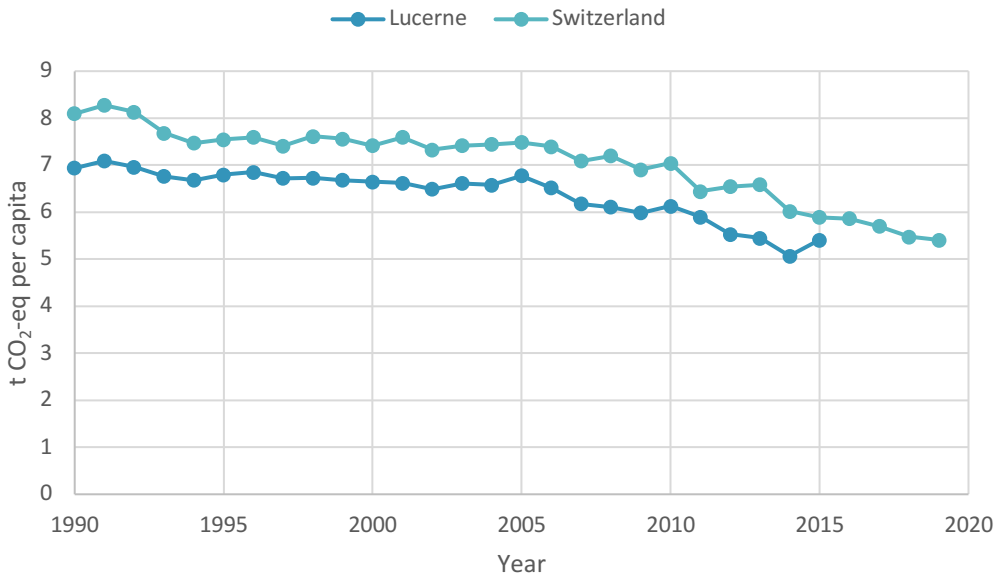

Figure 9: Greenhouse gas emissions in tonnes of CO_2-equivalent per capita for the municipality of Lucerne in comparison to the emissions per capita of Switzerland. Source: ECOSPEED calculator results Stadt Luzern, Energiestadt Association (2017); Bundesamt für Umwelt (2021)

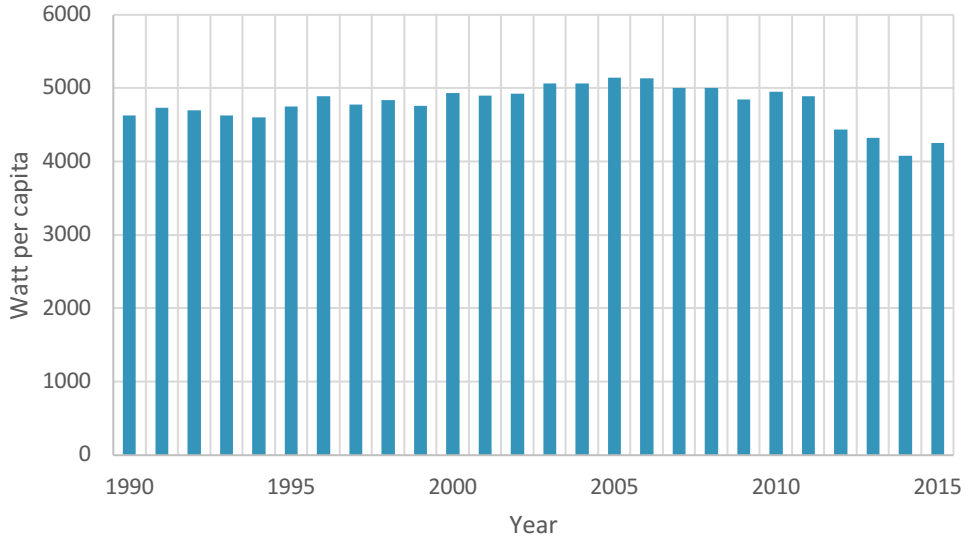

Figure 10: Primary energy consumption for the city of Lucerne in Watt per capita, 1990-2015. Source: ECOSPEED calculator results Stadt Luzern, Energiestadt Association (2017)

5 Discussion

This chapter aims to discuss the obtained results and specifically address the research question. First, it reflects on the findings with respect to the structure and content of the label. Then, it draws conclusions on the effectiveness of the label and finally, it provides recommendations for improvement.

5.1 Discussion on the Structure and Content

As mentioned in the literature, a clear definition of the aspect that a label is assessing is vital for the appropriate selection of indicators, as well as for evaluating whether the label is achieving its goals. Despite that the name Energiestadt reveals in some extent its content (i.e., energy), from an outside perspective it is not directly evident what the label is really certifying. Similar to the findings of Meijering et al. (2014), Energiestadt is not clearly stating on its website, nor in the publicly available reports, its actual purpose. However, after the interviews with the Energiestadt association, it becomes clear that the label is perceived as an environmental management system which aims to support municipalities with the development of their energy and climate policy. Thus, its primary goal is not to assess municipalities on their actual environmental performance but rather assess whether they have the established processed and tools to achieve their environmental policy. This clarification helps a lot in the further analysis of the label, and it explains some of the choices it has made regarding its indicators and assessment process.

With regards to the aggregation of the indicators in thematic areas, the label chooses to differentiate itself from the rest of the reviewed labels. While the other certification schemes group their indicators into common categories, such as energy; buildings; waste; water; governance, Energiestadt aggregates its indicators into planning; municipal buildings; supply and disposal; internal organisation; and communication. This is not necessarily negative. An explanation for this choice is that it facilitates its role as an environmental management system. For instance, for a municipality that initiates its energy and climate action plan, such an aggregation might be a logical order of the actions it needs to take. First, by defining a vision and a strategy, then by setting goals for its buildings, supply and disposal, afterwards by establishing the required internal structures and last, by creating communication channels with the stakeholders and the general

public. However, similarly to its purpose, this aggregation lacks intelligibility and therefore it is difficult for someone unfamiliar with it to understand the content and consequently the aspects at which a municipality is performing well. After all, the label is a sign of outstanding performance and if the content is not understandable by the public, then it loses some of its purpose.

As Tanguay et al. (2010) argue, there is a lack of consensus among the studies regarding the optimal number of indicators. Thus, it is not possible to draw a clear conclusion on whether the number of indicators of Energiestadt is sufficient. Nevertheless, compared to the rest of the reviewed labels, Energiestadt has the largest amount of indicators. This is also in agreement with the findings of Meijering et al. (2014) and it has an impact on the simplicity of the label (i.e. how costly, complicated or competence demanding it is to collect data).

An additional aspect to consider is the high number of qualitative indicators. Out of 56 Energiestadt indicators, over half of them are qualitative. Measuring both qualitative and quantitative indicators shows again that the label is putting emphasis not only on the current performance of the municipalities but also on the municipalities' intention to improve. At the same time, as Tanguay et al. (2010) mention, using qualitative indicators requires a clear definition of how to ensure a proper assessment and quality of the data. In this sense, Energiestadt has responded well to this challenge. It employs independent consultants who accompany the municipalities through the certification process and perform the final assessment. For the assessment itself, the consultants have access to a guide which explains how points are distributed. The final assessment is then reviewed by an auditor. Yet, this process risks the simplicity of the label, as it requires competence, results in high costs and effort, and hinders the repeatability of the assessment.

With respect to its content, Energiestadt covers to a great extent the areas highlighted by the Swiss Energy Strategy and it is aligned with most of the topics considered in other indices. However, the analysis showed that the topic of environmental impact in terms of GHG emissions and climate change mitigation is underrepresented. The two indicators related to these topics receive low number of points (6 and 8), while one indicator which measures GHG emissions per capita is part of a group of indicators which together weight 10 points. In contrary, most of the reviewed indices dedicate a single category on climate change and GHG emissions. Additionally, the main focus of the Swiss Energy Strategy

is to achieve climate neutrality by 2050, which is currently not reflected in the content and weighting system of Energiestadt.

Social and economic aspects of sustainability are not covered at all by the label. This is to be expected since the label does not claim to assess the sustainability of a municipality in general, but rather its energy and climate policy. However, as the effects of climate change are becoming more apparent in cities and thus affect the economy and well-being of citizens, a future update of the label might want to consider adding these aspects.

5.2 Assessing the Effectiveness of Energiestadt Label

The main question of this thesis has been whether Energiestadt is effectively achieving its purpose as a label. Considering that it aims to promote and reward sustainable energy and climate policy, it can be concluded that Energiestadt is achieving the desired outcome. In that sense, it assists municipalities with the development and monitoring of their energy and climate goals. Furthermore, the 4-year certification cycle helps with the continuous improvement of the municipality, exactly how a management system would do.

However, is this sufficient for a label which is so widespread and unique in its area of action? Energiestadt is dominated by indicators evaluating the presence of procedures, while indicators evaluating actual performance are few, meaning that the environmental impact of a municipality is not sufficiently assessed. On the other hand, it can be argued that planning and management procedures have a connection to environmental sustainability and, thus, are necessary. As Wangel et al. (2016) state in their article, a good result is difficult to obtain without a good process. However, a good process does not automatically lead to a good outcome.

This can be justified by looking at the way municipalities receive their assessment points. A 50% of the total points is sufficient for a municipality to be Energiestadt certified. The points across the different categories are aggregated, which means that a municipality might acquire full points from one category and none from another but still receive the label. Even if this is an extreme case, it shows that a municipality might have the right procedures in place to get the label, but it does not mean that it is sustainable enough in practice.

Another aspect concerning the effectiveness of the label is how much value it adds to the work of the municipalities. From the analysis it becomes evident that for municipalities with less resources, the value of the label is higher. These municipalities view the label not necessarily as a sign for branding, but as a platform which supports them with their energy planning. Energiestadt provides them with consulting, accompanies them during the entire planning process, and offers them access to tools and resources that they otherwise wouldn't have. On the other hand, bigger or "gold" certified municipalities have already established processes and for them the label brings little impact, unless it decides to focus more on the actual environmental performance. The fact that there are municipalities already reaching almost 90% of the points and others that just applied for the label by submitting their existing plans and monitoring sheets shows that the label needs to be continuously developed in order to keep up with the pace that the local environmental policy is evolving.

5.3 Recommendations

The analysis has shown that the topic of climate change and GHG emissions is of high importance for the swiss energy and climate agenda. Furthermore, those themes have a distinctive role in many certification systems. Therefore, it is recommended that the label should put more emphasis on GHG-related indicators, either by adding a thematic area dedicated to climate change indicators or by adjusting the weight of the currently available indicators.

With respect to the gap between the value offered to less advanced municipalities in contrast to more advanced ones, a solution could be to establish a different assessment process for "gold" certified municipalities. For these municipalities, indicators which assess established processes are not essential. However, to bring the certification forward, to make it more effective and to add value to the label, a stronger emphasis should be put on performance indicators. An alternative approach would be to use a limited number of indicators which focus on the most important aspects. An example of such set of indicators is shown in Table 9. The listed indicators have been derived from the analysis and are those that appear frequently on other labels as well as on the national sustainability strategy. This list can be a starting point for the design of the assessment for "gold" certified municipalities. After testing it on an actual case, the indicators can be

further reduced, and the list can be optimised. The aggregation of points should be designed in a way which ensures that the municipality is performing well in all thematic areas. This would mean that credits are not tradable between the categories and therefore will not lead to a situation where important issues are left unaddressed.

Table 9: Recommended set of indicators for the assessment of "gold" certified municipalities.

Category	Indicators	Type
Energy	Energy planning in the municipality (strategy and action plan)	Qualitative
	Final energy consumption per capita (kWh/capita)	Quantitative
	Share of renewable energy in total consumption (%)	
	Share of locally produced renewable energy (%)	
Climate change and GHG emissions	GHG reduction strategy (strategy and action plan)	Qualitative
	GHG emissions (t CO_2-eq./capita) - total - from transport - total excluding transport	Quantitative
	GHG emissions from municipal buildings and facilities - electricity (kg CO_2-eq/m^2) - heating (kg CO_2-eq/m^3)	
Buildings	Energy efficiency in municipal buildings (kWh/m^2)	Quantitative
	MINERGIE certified reference area per capita (m^2/capita)	
	GEAK over total number of buildings	
Mobility	Mobility planning in the municipality	Quantitative
	Cycle route network and infrastructure (km/m^2 of city area)	
	Financial contribution for public transport (CHF/capita)	
	Sustainable mobility (% electric vehicles owned by the municipality)	
Water	Water consumption (m^3/capita)	Quantitative
	Water efficiency in municipal buildings (l/m^2)	

	Wastewater management (% of wastewater treated)	
Waste and land use	Waste management (kg/capita)	Quantitative
	Resource management (% waste recycled)	
	Green spaces (m^2/capita)	
Governance	Energy and climate strategy	Qualitative
	Communication and cooperation with relevant stakeholders and with the public	
	Financial support for innovation projects (CHF/capita)	Quantitative

5.4 Research Limitations

Some limitations that might have affected the quality of the results and the ability of answering the research question should be noted. The effectiveness of the label and its impact on the certified municipalities has been assessed to some extent. However, the exact impact of the label on the municipalities is methodologically difficult to estimate. The measures that the municipalities might have or have not taken are the result of different factors. Thus, a causal relation between the label and the municipality's achievements cannot be proven in this thesis.

With respect to the availability of data, it can be stated that the topic is unexplored, while the scope of the thesis has been very specific. The combination of these two factors has made it difficult to find similar studies in the literature. Moreover, the chosen method for primary data collection has been semi-structured interviews. A larger study of certified municipalities using structured interviews, or online questionnaires, might have given more answers to some of the questions. As such, a future research could further investigate the impact of the label on the local level by including a larger number of municipalities in the research and reviewing the label's effects over a longer period.

6 Conclusion

Being the only label in its field on a local level in Switzerland, Energiestadt is perceived as a sign for a successful energy and climate policy. It is promoted and, in many cases, financially supported by national and cantonal offices, and used as a political tool for policy development. Over the last decades a great deal of work has been put into establishing and improving the label and its quantification methods. This thesis has investigated the overall structure of Energiestadt and has critically analysed the effectiveness of its indicators by assessing three areas: the design of the indicators' system and how this compares to other similar labels; the alignment of the indicators with the national strategy; and the performance of a municipality against certain Energiestadt indicators.

The results suggest that the label's indicators cover sufficiently the thematic areas indicated by similar certification schemes and are aligned with the targets of the Swiss Energy Strategy. However, more emphasis could be placed on indicators related to GHG emissions, since climate neutrality is one of the main directions of the national strategy. Furthermore, the label consists of a large amount of indicators, as well as a high share of qualitative indicators in comparison to other certifications. This could risk the label's simplicity, as it requires more effort and competence for the certification process, leading to higher costs.

The label is dominated by indicators which evaluate the presence of plans and procedure, rather than the environmental performance of a municipality. In practice, this offers great support to smaller municipalities, which might not have the knowledge and resources to properly develop and monitor their energy and climate targets. However, for more advanced municipalities the added value of the label is low. Additionally, this could lead to a case where municipalities receive the certification without being truly sustainable. A solution to this is to design an assessment for "gold" municipalities with emphasis on performance indicators and weights that do not aggregate among the different thematic areas.

Ultimately, the decision for a municipality to acquire the label depends on the value it provides over the costs it creates. The value of the label is reflected in the success of the certified municipalities. Therefore, to be relevant for the local policy, Energiestadt needs to be continuously developed and act as a progressive force for the local environmental targets.

7 Reference list

Berrini, M., & Bono, L. (2011). *Measuring Urban Sustainability: Analysis of the European Green Capital Award*. Retrieved from www.ambienteitalia.it

Bundesamt für Umwelt. (2021). Indikator Klima. Retrieved May 9, 2021, from https://www.bafu.admin.ch/bafu/de/home/themen/thema-klima/klima--daten--indikatoren-und-karten/klima--indikatoren/indikator-klima.pt.html/aHR0cHM6Ly93d3cuaW5kaWthdG9yZW4uYWRtaW4uY2gvUHVibG/ljL0FlbURldGFpbD9pbmQ9S0wwMDImbG5nPWRlJlN1Ymo9Tg%3D%3D.html

Burnett, J. (2007). City buildings-Eco-labels and shades of green! *Landscape and Urban Planning*, *83*(1), 29–38. https://doi.org/10.1016/j.landurbplan.2007.09.003

Economist Intelligence Unit. (2009). *European Green City Index*. *Siemens AG*. Munich. Retrieved from http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:European+Green+City+Index#0

Energiestadt. (2021). Über uns - Energiestadt. Retrieved February 4, 2021, from https://www.energiestadt.ch/de/ueber-uns-23.html

European Commission DG Environment. (2018). *In-depth Report: Indicators for Sustainable Cities*. Bristol. https://doi.org/10.2779/121865

Fuhr, H., Hickmann, T., & Kern, K. (2018). The role of cities in multi-level climate governance: local climate policies and the 1.5 °C target. *Current Opinion in Environmental Sustainability*. Elsevier B.V. https://doi.org/10.1016/j.cosust.2017.10.006

Haapio, A. (2012). Towards sustainable urban communities. *Environmental Impact Assessment Review*, *32*(1), 165–169. https://doi.org/10.1016/j.eiar.2011.08.002

Malmqvist, T., & Glaumann, M. (2006). Selecting problem-related environmental indicators for housing management. In *Building Research and Information* (Vol. 34, pp. 321–333). Routledge. https://doi.org/10.1080/09613210600733658

Meijering, J. V., Kern, K., & Tobi, H. (2014). Identifying the methodological characteristics of European green city rankings. *Ecological Indicators*, *43*, 132–142. https://doi.org/10.1016/j.ecolind.2014.02.026

NNBS. (2016). *Landkarte Standards und Labels*. Retrieved from https://www.nnbs.ch/documents/864304/992412/Schlussbericht_Landkarte_Labels_Standards_V2.2-gesamt.pdf

OECD. (2014). *Cities and Climate Change: National governments enabling local action*.

Swiss Federal Council. Dispatch on the first package of measures for Energy Strategy 2050 (revision of the Energy Act) and on the popular initiative 'For an orderly withdrawal from the nuclear energy programme (Nuclear Withdrawal Initiative)' BBI 2013 7561. (2013).

Swiss Federal Council. Energiegesetz (EnG) (2018).

Swiss Federal Council. (2020). Strategie Nachhaltige Entwicklung 2030 - Vernehmlassung. *Bericht Des Schweizer Bundesrates*, (November), 1–38. Retrieved from http://www.deza.admin.ch/ressources/resource_de_23811.pdf

Swiss Federal Council. (2021). *Switzerland ' s Long-Term Climate Strategy*.

Swiss Federal Office of Energy. (2020). *Energy Strategy 2050 Monitoring Report 2020*.

Tanguay, G. A., Rajaonson, J., Lefebvre, J. F., & Lanoie, P. (2010). Measuring the sustainability of cities: An analysis of the use of local indicators. *Ecological Indicators*, *10*(2), 407–418. https://doi.org/10.1016/j.ecolind.2009.07.013

Trägerverein Energiestadt. (2019). *Jahresbericht 2019*.

Trägerverein Energiestadt. (2020). *Neuerungen für Energiestädte und Mitgliedsgemeinden im Trägerverein Energiestadt*.

UNDP. (2020). *Human Development Report 2020*. New York. Retrieved from http://hdr.undp.org.

United Nations - Department of Economic and Social Affairs - Population Division. (2019). *World Urbanization Prospects: The 2018 Revision*. New York: United NAtions.

United Nations Commission on Sustainable Development. (2002). *Report of the World Summit on Sustainable Development*. *United Nations publication*. Johannesburg, South Africa. Retrieved from https://undocs.org/en/A/CONF.199/20

Wangel, J., Wallhagen, M., Malmqvist, T., & Finnveden, G. (2016). Certification systems for sustainable neighbourhoods: What do they really certify? *Environmental Impact Assessment Review*, *56*, 200–213. https://doi.org/10.1016/j.eiar.2015.10.003

World Bank. (2020). Urban Development Overview. Retrieved from https://www.worldbank.org/en/topic/urbandevelopment/overview#1

Xiao, G., Xue, L., & Woetzel, J. (2010). The Urban Sustainability Index : A New Tool for Measuring China's Cities, 1–42. Retrieved from www.urbanchinainitiative.typepad.com

Appendix A: List of Energiestadt indicators

Area	Indicators' group	Measure	Points	Objective measure	Indicators (measurable)	Unit	Type	Details	Methodology	Code
Development planning, Spatial planning	1.1 Energy and climate concept	**1.1.1 Energy and climate goals**	6	The municipality has a binding mission statement with ambitious qualitative and quantified targets for energy, climate and transport policy.	-		qualitative			Governance
		1.1.2 Energy and climate concept, respectively - strategy	6	The municipality concretises the mission statement and the energy and climate policy objectives with concrete short-, medium- and long- term objectives for the municipalitie's activities and planning instruments.	-		qualitative			Governance
		1.1.3 Balance sheet, indicator systems	10	The municipality has an energy and climate balance sheet for the entire municipality and a set of indicators for controlling the energy and climate policy.	GHG emissions per inhabitant	t CO2-eq/inhabitant	quantitative	Annual amount of greenhouse gas emissions (GHG) per inhabitant emitted by the total energy demand in the municipality (heat, processes, electricity and mobility)	Collect the annual final energy consumption (preferably real consumption figures) of each energy source in the municipality (electricity, fuels, fuels, etc.). Multiply by the corresponding KBOB factors for GHG. Add up all emissions Divide by the number of inhabitants	Energy
					consumption of heating/cooling per inhabitant (also used in 3.2.3)	kWh/inhabitant		Total of all final energy consumption that is used for heating and cooling in the municipality divided by the number of residents.	Network-connected heating / cooling supplies including processes: heating networks, gas, electricity (heat pumps, electrical heating systems) Environmental heat and waste heat: mostly a calculated share based on the power consumption of the heat pump - individual firing fossil and renewable based on data from the furnace control (oil, coal) The survey is carried out according to the energy source. The data can be compiled using the energy and climate calculator for municipalities. On the one hand, this contains useful information on data acquisition, on the other hand, it also contains default values.	
					electricity consumption per inhabitant	kWh/inhabitant		Amount of electricity passed through to all consumers in the municipality per inhabitant and year	Determination of the annual electricity supply from all electricity suppliers to all customers in the municipality. The power consumption is not differentiated according to application (heating, cooling, processes).	
					primary energy performance per inhabitant	Watt/inhabitant		Continuous power requirement per person at primary energy level.	Collect the annual final energy consumption (preferably real consumption figures) of each energy source in the municipality (electricity, fuels, fuels, etc.). Multiply by the corresponding KBOB factors for primary energy (PE factors). add up, convert to watts Divide by the number of inhabitants Tool: The calculation can be made automatically by entering the consumption data in the calculator (energy and climate calculator for municipalities, available free of charge at www.2000watt.ch) or with ECOSPEED-Region The PE factors can be found in the publication "Ecobalance data in the construction area 2009/1: 2014" by KBOB, ecobau and IBG; http://www.eco-bau.ch/resources/uploads/Oekobilanzdaten/kbob-Oekobilanzdaten-Empfehler_29_07_2014.pdf	
		1.1.4 Adaptation to the climate change	6	The municipality takes measures to adapt to the locally noticeable or expected impacts of climate change.	-		qualitative			Governance
		1.1.5 Waste and resource planning	6	The municipal waste concept aims to minimise waste and to ensure sensible energy / climate-friendly recycling or efficient management of the resources arising in the municipality, e.g. through the fee schedule, collection logistics, recycling strategies and communication / information.	household waste per inhabitant (also used in 3.2.7)	kg/inhabitant	quantitative	Weight of the annual household rubbish per capita in the municipality	Household waste includes the amount of waste from municipal collections from households. It does not include direct deliveries from households and businesses to the waste incineration plant and private disposal solutions that do not take the communal route.	Waste

	1.2 Municipal development planning	**1.2.1 Spatial energy planning**	10	Energy planning coordinates the spatial use of waste heat and renewable energies. It creates a planning basis for their use and is coordinated with the other planning and monitoring instruments of the municipality (e.g. urban and spatial planning).			qualitative			Energy
		1.2.2 Mobility and transport planning	10	Mobility planning coordinates the various modes of transport in the municipality with the aim of sustainable and climate-friendly mobility. It creates a planning basis for their use and is coordinated with the other planning and monitoring instruments of the municipality (e.g. urban and spatial planning).			qualitative			Mobility
	1.3 Obligation of landowners and authorities	**1.3.1 Landowner binding instruments**	10	The municipality uses planning instruments such as structure and zone plans, building regulations or special use/design plans for the implementation of energy and climate policy goals in private building owners.			qualitative			Buildings
		1.3.2 Submissions and levies under building law by the municipality (authority-binding instruments)	10	The instruments binding on the authorities, such as tenders/submissions, site developments, land sales or taxes under building law are based on the energy and climate policy objectives of the municipality.	e.g. adding an article which promotes the adaptability of existing residential buildings. Incentive created with the occupancy surcharge		qualitative			Buildings
	1.4 Building procedure	**1.4.1 Construction supervision: Consultation, testing, control**	10	The municipality uses its leeway to ensure energy-efficient and climate-friendly construction with a high share of renewable energies in building projects and their implementation			qualitative			Buildings
	2.1 Standards, planning and management	**2.1.1 Standards for construction and management of public buildings**	6	In the construction and management of municipal buildings and facilities, the municipality orients itself to the highest energetic and ecological standards and future climate policy requirements.	e.g. following the building standards of EnergieSchweiz		qualitative			Buildings
		2.1.2 Energy accounting and operational optimisation	8	The municipality ensures optimal management of its buildings and facilities in terms of energy, greenhouse gas emissions and water consumption from an energy and climate perspective.	e.g. performing energy accounting		qualitative			Buildings
		2.1.3 Renovation concept and planning	6	The refurbishment concept and investment planning aim at optimising energetic and climate-/resource-protection and conservation, and sustainable management of the buildings and facilities.			qualitative			Buildings
		2.1.4 Exemplary new building or renovations	6	The municipality has implemented new buildings and/or renovations in an exemplary manner, also in the sense of "lighthouses"			qualitative			Buildings
		2.2.1 Renewable energy - Heating (and cooling)	8	The municipality supplies its buildings and facilities with the highest possible proportion of renewable heating (and cooling).	share of heat from renewables in final heat consumption in public properties	% of renewables	quantitative	Share of heat from renewables in final heat consumption in public properties	In addition to renewable energy sources (biomass including biogas, electricity from renewable sources), environmental heat (solar, geothermal energy, ground and surface water, air, waste water), heat from waste (50% renewable), waste heat from processes are considered renewable heat	Energy
		2.2.2 Renewable energy - Electricity	8	The municipality supplies its buildings and facilities with a renewable and ecological electricity mix.	share of electricity from renewable resources in the electricity consumption in public buildings	% of renewables	quantitative	Share of electricity consumed from renewable energy sources in total electricity consumption in public buildings	End consumption of electricity: Sum of all measured electricity consumption of the public properties in the administrative assets including for heating / cooling supply as well as street lighting. In the case of properties in financial assets, the municipality generally has no influence on electricity consumption.	Energy
					used electricity production potential from renewables on public buildings and facilities	%		Effective electricity production from renewables on public facilities and buildings divided by the potential for production on public buildings and facilities.	The potential of production on public buildings and systems (installed capacity or expected annual production) is ascertained by means of a potential study or a simple estimate (especially for PV production) The installed capacity or production is recorded. It is irrelevant who owns the system or the ecological added value of the production (i.e. including KEV-funded systems)	
					share of "green" electricity in the electricity consumption of public buildings and facilities	%		Share of ecologically produced electricity in the electricity consumption of public buildings and systems (PV, wind with or without a label. Biomass and hydropower certified by naturemade star)	Electricity from the sun or wind (with or without a label) and electricity products certified by naturemade star count as green electricity. Naturemade basic certified electricity products contain 10% green electricity. End consumption of electricity: Sum of all measured electricity consumption of the public properties in the administrative assets including for heating / cooling supply as well as street lighting	

Municipal buildings and facilities	**2.2 Target values for energy, efficiency and climate impact**	**2.2.3 Energy efficiency - Heating/cooling**	8	Heating (and cooling) are used as efficiently as possible in the municipal buildings and facilities.	energy figure for heat in public buildings	kWh/m2	quantitative	End consumption of heat in public buildings, divided by the energy reference areas of these buildings, the so-called energy figure for heat	Final heat consumption: Sum of all measured heat consumption of public properties in administrative and financial assets (always use the same period when relying on heating bills, e.g. calendar year), including electricity for heating purposes as well as environmental or waste heat Energy reference area: total of all heated areas, calculated in accordance with the SIA 416/1 standard Climate adjustment: the heat consumption is used in a climate-adjusted manner, i.e. using the heating degree days. The energy figure for heat is preferably determined with the Enercoach , as this tool automatically cleans the climate.	Energy
		2.2.4 Energy efficiency - Electricity	8	Electricity is used as efficiently as possible in municipal buildings and facilities.	energy figure for electricity in public buildings	kWh/m2	quantitative	End consumption of electricity (excluding electricity used for heat generation and cooling) in public buildings, divided by the energy reference areas in the same buildings, the so-called energy figure for electricity	End consumption electricity: Sum of all measured electricity consumption of public properties in administrative assets. In the case of properties with financial assets, the municipality generally has no access to the electricity consumption data. Therefore, these can be omitted (consequently also subtract the corresponding energy reference areas for electricity). When relying on the electricity bill, always use the same period, e.g. calendar year Energy reference area: total of all heated areas, calculated in accordance with the SIA 416/1 standard Climate adjustment: the electricity consumption is used climate-adjusted, i.e. using the heating degree days	Energy
		2.2.5 CO2 and greenhouse gas emissions	8	The municipality reduces the CO2 and greenhouse gas emissions caused by the operation of the municipal buildings as much as possible	specific GHG emissions (electricity) from public buildings and facilities	kg CO2-eq/m2	quantitative	The amount of greenhouse gases emitted per year and energy reference area by the final energy consumption of electricity in public buildings	Multiply total electricity consumption for public buildings (without systems, e.g. ARA) by the electricity mix used for this. The resulting energy consumption per energy source is multiplied by the respective KBOB factor for CO2. Add these up and divide by the total energy reference area.	Energy
					specific GHG emissions (heat) from public buildings and facilities	kg CO2-eq/m3		The amount of greenhouse gases emitted per year and energy reference area by the final energy consumption of heat in public buildings	Collect total energy consumption per energy source for public buildings. multiply by the respective KBOB factor for CO2 per energy source. Add these up and divide by the total energy reference area.	
	2.3 Lighting and water	**2.3.1 Public lighting**	6	Public lighting reflects the exemplary role of the public sector in dealing with energy, e.g. with regard to the technologies used and the efficient and ecological use of lighting and continuous optimisation of operation.	electricity consumption of street lighting	MWh/km	quantitative	Electricity consumption for the lighting of streets and squares per km of illuminated street length	System limit for the collection of electricity consumption included: Streets, squares Slow traffic routes (including underpasses); public Christmas lights along streets; not included: cantonal roads, where the canton is responsible resp. Receives invoice; Building irradiation (offset against the electricity consumption of the respective building); Lighting of private shops and shopping malls (electricity consumption in businesses); Public transport facilities, tunnels; Signpost lighting (where indicated separately); private / commercial Christmas lights. Determination of street length: length of the illuminated streets / paths	Energy
		2.3.2 Water efficiency	4	The municipality uses water in its buildings and facilities in the most energy- and resource-efficient way possible.	specific water consumption in public buildings	l/m2	quantitative	End consumption of water divided by the energy reference area and year	The water consumption per building and year is recorded Wells should be surveyed separately, as they can have a strong influence on the specific water consumption of a building	Water
		3.1.1 Corporate strategy of the energy supplier	10	As far as it can, the municipality ensures that the utilities for electricity, gas, heat and water adopt a sustainable strategy and thus promote efficiency, renewable energy, biodiversity and climate protection.			qualitative			Governance

Supply and disposal	3.1 Corporate strategy	**3.1.2 Offering, selling and using sustainable products and services**	12	The municipality is committed to sustainable products, services and marketing strategies, as well as their sale and use, which promote energy efficiency, renewable energies, biodiversity and climate protection.	share of renewables in the total electricity sales	%	quantitative	The proportion of electricity from renewables according to the electricity label of the local provider	Adopt the percentage from the electricity label "Renewable energies" row, "Total" column	Energy
					share of green electricity in total electricity sales (without KEV share)	%		Share of ecologically produced electricity in the electricity sales of the energy supplied in the municipality	Electricity from the sun or wind (with or without a label) and electricity products certified by naturemade star count as green electricity. Naturemade basic certified electricity products contain around 10% green electricity Final consumption of electricity: Amount of electricity delivered to tied customers in the municipality KEV electricity is not counted here (although also green electricity)	
					share of synthetic gases/biogas in sales	%		Share of biogas or synthetic gases in the gas sales of the local gas supplier	Biogas includes gas products that are produced through the material utilization of biological waste products (fermentable, biomass-containing residues such as sewage sludge, biowaste or leftovers, as well as manure (liquid manure, manure) and previously unused plants and plant parts, for example catch crops, plant residues and the like). Synthetic gases are gases such as CH4 or H2 that have been produced using power to gas technologies.	
	3.2 Supply, disposal and energy use	**3.2.1 Renewable electricity production on the Municipal area**	15	The municipality promotes the production of renewable electricity in the municipality.	installed PV power per inhabitant	kWp/inhabitant	quantitative	Installed power from private, commercial, industrial and public-sector PV systems - systems that are financed from subsidies are included	Calculation of annual production from power: Installed power in kW x 1,000 h = annual production in kWh; Measured values are preferable in any case	Energy
					electricity production from PV systems per inhabitant (including KEV)	kWh/inhabitant		Electricity production from photovoltaic systems in the entire municipal area per inhabitant and year	KWh fed back into the grid from PV systems (including from subsidized systems) and measured self-consumption (if available)	
					utilised electricity production potential from renewable sources (incl. KEV)	%		Effective electricity production from renewables in the municipality divided by the potential for production in the entire municipality	The potential (installed capacity or expected annual production) is determined by means of a potential study or a simple estimate (especially for PV production) for the entire municipality The installed capacity or effective production including production on public buildings and facilities is recorded. It is irrelevant who owns the plant or the ecological added value of the production	
		3.2.2 Pipeline-based renewable heating (combined heat and power and waste heat recovery) and cooling	15	By implementing energy planning, the municipality supports the use of renewable energies, waste heat and environmental heat in heating / cooling networks.	used waste heat/anergy	%	quantitative	Share of used waste heat / anergy from processes (excluding environmental heat) in the total occurrence of waste heat / anergy from processes in the municipality	1. Determine the potential of waste heat / anergy in the community area, which is available for external applications 2. Determine the already used waste heat / anergy in the municipal area. Sources: Wastewater, WWTP, industrial processes and cooling. Applications: Electricity production, cold production, low or high temperature heating networks, anergy networks, hot water generation, heat pump operation	Energy
		3.2.3 Renewable heat production and use in the municipal (individual plants)	10	Through the implementation of energy planning, the municipality supports the use of renewable energies, waste heat and environmental heat in individual systems	consumption of heating/cooling per inhabitant (also used in 1.1.3)	kWh/inhabitant	quantitative	Total of all final energy consumption that is used for heating and cooling in the municipality divided by the number of residents.	Network-connected heating / cooling supplies including processes: heating networks, gas, electricity (heat pumps, electrical heating systems) Environmental heat and waste heat: mostly a calculated share based on the power consumption of the heat pump - individual firing fossil and renewable based on data from the furnace control (oil, coal) The survey is carried out according to the energy source. The data can be compiled using the energy and climate calculator for municipalities. On the one hand, this contains useful information on data acquisition, and on the other hand, it also contains default values.	Energy

					share of heating/cooling from renewables in the final consumption of heating/cooling	%		End consumption of heat from renewables divided by end consumption of heat in the entire municipality	In addition to renewable energy sources (biomass including biogas, electricity from renewables), environmental heat (solar, geothermal energy, ground and surface water, air, waste water), heat from waste (50% renewable) are considered renewable heat; Waste heat from processes. The data can be compiled using the energy and climate calculator for municipalities. On the one hand, this contains useful information on data acquisition, and on the other hand, it also contains default values.	
		3.2.4 Water supply and management	8	The municipality ensures that drinking water is treated in an energy-efficient manner and that drinking and rainwater are used in a way that conserves resources.	drinking water consumption per inhabitant	m3/inhabitant	quantitative	Drinking water consumption in the municipality by households, trade and industry, public institutions, wells, leakage losses	The consumption data is requested from the drinking water suppliers in the entire municipality. It should be noted that well feeds and leakage losses must be included	Water
		3.2.5 Management of green spaces	4	The municipality supports the ecological and climate-friendly management of green and open spaces. Green and open spaces, especially in densely populated areas, are preserved, upgraded and/or expanded as far as possible	areas of recreational and green spaces per inhabitant	m2/inhabitant	quantitative	Area of recreational and green spaces per inhabitant (parks, cemeteries, playgrounds and sports fields, golf courses, allotments)	Own surveys by the municipality or use of federal land use statistics	Green spaces
		3.2.6 Waste water management and energy use	15	The municipality pays attention to an energetic use of wastewater, as well as and an energy-efficient treatment (e.g. use of heat in sewers, optimal management of the treatment plant). The water cycles as well as the products of wastewater treatment are controlled in an energetically optimal and climate-friendly manner, e.g. through the design of the fee schedule or the utilisation of heat, biogas and sewage sludge.			qualitative			Water
		3.2.7 Waste management and energetic use	15	The waste (municipal waste, recyclable waste, biomass, hazardous waste) in the municipality is managed efficiently and in a climate-friendly manner and optimally used in terms of energy.	household waste per inhabitant (also used in 1.1.5)	kg/inhabitant	quantitative	Weight of the annual household rubbish per capita in the municipality	Household waste includes the amount of waste from municipal collections from households. It does not include direct deliveries from households and businesses to the waste incineration plant and private disposal solutions that do not take the communal route.	Waste
Mobility	**4.1 Mobility in the administration / mobility controlling**	**4.1.1 Sustainable mobility / awareness in administration**	8	The municipality maintains an energy-efficient and climate-friendly vehicle fleet, promotes the efficient use of its vehicles and sustainable mobility behavior among employees.	annual km driven for business trips per employee	km/employee	quantitative	Number of kilometers driven annually by the municipality for business trips divided by the number of employees	Collection of kilometers driven (company cars, private cars, Mobility Carsharing), company cars according to the mileage reading, private cars according to the mileage allowance paid, Mobility Carsharing according to the invoice received.	Mobility
					annual fuel consumption for business trips per employee	MWh/employee		Fuel consumption of company cars, private cars, mobility car sharing for business trips divided by the number of employees and year	Conversion of the kilometers driven into fuel consumption according to information from www.mobitool.ch	
					proportion of employees in public companies who commute to work by motorized vehicle	%		Percentage of employees who commute to work by car	Survey by means of a questionnaire in public companies (administration, schools, factories, hospitals / care institutions) or online survey on the modal split commuter traffic: https://findmind.ch/	
		4.1.2 Mobility standards in the municipality	4	The municipality supports the implementation of its mobility / traffic planning with monitoring of relevant mobility indicators.	number of users of car sharing per 1000 inhabitants (also in 4.4.2)	# car-sharing customers / 1000 inhabitants	quantitative	The number of registered users of car sharing offers per 1000 inhabitants in the municipality.	The number of users per community is recorded annually by Mobility Carsharing and made available on request.	Mobility
					number of registered passenger cars per 1000 inhabitants	# / 1000 inhabitants		Passenger cars registered in the municipality per 1,000 inhabitants	The number of registered road vehicles per municipality is collected and made available annually by the Federal Statistical Office.	
	4.2 Traffic organisation	**4.2.1 Parking infrastructure and management**	10	With its parking infrastructure and management, the municipality promotes sustainable mobility, especially facilities that generate traffic (shopping, leisure, logistics, etc.).			qualitative			Mobility
		4.2.2 Speed reduction	10	The speed regime in the municipality supports bicycle and pedestrian traffic and increases the safety of all road users, as well as the quality of life in the municipality.			qualitative			Mobility
		4.2.3 Local goods supply	4	The municipality supports short distances for the basic supply of the population as well as initiatives for efficient logistics systems for the supply of goods.			qualitative			Mobility
	4.3 Non-motorised mobility	**4.3.1 Pedestrian network and public spaces**	15	The municipality ensures attractive and safe footpaths throughout the municipality and supports their use by upgrading public spaces.			qualitative			Mobility
		4.3.2 Cycle route network and -infrastructure	15	The municipality ensures that there is an attractive, extensive network of cycle paths and the necessary parking facilities.			qualitative			Mobility

	4.4 Public transport	4.4.1 Public transport	15	The municipality provides an attractive range of public transport services.	number of departures with public transport per 1000 inhabitants	# of departures / 1000 inhabitants	quantitative	Total number of departures at all stops on a working day outside the school holidays per 1000 inhabitants in the municipality.	The departures at all public transport stops must be collected independently for each municipality or are provided by the public transport operator on request.	Mobility
					financial contribution to public transport	CHF/1000 inhabitants		Contributions that the municipality pays out annually for the operation and expansion of public transport	The contributions are taken from the municipality's annual accounts and converted to the specific indicator.	
		4.4.2 Mobility management and combined Mobility	15	The municipality supports initiatives for mobility management and intermodal mobility.	number of users of car sharing per 1000 inhabitants (also in 4.1.2)	# car-sharing customers / 1000 inhabitants	quantitative	The number of registered users of car sharing offers per 1000 inhabitants in the municipality.	The number of users per community is recorded annually by Mobility Carsharing and made available on request.	Mobility
Internal organisation	5.1 Internal structures	5.1.1 Responsibilities, resources and processes	8	The municipality ensures the implementation of the energy and climate policy by defining the necessary responsibilities, making sufficient human resources available and clarifying the processes.			qualitative			Governance
		5.1.2 Financial resources for energy and energy and climate policy	6	The municipality ensures the necessary financial resources for the implementation of the energy and climate policy.			qualitative			Governance
		5.1.3 Energy City Anchoring (committee)	4	The actors relevant to energy and climate policy are involved in the responsible bodies.			qualitative			Governance
	5.2 Internal processes	5.2.1 Success monitoring and annual planning	10	The municipality has an internal quality management system for the implementation of the Energy City process and communicates the results internally and externally.			qualitative			Governance
		5.2.2 Further training and awareness- raising	6	With the help of training courses and further education, the community ensures that employees can make their contribution to energy and climate policy goals and that the community's role model effect is perceived in the area of its internal scope for action.			qualitative			Governance
		5.2.3 Procurement	10	In the area of ecological procurement, the municipality has a strategy and corresponding guidelines with control instruments. In this way, it minimizes environmental pollution, promotes the sale of ecological products and serves as a role model. This not only applies to devices and consumables but also to financial investments (including assets, loans and pension fund assets).			qualitative			Governance
	6.1 Communication from the community	6.1.1 Conception and planning of communication	4	The municipality uses the communication channels in a targeted manner to inform the stakeholders in the municipality about energy and climate policy.			qualitative			Governance
		6.1.2 Role model and corporate Identity	4	The exemplary role of the municipality in the energy and climate sector is reflected in the activities and appearance of the community.			qualitative			Governance
		6.1.3 Advice and information point	10	The population has access to an advice and information centre for energy, climate or mobility issues.	energy advice per inhabitant	# / inhabitant	quantitative	Number of energy consultations that were carried out in direct contact with the customer (telephone conversation, personal email, direct conversation)	Only the number is evaluated, no qualitative criteria. The consultations can also be offered and carried out by third parties. It is important that the community can influence the number, e.g. through application or financial contributions, etc.	Governance
		6.1.4 Financial support	10	The municipality financially supports sustainable projects in the field of efficiency, renewable energies and climate protection.	subsidies distributed per inhabitant	CHF / inhabitant	quantitative	Distributed subsidies based on communal regulations, e.g. energy fund, subsidy regulations	Subsidies distributed in the municipality (only municipal program, not cantonal or national), including subsidies from the municipal EVU. Contribution to cantonal advice is not counted. Important: it is the paid and non-budgeted grants that count	Governance
		6.2.1 Regional and supra- regional cooperation	6	The municipality supports the implementation of its energy and climate policy with active cooperation with the municipalities in the region, with the canton and the federal government.			qualitative			Governance
		6.2.2 Cooperation with schools and educational institutions	8	The municipality supports schools and educational institutions with energy and climate education and projects and uses their know-how and resources for the implementation of the energy and climate policy			qualitative			Governance
		6.2.3 Cooperation with industry, trade, services	15	The municipality supports and cooperates with industry, commerce and service companies, as well as agricultural and forestry enterprises, in programmes	total share of companies with binding efficiency programs	%	quantitative	Share of all companies located in the municipality that carry out systematic monitoring of their energy consumption	The municipalities must request the number of companies from the responsible monitoring programs	Governance

Cooperation and communication		**and forestry / agriculture**	15	and projects to increase energy efficiency, for renewable energies, climate protection or sustainable mobility.	proportion of companies with mobility management	%		Share of all companies located in the municipality that carry out systematic monitoring of their employees' mobility behavior in accordance with EnergieSchweiz	In the SwissEnergy program for municipalities, the number of companies with “mobility management in companies” is recorded. Enterprises can also be counted that have introduced mobility management outside of the program. However, the same criteria must be met as in the program.	Governance
	6.2 Cooperation and communication	**6.2.4 Cooperation with professional investors and homeowners.**	10	The municipality works with professional investors and homeowners to ensure that they contribute to the municipality's energy and climate policy goals.	Minergie certified energy reference area per inhabitant	m2/inhabitant	quantitative	Total of the energy reference areas according to all Minergie standards (Minergie, Minergie P, Minergie A, Minergie Eco) and sectors (residential buildings, industry / services) in the municipality	Only definitive certifications, ie without provisional ones	Buildings
					number of GEAK to number of buildings	GEAK / building total		Number of GEAK carried out in the municipality since the GEAK was founded based on the number of registered buildings in the municipality	Number of completed GEAK in the municipality, all quality levels Number of buildings: The number of residential buildings (single and multi-family houses), administrative buildings and school buildings in the municipality is registered in the Federal Building and Housing Register GWR "	
		6.2.5 Communication with the general public	15	The municipality informs and sensitises the population on energy and climate policy issues, in particular with a view to consumption issues and room for manoeuvre as tenants.			qualitative			Governance
		6.2.6 Participation and dissemination	6	The municipality ensures the participation of the various interested actors in the development and implementation of energy and climate policy. It involves disseminators such as associations from the region and supports initiatives from the population on the topics sustainability, energy saving, climate protection, etc.			qualitative			Governance
	6.3 Lighthouses	**6.3.1 Lighthouse project**	8	The municipality develops and supports outstanding, innovative projects in the community with the broadest possible impact and multiplication effect.			qualitative			Governance

Appendix B: Original list of Energiestadt indicators

Massnahmenkatalog Energiestadt

Version 2017

Geschäftsstelle Trägerverein Energiestadt, Dezember 2016

Bereich	Titel	Pkte	Zielsetzung Massnahme
1	**Entwicklungsplanung, Raumordnung**		Insgesamt 84 Punkte
1.1	*Energie- und Klimakonzept*		
1.1.1	Energie- und Klima-ziele	6	Die Gemeinde verfügt über ein verbindliches Leitbild mit ambitionier-ten qualitativen und quantifizierten Zielen für die Energie-, Klima- und Verkehrspolitik.
1.1.2	Energie- und Klima-konzept respektive – strategie	6	Die Gemeinde konkretisiert das Leitbild resp. die energie- und klima-politischen Zielsetzungen mit konkreten kurz-, mittel- und langfristigen Vorgaben für die Gemeindeaktivitäten und die Planungsinstrumente.
1.1.3	Bilanz, Indikatoren-systeme	10	Die Gemeinde verfügt über eine Energie- und Klimabilanz für das ganze Gemeindegebiet respektive über ein Indikatorenset zur Steue-rung der Energie- und Klimapolitik.
1.1.4	Anpassung an den Klimawandel	6	Die Gemeinde ergreift Massnahmen zur Anpassung an die lokal spürbaren oder erwarteten Auswirkungen des Klimawandels.
1.1.5	Abfall- und Ressour-cenplanung	6	Das Abfallkonzept der Gemeinde zielt auf eine Minimierung der Abfäl-le sowie eine sinnvolle energetische / klimaschonende Verwertung resp. eine effiziente Bewirtschaftung der auf dem Gemeindegebiet anfallenden Ressourcen, bspw. über die Gebührenordnung, die Sammellogistik, die Verwertungsstrategien sowie Kommunikation / Information.
1.2	*Kommunale Entwicklungsplanung*		
1.2.1	Räumliche Energie-planung	10	Eine Energieplanung koordiniert die räumliche Nutzung von Abwärme und erneuerbaren Energien. Sie schafft planerische Grundlagen für deren Nutzung und ist mit den weiteren Planungs- sowie Monitoring-Instrumenten der Gemeinde abgestimmt (z.B. Stadt- und Raumpla-nung).
1.2.2	Mobilitäts- und Ver-kehrsplanung	10	Die Mobilitätsplanung koordiniert die verschiedenen Verkehrsträger auf dem Gemeindegebiet mit dem Ziel einer nachhaltigen und klima-schonenden Mobilität. Sie schafft planerische Grundlagen für deren Nutzung und ist mit den weiteren Planungs- sowie Monitoring-Instrumenten der Gemeinde abgestimmt (z.B. Stadt- und Raumpla-nung).

Bereich	Titel	Pkte	Zielsetzung Massnahme
1.3	*Verpflichtung von Grundeigentümern und Behörden*		
1.3.1	Grundeigentümerverbindliche Instrumente	10	Die Gemeinde nutzt Planungsinstrumente wie Richt- und Zonenplanung, Bauvorschriften oder Sondernutzungs- / Gestaltungspläne für die Umsetzung der energie- und klimapolitischen Ziele bei privaten Bauherrschaften.
1.3.2	Submissionen und Abgaben im Baurecht durch die Gemeinde (behördenverbindliche Instrumente)	10	Die behördenverbindlichen Instrumente wie Ausschreibungen/Submissionen, Arealentwicklungen, Landverkäufe oder Abgaben im Baurecht orientieren sich an den energie- und klimapolitischen Zielsetzungen der Gemeinde.
1.4	*Bauverfahren*		
1.4.1	Baubegleitung: Beratung, Prüfung, Kontrolle	10	Die Gemeinde nutzt ihren Spielraum, um bei Bauvorhaben und deren Umsetzung eine energieeffiziente und klimafreundliche Bauweise mit einem hohen Anteil erneuerbarer Energien sicherzustellen.
2	**Kommunale Gebäude und Anlagen**		Insgesamt 76 Punkte
2.1	*Standards, Planung und Bewirtschaftung*		
2.1.1	Standards für Bau und Bewirtschaftung öffentlicher Gebäude	6	Die Gemeinde orientiert sich bei Bau und Bewirtschaftung der kommunalen Gebäude und Anlagen an den höchsten energetischen sowie ökologischen Standards und künftigen klimapolitischen Anforderungen.
2.1.2	Energiebuchhaltung und Betriebsoptimierung	8	Die Gemeinde stellt eine aus energetischen und klimatischen Gesichtspunkten optimale Bewirtschaftung ihrer Gebäude und Anlagen in Bezug auf Energie, Treibhausgasemissionen und Wasserverbrauch sicher.
2.1.3	Sanierungskonzept und -planung	6	Sanierungskonzept und Investitionsplanung zielen auf eine energetische und klima-/ressourcenschonenende Optimierung und eine nachhaltige Bewirtschaftung der Gebäude und Anlagen.
2.1.4	Vorbildliche Neubauten oder Sanierungen	6	Die Gemeinde hat Neubauten und/oder Sanierungen vorbildlich, auch im Sinne von „Leuchttürmen“, umgesetzt.
2.2	*Zielwerte für Energie, Effizienz und Klimawirkung*		
2.2.1	Erneuerbare Energie Wärme (Kälte)	8	Die Gemeinde versorgt ihre Gebäude und Anlagen mit einem möglichst hohen Anteil erneuerbarer Wärme (und Kälte).
2.2.2	Erneuerbare Energie Elektrizität	8	Die Gemeinde versorgt ihre Gebäude und Anlagen mit einem erneuerbaren und ökologischen Strommix.
2.2.3	Energieeffizienz Wärme (Kälte)	8	Wärme (und Kälte) werden in den kommunalen Gebäuden und Anlagen möglichst effizient eingesetzt.
2.2.4	Energieeffizienz Elektrizität	8	In den kommunalen Gebäuden und Anlagen wird Strom möglichst effizient eingesetzt.
2.2.5	CO_2- und Treibhausgasemissionen	8	Die Gemeinde reduziert die CO_2- und Treibhausgasemissionen, welche durch den Betrieb der gemeindeeigenen Gebäude verursacht werden, soweit als möglich.

Bereich	Titel	Pkte	Zielsetzung Massnahme
2.3	*Beleuchtung und Wasser*		
2.3.1	Öffentliche Beleuchtung	6	Die öffentliche Beleuchtung widerspiegelt die Vorbildrolle der öffentlichen Hand im Umgang mit Energie, bspw. bezüglich der eingesetzten Technologien, effizientem und ökologischem Einsatz der Beleuchtung und kontinuierlicher Optimierung des Betriebs.
2.3.2	Wassereffizienz	4	Die Gemeinde nutzt Wasser in ihren Gebäuden und Anlagen möglichst energie- und ressourcenschonend.
3	**Ver- und Entsorgung**		Insgesamt 104 Punkte
3.1	*Strategie der Unternehmen*		
3.1.1	Unternehmensstrategie der Energieversorger	10	Die Gemeinde sorgt im Rahmen ihrer Möglichkeiten bei den Versorgungsunternehmen für Strom, Gas, Wärme und Wasser für eine nachhaltige Strategie und damit die Förderung von Effizienz, erneuerbaren Energien, Biodiversität und Klimaschutz.
3.1.2	Angebot, Verkauf und Nutzung von nachhaltigen Produkten und Services (Strom / Gas / Wärme / Wasser)	12	Die Gemeinde setzt sich im Rahmen ihrer Möglichkeiten für nachhaltige Produkte, Dienstleistungsangebote und Vermarktungsstrategien resp. deren Verkauf und Nutzung ein, die Effizienz, erneuerbare Energien, Biodiversität und Klimaschutz fördern. Dazu zählen Produkte im Bereich Strom, Gas, Wärme und Wasser sowie Beratung und Dienstleistung.
3.2	*Ver- und Entsorgung sowie energetische Nutzung*		
3.2.1	Erneuerbare Stromproduktion auf dem Gemeindegebiet	15	Die Gemeinde fördert die Nutzung des gemeindeeigenen Potentials für eine nachhaltige Produktion erneuerbaren Stroms.
3.2.2	Leitungsgebundene erneuerbare Wärme (Wärmekraftkopplung und Abwärmenutzung)	15	Über die Umsetzung der Energieplanung unterstützt die Gemeinde die Nutzung von Abwärme und die Produktion sowie Nutzung leitungsgebundener erneuerbarer Wärme (z.B. Wärmeverbünde, inkl. Kühlung, Wärmekraftkopplung).
3.2.3	Erneuerbare Wärmeproduktion und -nutzung auf dem Gemeindegebiet (Einzelanlagen)	10	Über die Umsetzung der Energieplanung unterstützt die Gemeinde die Nutzung des gemeindeeigenen Potentials für die Produktion und Nutzung von nicht leitungsgebundener, erneuerbarer Wärme / Kälte.
3.2.4	Wasserversorgung und -bewirtschaftung	8	Die Gemeinde achtet auf eine energieeffiziente Aufbereitung des Trinkwassers sowie einen ressourcenschonenden Umgang mit Trink- und Regenwasser.
3.2.5	Bewirtschaftung der Grünflächen	4	Die Gemeinde unterstützt die ökologische und klimafreundliche Bewirtschaftung der Grün- und Freiflächen. Grün- und Freiflächen, v.a. in dicht besiedelten Gebieten, werden nach Möglichkeit erhalten, aufgewertet und/oder erweitert.

Bereich	Titel	Pkte	Zielsetzung Massnahme
3.2.6	Abwasserbewirtschaftung und energetische Nutzung	15	Die Gemeinde achtet auf eine energetische Nutzung der Abwässer sowie eine energetisch effiziente Aufbereitung (bpsw. Nutzung Wärme in Abwasserkanälen, optimale Bewirtschaftung der Aufbereitungsanlage). Die Wasser-Kreisläufe sowie die Produkte der Abwasserreinigung werden energetisch optimal und klimafreundlich gesteuert, bspw. über die Ausgestaltung der Gebührenordnung oder die Verwertung von Wärme, Biogas und Klärschlamm.
3.2.7	Abfallbewirtschaftung und energetische Nutzung	15	Die Abfälle (Siedlungsabfälle, wiederverwertbare Altstoffe, Biomasse, Sonderabfälle) auf dem Gemeindegebiet werden effizient sowie klimaschonend bewirtschaftet und energetisch optimal genutzt.
4	**Mobilität**		Insgesamt 96 Punkte
4.1	*Mobilität in der Verwaltung / Mobilitätscontrolling*		
4.1.1	Mobilitätsstandards in der Verwaltung	8	Die Gemeinde fördert den effizienten Einsatz der der Fahrzeuge sowie ein nachhaltiges Mobilitätsverhalten bei den Mitarbeitenden und unterhält einen energieeffizienten und klimafreundlichen Fuhrpark.
4.1.2	Mobilitätsstandards in der Gemeinde	4	Die Gemeinde unterstützt die Umsetzung ihrer Mobilitäts-/Verkehrsplanung mit einem Monitoring von relevanten Mobilitätsindikatoren.
4.2	*Verkehrsorganisation*		
4.2.1	Parkplatzinfrastruktur und -bewirtschaftung	10	Die Gemeinde fördert mit ihrer Parkplatzinfrastruktur und -bewirtschaftung eine nachhaltige Mobilität, v.a. bei speziell verkehrserzeugende Einrichtungen (Einkaufen, Freizeit, Logistik usw.).
4.2.2	Temporeduktion	10	Das Temporegime in der Gemeinde unterstützt den Velo- und Fussverkehr sowie die Sicherheit aller Verkehrsteilnehmenden und erhöht die Lebensqualität in der Gemeinde.
4.2.3	Lokale Güter-Versorgung	4	Die Gemeinde unterstützt kurze Wege für die Grundversorgung der Bevölkerung sowie Initiativen für effiziente Logistiksysteme zur Versorgung des Gewerbes.
4.3	*Nicht motorisierte Mobilität*		
4.3.1	Fusswegnetz und öffentliche Räume	15	Die Gemeinde sorgt für attraktive und sichere Fusswege auf dem gesamten Gemeindegebiet und unterstützt deren Nutzung über die Aufwertung öffentlicher Räume.
4.3.2	Velowegnetz und -infrastruktur	15	Die Gemeinde sorgt für ein attraktives, möglichst flächendeckendes Velowegnetz und die nötigen Abstellanlagen.
4.4	*Öffentlicher Verkehr*		
4.4.1	Öffentlicher Verkehr	15	Die Gemeinde stellt ein attraktives Angebot des öffentlichen Verkehrs sicher.
4.4.2	Mobilitätsmanagement und kombinierte Mobilität	15	Die Gemeinde unterstützt Initiativen zum Mobilitätsmanagement und für intermodale Mobilität.

Bereich	Titel	Pkte	Zielsetzung Massnahme
5	**Interne Organisation**		Insgesamt 44 Punkte
5.1	*Interne Strukturen*		
5.1.1	Verantwortlichkeiten, Ressourcen und Abläufe	8	Die Gemeinde stellt die Umsetzung der Energie- und Klimapolitik sicher, indem sie die nötigen Verantwortlichkeiten definiert, genügend personelle Ressourcen zur Verfügung stellt sowie die Abläufe klärt.
5.1.2	Finanzielle Ressourcen für Energie- und Klimapolitik	6	Die Gemeinde stellt die nötigen finanziellen Ressourcen für die Umsetzung der Energie- und Klimapolitik sicher.
5.1.3	Energiestadt-Verankerung (Gremium)	4	Die für Energie- und Klimapolitik relevanten Akteure sind in die zuständigen Gremien eingebunden.
5.2	*Interne Prozesse*		
5.2.1	Erfolgskontrolle und jährliche Planung	10	Die Gemeinde verfügt über ein internes Qualitätsmanagement für die Umsetzung des Energiestadt-Prozesses und kommuniziert die Ergebnisse intern und extern.
5.2.2	Weiterbildung und Sensibilisierung	6	Die Gemeinde stellt sicher, dass die Mitarbeitenden ihren Beitrag an die energie- und klimapolitischen Ziele leisten können und die Vorbildwirkung der Gemeinde im Bereich ihres internen Handlungsspielraumes wahrgenommen wird.
5.2.3	Vorbildfunktion im Beschaffungswesen	10	Die Gemeinde nimmt ihre Vorbildwirkung im Beschaffungswesen wahr. So verfügt sie über eine Strategie zu einer nachhaltigen Beschaffung, welche sämtliche Produkte im Berufsalltag, aber auch Textilien oder Lebensmittel mit einschliesst. Des Weiteren minimiert die Gemeinde mit einer nachhaltigen Strategie die ökologischen Auswirkungen bei der Anlage ihrer Gelder (u.a. Vermögen, Kredite und Pensionskassengelder).
6	**Kooperation und Kommunikation**		Insgesamt 96 Punkte
6.1	*Kommunikation aus der Gemeinde*		
6.1.1	Konzeption und Planung	4	Die Gemeinde nutzt die Kommunikationskanäle gezielt, um die verschiedenen Akteure in der Gemeinde über die Energie- und Klimapolitik zu informieren.
6.1.2	Vorbildwirkung und Corporate Identity	4	Die Vorbildrolle der Gemeinde im Energie- und Klimabereich widerspiegelt sich in Aktivitäten und Auftritt der Gemeinde.
6.1.3	Beratung- und Informationsstelle	10	Der Bevölkerung steht eine Beratungs- und Informationsstelle für Energie-, Klima- oder Mobilitätsfragen zur Verfügung.
6.1.4	Finanzielle Förderung	10	Die Gemeinde unterstützt nachhaltige Projekte im Bereich Effizienz, erneuerbare Energien und Klimaschutz auch finanziell.

Bereich	Titel	Pkte	Zielsetzung Massnahme
6.2	*Kooperation und Kommunikation*		
6.2.1	Regionale und überregionale Zusammenarbeit	6	Die Gemeinde unterstützt die Umsetzung ihrer Energie- und Klimapolitik mit einer aktiven Zusammenarbeit mit den Gemeinden in der Region, mit Kanton und Bund.
6.2.2	Zusammenarbeit mit Schulen und Bildungsinstitutionen	8	Die Gemeinde unterstützt Schulen und Bildungsinstitutionen bei Energie- und Klimaunterricht sowie -projekten und nutzt deren Knowhow und Ressourcen für die Umsetzung der Energie- und Klimapolitik.
6.2.3	Zusammenarbeit mit Industrie, Gewerbe, Dienstleistung und Forst-/Landwirtschaft	15	Die Gemeinde unterstützt Industrie, Gewerbe und Dienstleistungsunternehmen sowie Betriebe der Land- und Forstwirtschaft bei Programmen und Projekten zur Steigerung der Energieeffizienz, für erneuerbare Energien, Klimaschutz oder nachhaltiger Mobilität.
6.2.4	Zusammenarbeit mit professionellen Investoren und HauseigentümerInnen	10	Die Gemeinde arbeitet mit professionellen Investoren und HauseigentümerInnen zusammen, damit diese einen Beitrag an die energie- und klimapolitischen Ziele der Gemeinde leisten.
6.2.5	Kommunikation mit der breiten Bevölkerung	15	Die Gemeinde informiert und sensibilisiert die Bevölkerung zu energie- und klimapolitischen Themen, insbesondere auch mit Blick auf Konsumthemen und Handlungsspielraum als Mietende.
6.2.6	Partizipation und Multiplikatoren	6	Die Gemeinde stellt die Partizipation der verschiedenen interessierten Akteure bei der Entwicklung und Umsetzung der Energie- und Klimapolitik sicher. Sie bindet Multiplikatoren wie Vereine aus der Region ein und unterstützt Initiativen aus der Bevölkerung zu den Themen Nachhaltigkeit, Energiesparen, Klimaschutz usw.
6.3	*Leuchttürme*		
6.3.1	Leuchtturmprojekt	8	Die Gemeinde entwickelt und unterstützt herausragende, innovative Projekte in der Gemeinde mit einer möglichsten breiten Ausstrahlung und Multiplikationswirkung.