University of Bern
Faculty of Business, Economics and Social Sciences
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Quality of Life and Sustainability in Rural Switzerland

Inaugural dissertation
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Content

Summary

Most wealthy countries, such as the members of the Organisation for Economic Co-operation and Development, offer an above-average quality of life. Switzerland is known for being one of the wealthiest countries in the world and one of those that offer the highest quality of life. However, like many other wealthy countries, Switzerland massively overuses natural resources. This threatens the quality of life of those humans living in less wealthy countries and those who will belong to future generations. Reducing the inequitable distribution of high quality of life in the present and future generations is one of humanity's greatest challenges. To contribute to this discussion, this thesis is dedicated to the topic of sustainable quality of life and investigates this topic in Swiss rural areas in general and three regional nature parks. Thus, all four articles focus on the quality of life and its connection to sustainability. Specifically, the thesis addresses the conceptualisation of sustainable quality of life (Article 1), assesses the opinions of Swiss rural inhabitants on how to combine the quality of life with sustainability in rural areas (Article 2), tests regional nature parks as a model region for social and ecological sustainability and the relationship between resource use and life satisfaction (Article 3), and provides recommendations to regional nature park managers on how to improve quality of life in a sustainable manner (Article 4).

The research project in which the thesis is embedded took place in cooperation with the management of the regional nature parks. Two empirical studies were conducted. The first involved qualitative interviews analysed via a content analysis (n = 90). The second was a cross-sectional survey, analysed via inferential statistics (n = 3’358).

The resulting sustainable quality of life concept is multidimensional and contains nine components that integrate quality of life and sustainability. In the opinion of the rural inhabitants, the most important components for quality of life are not necessarily in conflict with sustainability. On the other hand, challenges to reconciling quality of life with sustainability revealed within the rural regions concern mainly equality between specific social groups and the supply of sustainable infrastructure.

Further results of this thesis suggest that the regional nature parks do not yet provide quality of life and ecological sustainability in a significantly different way than in other comparable rural regions. However, another result of this thesis rejects the common hypothesis that resource use leads to life satisfaction and indicates the opposite relation. It can be assumed that the individual’s quality of life can promote sustainable development. Therefore, the thesis presents several opportunities to promote the quality of life of the population in the future.

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Thea Xenia Wiesli, November 2021

Part I – Framing the Research

1. Introduction

Switzerland ranks above the average of the Organisation for Economic Co-operation and Development (OECD) countries in terms of quality of life[1] (QoL) and in terms of gross domestic product (GDP) (OECD 2020). Switzerland massively overconsumes natural resources (Federal Statistical Office 2019b). If all individuals on this planet consumed as the Swiss do, it would take more than three planet Earth to provide all that the individuals demand (Federal Statistical Office 2019b; Global Footprint Network 2017). QoL is, therefore, high for individuals and specific societies in the present. However, this consumption can lead to social, environmental and climate problems and can be a threat to equality, the QoL and the existence of the populations in other countries or in the future. Thus, like many other wealthy countries, Switzerland must find a way to maintain a high QoL without compromising those of other societies globally or in future (Brundtland 1987).

GDP is still widely used as an indicator of QoL, although it measures only one material dimension of QoL. Other measurements, such as the Better Life Index of the OECD (OECD 2020) or the Swiss government's measurement of welfare (Federal Statistical Office 2019a), include many more indicators to measure QoL. For example, the individuals' self-reported life satisfaction or the country's environmental state are included as indicators. Many studies claim that GDP contributes only to a limited extent to QoL, and after a certain amount, the marginal returns begin decreasing (Easterlin 1974; Frey and Stutzer 2010; Layard 2006; Max-Neef 1995). In general, it is a matter of debate to what extent financial indicators can contribute to QoL (Weimann, Knabe, and Schöb 2015). However, political economy perspectives essentially link the causation of economic growth to environmental problems (Jackson 2016; O'Neill et al. 2018; Verhofstadt et al. 2016). Several empirical studies show the harmful influence of increasing GDP per capita on the environment (e.g. Ahmed et al. 2020; Dogan et al. 2020; Dogan and Inglesi-Lotz 2020; York et al., 2003) and the effect of high income on over-consumption in Switzerland (Bruderer Enzler and Diekmann 2019).

Nevertheless, several studies claim that high QoL can be reconciled with sustainability (Chancellor and Lyubomirsky 2011; Fanning and O'Neill 2019; Fritz and Koch 2014; O'Neill et al. 2018; Sameer et al. 2021; Verhofstadt et al. 2016; Vita et al. 2019; Zidanšek 2007). For example, psychological studies show that pro-ecological behaviour can have positive psychological effects (e.g. mending

[1] QoL here refers to a multidimensional construct that includes subjective and objective indicators on tangible and intangible needs, needs beyond basic needs and capabilities (Costanza et al. 2016; Nussbaum and Sen 1993; Wiesli et al. 2021).

objects instead of buying new ones or growing vegetables instead of buying them), which can contribute to QoL (e.g. Kasser, 2017; Ryan et al., 2008; Ryan & Deci, 2000) and that happier people tend to be more social, cooperative and helpful (e.g. Chancellor & Lyubomirsky, 2011; Kasser, 2017; Lyubomirsky et al., 2005). Many areas of life complement each other positively regarding pro-ecological behaviour and QoL. For example, shared living situations are pro-ecological and contribute to QoL as the individuals spend less time alone (Verhofstadt et al. 2016). The assumption that high QoL can be reconciled with sustainability leads to the overall question that forms the basic subject of this thesis: how can high QoL be promoted in a way that is more sustainable?

So far, only a few publications conceptually or empirically connect QoL and sustainability (Bakar et al. 2015; Cloutier and Pfeiffer 2015; Costanza et al. 2016; Sameer et al. 2021). Most studies do not use a comprehensive approach that includes and connects QoL and sustainability in several relevant dimensions. The majority of the existing empirical studies on the linkages between QoL and (mostly ecological) sustainability are measured at the country level and not at the individual level (Fanning and O'Neill 2019; O'Neill et al. 2018; Verhofstadt et al. 2016). The perspectives of the population are largely not included. In addition, only a few studies concretely suggest how QoL can become more sustainable. These exceptions refer to, for example, the steady-state economy and renewable energies (Dietz and Jorgenson 2014; Fritz and Koch 2014; O'Neill et al. 2018).

In this thesis, rural regions of Switzerland, as well as regional nature parks ("parks") in the country, were investigated at the individual level and included the perspectives of their inhabitants. Parks are certified, largely populated regions of special landscapes, biodiversity and cultural value (Federal Office for the Environment 2019). The managers of the parks address the different needs of the population in a sustainable way and pursue strategies that are compatible with the promotion of a sustainable QoL (SQoL). Park management activities contribute, for example, to the promotion of infrastructure such as renewable energies and sustainable forms of mobility, to hiking trails and to the quality of the natural environment. In the research field on protected areas, these types of parks have thus been considered as model regions (Borsdorf et al. 2020; Braun 2020; Hammer et al. 2016; Merlin 2017) and as real laboratories (Wagner and Grunwald 2015) in which sustainable development can be researched and tested. The aim of the Swiss federal government includes here, in addition to ecological goals, the promotion of a sustainable regional economy and the promotion of the well-being of the population, especially through the quality of the landscape (Federal Office for the Environment 2019).

However, QoL, and its sustainability at the regional level in general and in parks in particular, has been little researched so far. A larger part of research is available on the connections between human well-being, often understood in a health-related sense and landscape. These studies indicate the positive effects of nature and landscape, for example, by offering recreational areas to promote individual well-being (Bieling et al. 2014; Bignante 2015; Brymer, Crabtree, and King 2021; Keller

and Backhaus 2021; Mossabir, Froggatt, and Milligan 2021). Exceptions in research on the parks' impact on QoL exist in some countries which have a long tradition of similar large protected areas, for example, in Spain (Bonet-García et al. 2015; Jones et al. 2020; Romagosa, Eagles, and Lemieux 2015; Wolf and Wohlfart 2014). However, the meaning of QoL in these studies is narrow and often focused on health-related well-being instead of a broader understanding of QoL or SQoL. Therefore, my thesis is dedicated to examining QoL according to a more comprehensive definition of QoL and in connection to sustainability.

1.1 Research Context

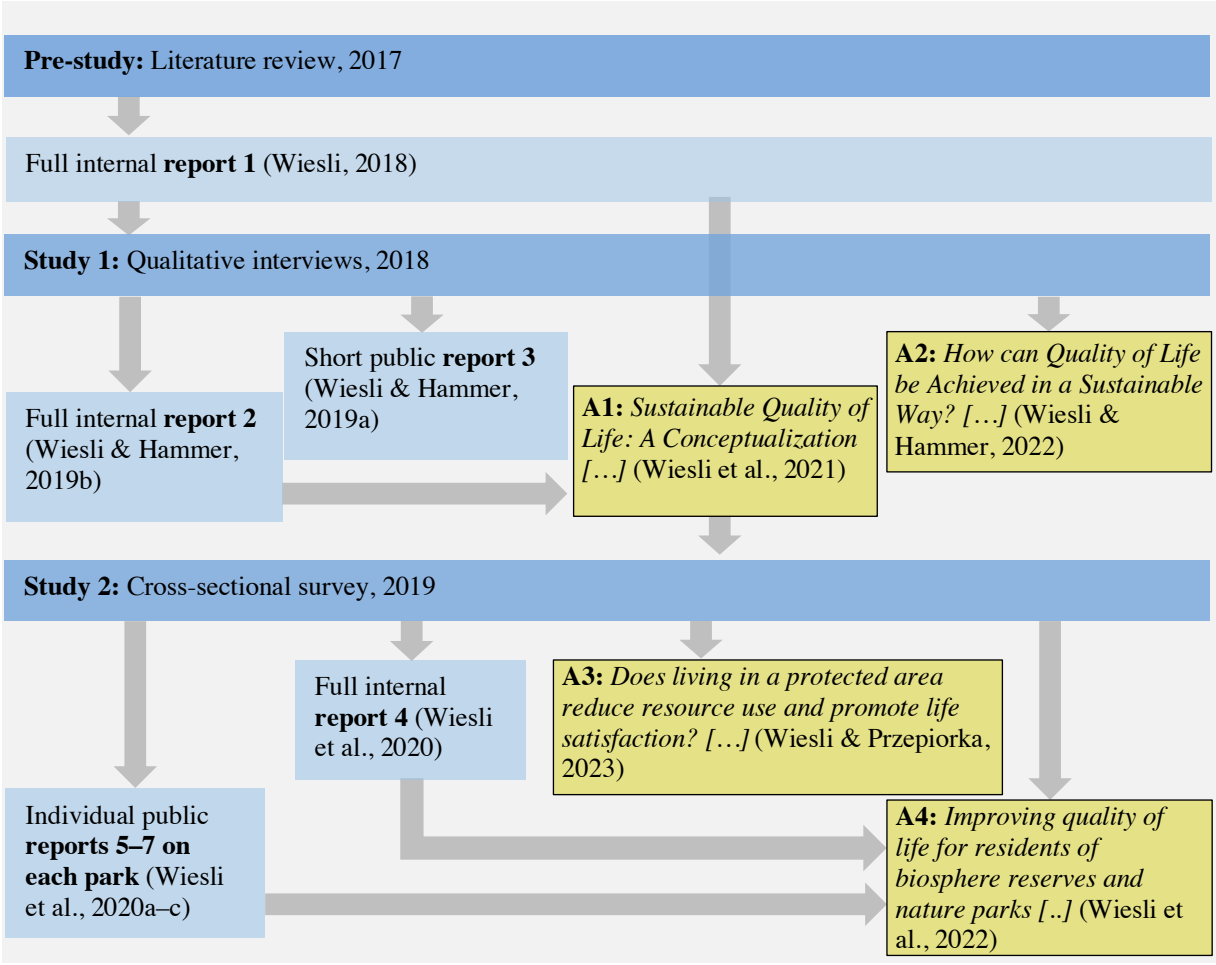
This thesis is embedded within the research project entitled "Quality of Life in Context of Sustainable Development. The perspectives of Local Actors and the Contribution of Parks of National Significance to Foster Sustainable Quality of Life", which ran from 2017 to 2021 at the Centre for Development and Environment (CDE) at the University of Bern. The project was led by Thomas Hammer; the research team consisted of Ulf Liebe, as my PhD supervisor, Roger Bär, as senior researcher, Elena Siegrist as a student assistant, and me as a PhD student. The project was funded by the Swiss National Science Foundation (SNSF: 173372). The Institute of Sociology at the University of Bern and the managers of the three Swiss parks UNESCO Biosphere Entlebuch, Nature Park Gantrisch and the park Jurapark Aargau cooperated as partners of the CDE, and this cooperation was the key to this transdisciplinary research project.

The objectives of the project were to establish the population's view on the different aspects of QoL, to understand how the different aspects are compatible or interrelated with sustainable development, and to determine how SQoL can be promoted in the parks. Besides the contribution to science, the results of the research project were intended to provide practical applications for park management and further actors, such as regional development bodies.

To achieve the goals of the research project, we conducted several research studies, which are the same as those in my thesis. First, we developed a theoretical basis as a pre-study and then conducted qualitative interviews and a cross-sectional survey (see Studies 1 and 2 in Section 3). As a first author, I recorded our survey design, my collection of the data, my analyses and the results in seven reports (see the reports in Figure 1). The four articles in my thesis are based on the pre-study, on the two empirical studies and (in part) on the corresponding reports of this research project (see Figure 1).

Figure 1

Overview of the research studies, reports and articles in this thesis



Note. The three studies (in blue) were investigated in the research project and were included at the same time in my thesis. The reports (in light blue) aimed to record the studies and are part of the research project. The research articles (in yellow) constitute my thesis. A1–A4 = research articles.

1.2 Research Objectives

The overall objective of my thesis was to gain a better understanding of how QoL and sustainability are manifested among the inhabitants of rural regions in Switzerland. This includes an assessment of their current level of QoL, their ecological behaviour and their social attitudes, with the aim of understanding their subjective conception of SQoL and of establishing ways in which QoL and sustainability are compatible. I posed the following overall research question for my thesis: *How can high QoL be promoted to be more sustainable?*

To answer this research question and to achieve the overall objective, the concretised objectives and research questions, presented in Table 1, structured the qualitative (study 1) and quantitative (study 2) research of my thesis and led to the four research articles of my thesis.

Table 1

Overview of objectives, research questions and the corresponding articles of the thesis

Study	Concretised objective	Concretised research question	Article
S1	O1: Having a concept that defines SQoL according to the key literature and the opinions of the population.	Q1: "How can QoL and sustainable development be integrated into one concept?" (Wiesli et al., 2021)	A1: *Sustainable Quality of Life: A Conceptualization That Integrates the Views of Inhabitants of Swiss Rural Regions* (Wiesli et al., 2021)
S1	O2: Establishing the most important components of SQoL.	Q2: What are the most important components of SQoL?	A1: *Sustainable Quality of Life: A Conceptualization That Integrates the Views of Inhabitants of Swiss Rural Regions* (Wiesli et al., 2021)
S1	O3: Establishing the main challenges of SQoL in the rural areas.	Q3: What are the main challenges of SQoL in the rural areas?	A1: *Sustainable Quality of Life: A Conceptualization That Integrates the Views of Inhabitants of Swiss Rural Regions* (Wiesli et al., 2021)
S1	O4: Establishing the rural inhabitants' perception on the opportunities to reach SQoL in order to derive recommendations for regional development bodies.	Q4: "What factors do the inhabitants of rural regions in Switzerland consider beneficial to SQoL […]?" (see Article 2)	*A 2: How can Quality of Life be Achieved in a Sustainable Way? Perceptions of Swiss Rural Inhabitants* (Wiesli & Hammer, 2022)
S2	O5: Establishing if the park regions differ from other rural regions in terms of SQoL, in order to test the hypothesis that parks can be considered as model regions for SQoL.	Q5: "Does the relation between resource use and life satisfaction in protected areas differ from other rural regions in Switzerland?" (see Article 3)	A3: *Does living in a protected area reduce resource use and promote life satisfaction? Survey results from and around three regional nature parks in Switzerland* (Wiesli & Przepiorka, 2023)
S2	O6: Establishing how the rural inhabitants' QoL and sustainability is related in order to determine indications for the understanding of the rural inhabitants' values and situation.	Q6: How are resource use and life satisfaction related?	A3: *Does living in a protected area reduce resource use and promote life satisfaction? Survey results from and around three regional nature parks in Switzerland* (Wiesli & Przepiorka, 2023)
S2	O7: Finding recommendations park managements to promote QoL sustainably.	Q7: "How can park managements best contribute to park residents' QoL […]"? (see Article 4)	A4: *(Improving quality of life for residents of biosphere reserves and nature parks: management recommendations from Switzerland* (Wiesli et al., 2022)

Note. S1 = Study 1: Qualitative interviews; S2 = Study 2: Cross-sectional survey.

2. Theoretical Framework

My thesis aims to bring the two main concepts of QoL and sustainability together. These concepts are used in several disciplines and belong to an interdisciplinary discussion. The detailed inclusion of these concepts in the construction of the SQoL concept is elaborated in the first research article (Wiesli et al. 2021) of this thesis. In the following, the main important concepts in my thesis are briefly introduced.

2.1 Quality of Life

The economic sciences, in particular, began to look at how the state of a population can be observed in the 1990s by investigating it more comprehensively and not just analysing GDP or purely economic data. Nussbaum and Sen (Nussbaum, 2011; Nussbaum & Sen, 1993; Sen, 2005) and Stiglitz, Sen and

Fitoussi (Stiglitz, Sen, and Fitoussi 2009) promoted the discussion on different measures of welfare and well-being. Research on QoL in the context of sustainable development thus received a boost from criticism of "classical" indicators of prosperity, such as GDP, and classical economic growth theories. QoL and similar concepts, such as well-being, are meanwhile important in the discussion on overarching social and political goals and the measurement of a population's state. For example, the OECD publishes the *Your Better Life Index* yearly in order to compare the conditions of OECD countries in terms of their "well-being" (OECD 2020).

Many similar concepts to QoL are used, sometimes depending on the discipline (see the details in Article 1). For example, "well-being" is often used synonymously with QoL as a multidimensional concept (e.g. Costanza et al., 2016; da Silva et al., 2020). The concepts of "life satisfaction" and "happiness" are often used as subjective, self-reported measurements of a population (Frey and Stutzer 2018; Layard 2006; Weimann et al. 2015).

In this thesis, I define QoL as a multidimensional construct, one that consists of subjective indicators, such as self-reported life satisfaction, and objective indicators, such as life expectancy or infrastructure (Costanza et al. 2007). QoL in this sense includes the living conditions and surrounding of individuals, such as infrastructures, goes beyond basic human needs, is extended to the fulfilment of several life areas, and the possession of the capabilities to fulfil them (Nussbaum, 2011).

2.2 Sustainability

Today's understanding of the concept of sustainability was first shaped after the Second World War by the discussion of finite resources, which became better known in particular through Meadows' work *The Limits to Growth* (Meadows et al. 1974). The establishment of the World Commission on Environment and Development and the report *Our Common Future* (Brundtland 1987) published in this context, which coined the term "sustainability", was a further step forward. Both built the basis for today's widespread understanding of a three-dimensional concept consisting of ecology, economy and society (Zimmermann 2016). The United Nations (UN) further shaped the discussion on sustainability through the formulation of the Sustainable Development Goals in 2016 (United Nations 2021; Zimmermann 2016).

In this thesis, I have applied an understanding of sustainability based on that of the UN and *Our Common Future*. According to this definition, I understand "sustainability" as the satisfaction of current human needs without compromising the ability of future generations to meet their own needs (Brundtland 1987). This understanding of sustainability includes an intact environment, intra- and intergenerational distribution of, for example, natural resources and thus a claim to social justice (Zimmermann 2016).

2.3 Sustainable Quality of Life

QoL in the context of sustainability has been researched in interdisciplinary fields, for example in planning sciences (e.g. Gavrilidis et al., 2016; Vogt, Andereck, and Pham 2020), urban research (e.g. Baernholdt et al., 2012; Higgins & Campanera, 2011; Marans, 2015; Turkoglu, 2015), rural research (Baernholdt et al. 2012; Kazana and Kazaklis 2009) and economics (Bartelmus 2002; Fritz and Koch 2014; Greenwood and Holt 2014; Max-Neef 1995). Many related terms and concepts to QoL, such as "well-being" (Bakar et al. 2015; Costanza et al. 2016; Dietz and Jorgenson 2014; Dwyer 2020; Fanning and O'Neill 2019; da Silva et al. 2020), "life satisfaction" (Brand-Correa and Steinberger 2017; Vita et al. 2019; Welsch 2006) and "happiness" (Aksoy and Bayram Arlı 2020; Ambrey and Daniels 2017; Fanning and O'Neill 2019; Petrovič and Murgaš 2020; Sameer et al. 2021; Sheldon and Lyubomirsky 2021) are used in their connections to sustainability, resource use and consumption. In contrast, QoL in connection to "sustainability" is a more rarely used term (exceptions are, e.g., (Bartelmus 2002; Costanza et al. 2007; Fritz and Koch 2014; Greenwood and Holt 2014; Higgins and Campanera 2011; Malkina-Pykh and Pykh 2016; Max-Neef 1995). As QoL provides a pluralistic understanding of this concept (e.g. includes not only people's well-being but also their surrounding infrastructures and capabilities), as described above, I have chosen QoL for this thesis.

In Article 1 of my thesis, the two terms QoL and sustainability are conceptually intertwined, and a concept of *sustainable quality of life* (SQoL) is presented. The concept of my thesis consists of nine components, which all provide a detailed target definition and a justification (see Table 2), relating to both QoL and sustainability: "social relations and equality; nature and landscape; education and knowledge; participation, identification, and collective emotions; living; mobility; health and safety; leisure and recreation; and income and employment" (Wiesli et al. 2021:13). The term "sustainability" denotes QoL as intergenerational and intragenerational and gives QoL a claim to social justice (Brundtland 1987; Zimmermann 2016). Justice is thus is an essential part of SQoL (see Article 1).

Table 2

Components of the concept SQoL (Wiesli et al., 2021)

Component	Target	Justification	Key source and concept
Social relations and equality	The greatest possible freedom and equal opportunities. Intra- and intergenerational justice. Opportunities for social relations. No discrimination based on gender, ethnicity, religion, species, or other affiliation. Recognition of potentially excluded groups as a basis for justice.	Justice and recognition are fundamental to living a self-determined life with equal opportunities, in freedom, without environmental pressures, and with sufficient resources. Living in a society, having relationships, and thus feeling empathy for other people and other living beings satisfies the human need for closeness and enables joint development.	Nussbaum (2011): "Capability Approach" Rawls (2009): "Theory of Justice" Schlosberg (2009): "Environmental Justice" Sen (2005): "Capability Approach" United Nations (2019): "SDG's"
Nature and landscape	High quality of nature and landscapes for all present and future generations.	High-quality nature and landscapes stimulate positive emotions and have a positive influence on physical and mental health. Nature and landscape	Bieling et al. (2014): "Well-Being and Landscape" Bignante (2015): "Well-Being and Landscape" Nussbaum, (2011): "Capability Approach" United Nations, (2019): "SDG's"

		enable recreation and community experiences outdoors.	
Education and knowledge	A good general and specific education and knowledge. Education on the environment and sustainability. The ability to absorb and process information, think critically, and use one's personal knowledge.	A good education and knowledge is essential to individual development, to shaping one's own life, and to participating in social life. Education on the environment and sustainability enables people to increase sustainability in their own lives and to contribute to development.	Federal Statistical Office (2019): "Swiss welfare measurement" Frey & Stutzer (2010): "Happiness/Satisfaction" Layard (2009): "Happiness" Nussbaum, (2011): "Capability Approach" OECD (2017): "Better Life Index" Sen (1993): "Capability Approach" United Nations (2019): "SDG'S"
Living	Appropriate, environmentally friendly, and resource-efficient living conditions that are not impaired by environmental pollution.	Living conditions appropriate to the individual situation that are not impaired by environmental pollution are essential to well-being. To reduce environmental pollution, it is important that living should be as environmentally friendly and resource-efficient as possible for everyone.	Federal Statistical Office (2019): "Swiss welfare measurement" Frey & Stutzer (2010): "Happiness/Satisfaction" Layard (2009): "Happiness" OECD (2017): "Better Life Index" Preisendörfer (2014): "Environmental Justice" Wackernagel et al. (2019): "Ecological Ressources"
Participation, identification, and collective emotions	Freedom of choice, the right to have a say, and effective participation in social processes. Identification with one's social environment and home area and a positive collective mood.	Participation and freedom of choice are important for self-determination and the control over one's personal well-being. Identification promotes participation in social processes and reduces the likelihood of conflict. Positive collective emotions are essential for mental well-being as well as for trust and freedom in a society. Membership in associations enables social and intercultural networking and integration.	Frey & Stutzer (2010): "Happiness/Satisfaction" Lengen (2016): "Identification" United Nations, (2019): "SDG's" Weimann et al. (2015): "Happiness/Satisfaction"
Mobility	Environmentally friendly and resource-efficient mobility for everyone, including efficient and frequent access to cities.	Mobility is fundamental for the supply of goods and services, for accessing appropriate employment and education, for cultural activities, for individual freedom, and for the maintenance of social relationships.	Meschik & Meth (2008): "Ecological Mobility" Nussbaum (2011): "Capability Approach" Wackernagel et al. (2019): "Ecological Ressources"
Health and safety	A long and healthy life without fear and without the danger of conflicts or negative environmental and climatic influences. Availabilty to all individuals of fresh and locally produced food, without overuse of resources.	A good physical and mental individual constitution, safety, and an intact environment are essential conditions for a successful life. Fresh food is essential for health and enjoyment. Local, ecological production and moderate consumption enable a fair distribution of food while keeping nature intact.	Frey & Stutzer (2010): "Happiness/Satisfaction" Layard (2009): "Happiness" Nussbaum (2011): "Capability Approach" United Nations (2019): "SDG's" Wackernagel et al. (2019): "Ecological Ressources" Weimann et al. (2015): "Happiness/Satisfaction"
Leisure and recreation	Leisure activities, recreation, and cultural activities that are as environmentally friendly as possible and compatible with the conservation of renewable natural resources.	Leisure activities, recreation, and cultural activities satisfy the need for expression, social life, entertainment, and education. Culture and art offer opportunities for sharing, creativity, and an understanding of common values that can promote sustainable development.	Kurt & Wagner (2001): "Culture, Art and Sustainability" Nurse (2006): "Culture as the Pillar of Sustainability" Nussbaum (2011): "Capability Approach" United Nations (2019): "SDG'S"
Income and employment	Employment within a resource-efficient and environmentally friendly economy. Employment that is freely chosen, meaningful, and provides sufficient income, a good work-life balance, and the option of working part-time.	Sufficient income and meaningful work are essential for a successful life. Sufficient time, and hence part-time employment, can benefit the environment and increases personal satisfaction. To counteract scarcity of natural resources and existing environmental and social problems, it is important that income and work are generated within a resource-efficient and environmentally friendly economy that ensures fair distribution.	Federal Statistical Office (2019): "Swiss welfare measurement" Frey & Stutzer (2010): "Happiness/Satisfaction" Layard (2009): "Happiness" OECD (2017): "Better Life Index" United Nations (2019): "SDG's" Weimann et al. (2015): "Happiness/Satisfaction"

Note. See Table in Article 1, inclusive supplementary material.

3. Research Design

The objectives and research questions of my thesis were addressed by means of a procedure that includes qualitative (Study 1) and quantitative research (Study 2), as well as explorative, semi-structured and hypothesis-guided approaches. The combination of these research approaches allowed insights into lifeworlds and attitudes (Flick, Kardoff, and Steinke 2004), falsification (Popper 2002) and inferential statistics. In the following section, the research design of the thesis is described (see further details in Articles 1–4).

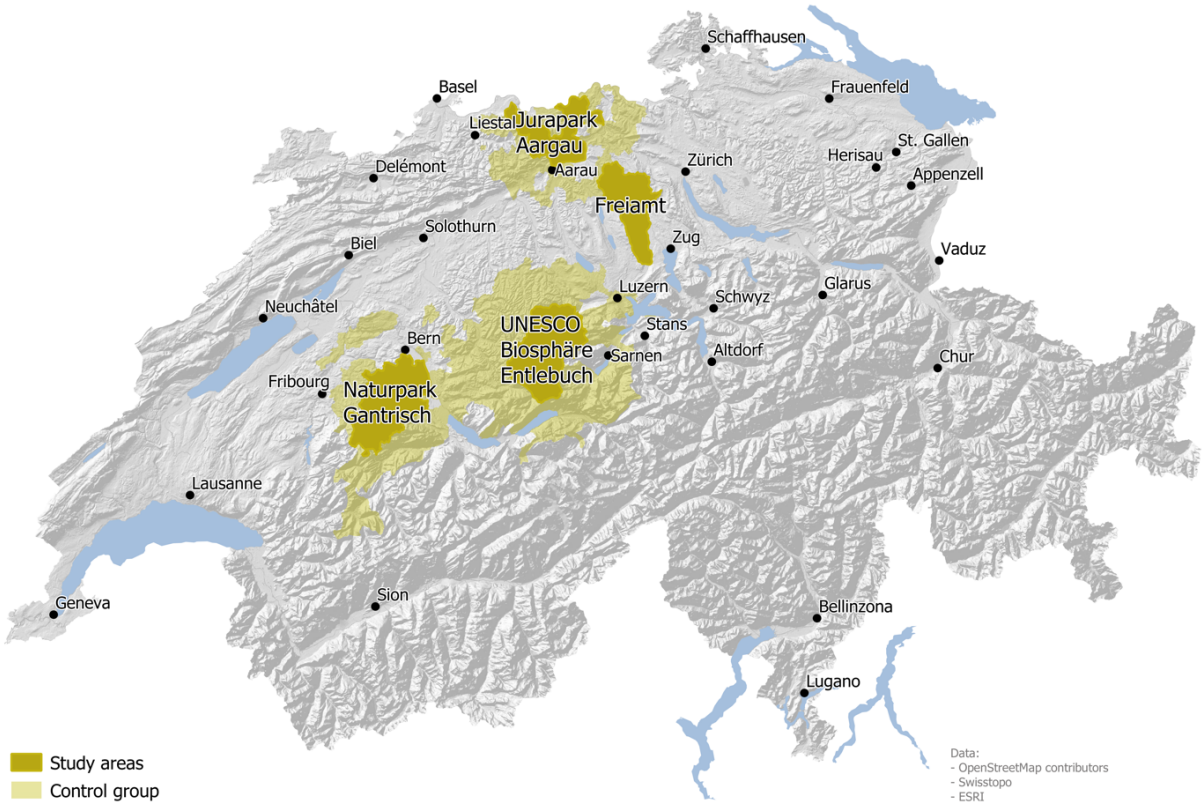
3.1 Study Areas

The study areas of this thesis are rural areas in Switzerland. The qualitative interviews (Study 1) were conducted in the three parks: Gantrisch, Jurapark and Biosphere Entlebuch, and in a region called Freiamt[2] (see Figure 2). The cross-sectional survey (Study 2) was conducted in the same three parks, and in additional Swiss rural municipalities scattered around the three parks that served as control groups for comparison with the parks (see Figure 2). All study areas are located in the German-speaking part of Switzerland, are well accessible from densely populated agglomeration areas and have a relatively large population compared to many alpine areas (e.g. 168 inhabitants per square kilometre in the Jurapark Aargau). The UNESCO Biosphere Entlebuch was founded in 2001 as UNESCO Biosphere and in 2008 was recognised as a regional nature park. It is the oldest of the three parks. Gantrisch and Jurapark Aargau have both existed since 2012.

[2] In the research project, Freiamt was originally selected as a control group. However, in the qualitative data no substantial differences between the parks and the Freiamt was revealed (as far as qualitative research allows for comparison at all). Therefore, in this thesis, all four regions were equally included in the paper and served as study regions for areas with rural inhabitants.

Figure 2

Study areas of the qualitative interviews (Study 1) and the cross-sectional survey (Study 2).



Note. The three Swiss regional parks and the Freiamt are highlighted in dark yellow. The control group of the survey (Study 2) are in the municipalities scattered around the three regional parks highlighted in light yellow. Source: Open Street Map Contributors, Swisstopo, ESRI. Map: Roger Bär.

3.2 Literature Review

In order to establish a theoretical background and collect a range of components of SQoL, as presented in Table 2, I analysed the existing literature as a preparatory study for the empirical studies (Studies 1 and 2).

To examine the existing state of research, I used the *Ingenta Connect* database. The purpose of the first step of the search was to determine which similar concepts and what empirical research already exists. Thus, the first search comprised keywords such as *sustainable quality of life*, *sustainable well-being*, *sustainability and*; *quality of life; well-being; satisfaction*. In the second step of the literature review, I used the search terms *quality of life* and *sustainability* to define them. To that end, I conducted empirical and theoretical work on QoL and related concepts, such as *life satisfaction*, *well-being* and *happiness*. In addition, I included indicator systems of governmental and international institutions (e.g. OECD) in order to find components of QoL. To define the term *sustainability*, I used sources from the UN and secondary literature (e.g. Zimmermann, 2016), literature on environmental justice (Preisendörfer 2014; Schlosberg 2009), and justice theory (Rawls 2009). I then extracted the most common indicators and components from the literature on QoL, related concepts, and

sustainability, ecological resources, and environmental justice. As a last step, I compiled them into a list of components and formulated targets and justifications for the components based on their literature sources. This first version of the concept of SQoL, based on literature, was stated in the first report of the research project (see Table 1). In connection with the results of Study 1, it is part of Article 1 of my thesis.

3.3 Study 1: Qualitative Interviews

The first empirical study of my thesis was a qualitative study in the three parks and the Freiamt in 2018. One aim of this qualitative study was to survey the views of the rural population on SQoL and to test, substantiate and expand the concept of SQoL that was developed in the literature review in Section 3.2 with the opinion of the rural inhabitants (see Article 1). The other aim of the qualitative interviews was to work out the rural inhabitants' opinions on opportunities to maintain high QoL and reach a more sustainable QoL (see Article 2).

In order to conduct the narrative interviews, I developed a semi-structured questionnaire (see supplementary information to Article 1: https://www. mdpi.com/article/10.3390/su13169187/s1). The questionnaire included the nine components of the literature-based concept of SQoL (see Table 2) and questions and narrative-generating questions on the perception of QoL, sustainability, the living situation in rural areas, its future and the compatibility of QoL with sustainability. The questionnaire was tested in 10 interviews and partly adjusted accordingly for the subsequent interviews.

We determined the sample by means of a mixed form of pre-determination and theoretical sampling (Flick, 2007). For each type of socio-demographic criterion and the municipality type according to the typology of the Swiss government (Federal Statistical Office 2012), we determined a minimum number that the survey in the rural regions should cover. This served to cover all the groups of people in terms of age, gender, occupation, education, place of residence and income. According to this sampling strategy, we collected a total of 90 interviews in the four Swiss rural regions in which an assistant and I approached the residents on-site in public places, in the field, at work or in the garden. The contact and selection of the interviewees were intentionally not made through a snowball system to counteract the risk of interviewing people from a similar social environment. All interviews lasted between 30 and 50 minutes and were recorded for subsequent transcription in Swiss German, verbatim, according to the method of Dresing & Pehl (2015) (see transcription guide in the supplementary information to Article 1). Afterwards, I analysed the data using content analysis, following the methods of Mayring (2014), with the help of an assistant who coded the data with me by using the software MAXQDA (see code book in the supplementary information to Article 1). I reported the collection process, data analysis, and the final results of Study 1 in Reports 2 and 3 (see Table 1). In addition, the data and its analyses of Study 1 resulted in Articles 1 and 2.

3.4 Study 2: Quantitative Cross-Sectional Survey

The second empirical investigation of my thesis was a cross-sectional survey in 2019. The data collected was intended to enable comparisons between the parks and other rural regions, investigate links between QoL and sustainability, and record the ecological and social sustainability of residents and the possibilities they have for setting SQoL into practice.

My colleagues and I used an integrated within-method triangulation in the questionnaire by using several kinds of items, scales and vignettes (Flick et al., 2004, pp. 179-180). To survey QoL, we used items on self-reported life satisfaction (see questionnaire in the appendix to Article 4) as it is widely used (e.g. Frey & Stutzer, 2018; Layard, 2006) and a valid proofed measurement (Diener and Suh 1999). Several life areas were investigated by this means, e.g., overall life satisfaction or satisfaction with one's health.

Furthermore, we surveyed the consumption of natural resources (see Article 3). According to Jungbluth et al. (2011), the areas of mobility, living and nutrition are the areas with the most intensive effects on CO_2 emissions resulting from individuals in Switzerland. We thus focused on these three areas and included related items in our questionnaire, and then calculated the carbon footprint in kilograms of CO_2 emissions according to Jungbluth & Meili (2017).[3] Vignette techniques allowed us to record an illustration of the resource use in an additional way (see Article 3). Describing lifestyles, which ultimately stand for high, medium, or low resource consumption, the survey participants were asked how similar they felt to the lifestyle, whether they would want to have it and whether they thought it was feasible in their environment.

The sampling of the survey was done in two steps. First, we sampled the municipalities randomly; second, we sampled the addresses of the people randomly (see details on the sampling method in Articles 3 and 4). In order to obtain the addresses of the individuals, the project partners from the respective park management asked the selected municipalities for a random sample of addresses.

In order to obtain a sample of a control group that is comparable to the park's municipalities, we chose the same types of municipalities according to the typology of the government (Federal Statistical Office 2012). The typology makes it possible to compare population densities and geographic features and to assume similar situations for infrastructure and distances. Furthermore, in the data collected, we compared several socio-demographic criteria between the samples of the parks and the control group (see Article 3). To obtain the addresses of the control group, the student assistant in the project team and I asked the municipalities for a list of addresses in the random sample.

[3] Jungbluth & Meili (2017) invented this calculation for the World Wide Fund for Nature in order to offer individuals a way to calculate their carbon footprint.

In an additional step, we subjected the draft of the questionnaire to a three-step pre-test procedure. First, ten people completed the questionnaire; second, face-to-face pre-tests were carried out; and third, we addressed the questionnaire to 150 people by post in a standard pre-test process. Based on the feedback, we adjusted the questionnaire after each test.

For the actual survey, we contacted 13,313 individuals (between 3,116 and 3,400 questionnaires per park and control group) by post in the three parks and the control groups and gave the opportunity to fill in the questionnaire on paper or online using "Lime Survey" (Limesurvey GmbH 2019). In order to increase the response rate, we sent a reminder after three weeks. The response rate was 25%, resulting in a gross sample of 3,358. The paper questionnaires returned were scanned using the Remark Office software (Remark Products Group 2010) by student assistants. We then coded and cleaned the data. Afterwards, I carried out descriptive and inferential statistical processes, e.g. model estimations, factor analyses, and interaction effects (see the detailed description of the analysis in Articles 3 and 4) in the software STATA (StataCorp LLC 2019).

I reported the whole process of Study 2 and its results as a first author in an extensive internal report (see Table 1, Report 4) and specific analyses for each of the three parks in specific reports (see Figure 1, Reports 5–7). The results of my statistical analysis, based on Study 2, established the contents of Articles 3 and 4 of my thesis.

4. Overview of the Articles

The main body of this thesis consists of four articles (of which I am the first author) based on the above-described literature review and the data in Studies 1 and 2. Article 1 has been published in the journal *Sustainability* (Wiesli et al. 2021); the remaining three are in the peer-reviewed journals' review procedure. A brief overview of the four articles, the contributions of the authors in the case of co-authorships, and the articles' contents and key results are presented in the following section. An overarching interpretation and discussion of the main results follow in Section 5.

Article 1

Wiesli, Thea Xenia; Liebe, Ulf; Hammer, Thomas & Bär, Roger (2021). "Sustainable Quality of Life: A Conceptualization That Integrates the Views of Inhabitants of Swiss Rural Regions." *Sustainability* 13, 9187. https:// doi.org/10.3390/su13169187.

- TW: Research design and conceptualisation, literature review, data collection, data analysis, manuscript writing and preparation.
- UL: Supervision, writing and reviewing.
- TH: Writing and reviewing.
- RB: Reviewing, and support method design (testing questionnaire, sample and content analysis).

In this research article, we present a comprehensive concept that defines SQoL. This concept was developed on the basis of key literature and 90 interviews with Swiss rural inhabitants in Study 1. The interviews were analysed using content analysis, following Mayring's approach (2014).
The result was a multidimensional, comprehensive concept of SQoL that consists of nine components (see Table 2). Social relations, health and nature, were revealed as most important for SQoL, in the opinion of the rural inhabitants. In addition, the findings indicate that the equality and inclusion of several social groups are perceived as a challenge. Furthermore, the lack of public transport in rural areas, and thus sustainable mobility for everybody, is perceived as challenging. Decisions on and access to renewable energies for housing are perceived as reserved for homeowners and thus not equally distributed. Hence, according to the interviews, the components of *equality*, *mobility*, and *living* (see Table 2) differ from a normative definition of SQoL.

Article 2

Wiesli Thea Xenia & Hammer Thomas (2022). "How can Quality of Life be Achieved in a Sustainable Way? Perceptions of Swiss Rural Inhabitants." *Discover Sustainability* 3, 44. https://doi.org/10.1007/s43621-022-00114-6

- TW: Research design and conceptualisation, literature review, data collection, data analysis, manuscript writing and preparation.
- TH: Conceptualisation, research design and reviewing.

In this second research article, I present possibilities to enhance SQoL in the opinion of rural inhabitants. The article is based on the results of the qualitative interviews in Study 1. I categorised the opinions of the interviewees into final categories of benefits for SQoL. The results show that in the opinions of the interviewees, attitudes and values are the starting points for shaping many other areas in SQoL. Social and legal norms should provide reference points for individuals and economic actors, in their opinion; infrastructure should support individuals in their ecological behaviour, and the economy should serve the common good. To a large extent, politics, the electorate and the state are assigned joint responsibility by the interviewees. Derived from this, the article closes by recommending that decision-makers support sustainability education in schools and the extracurricular context in a targeted, group-specific manner. In addition, it recommends making renewable energies available for everyone and creating incentives for the use of sustainable mobility, promoting the cyclic economy, and involving corresponding actors in supporting SQoL through appropriate legal conditions, regulations and incentives.

Article 3

Wiesli, Thea Xenia & Przepiorka Wojtek (2023). "Does living in a protected area reduce resource use and promote life satisfaction? Survey results from and around three regional nature parks in Switzerland." *Social Indicators Research* 168, 1. https://doi.org/10.1007/s11205-023-03164-z

- TW: Research design and conceptualisation, data collection, data analysis, manuscript writing and preparation.
- WP: Support the conceptualisation of data analysis, manuscript writing and reviewing.

In this third research article, we test whether resource use and life satisfaction differ between individuals living in parks and people in comparable control groups. The results are based on Study 2 and thus on the survey of inhabitants of the three Swiss regional parks and the control group (gross sample n = 3'358). In the article, we use vignettes describing three kinds of lifestyles as a proxy for resource use. Based on ordinary least squares (OLS) regression models, including interaction terms, we find no significant difference in the relation between the resource use and life satisfaction of the inhabitants living in the three regional parks and that of the inhabitants living outside the parks. Furthermore, we test the relation between resource use and life satisfaction according to our hypothesis, suggesting that consumption plays a major role in fulfilling satisfaction and thus correlates positively with life satisfaction. Contrary to our hypothesis, we find a negative relation between resource use and life satisfaction. We conclude that it might be worth increasing individuals' QoL in order to decrease resource use.

Article 4

Thea Xenia Wiesli, Thomas Hammer & Florian Knaus (2022). "Improving quality of life for residents of biosphere reserves and nature parks: management recommendations from Switzerland" *Sustainability: Science, Practice and Policy* 18, 1. DOI: 10.1080/15487733.2022.2100128

- TW: Research design and conceptualisation, data collection, data analysis, manuscript writing and preparation.
- TH: Supervision on survey design and reviewing of the manuscript.
- FK: Writing and reviewing the manuscript.

Following the assumption that QoL could have a positive influence on resource use, the final research article of this thesis focuses on QoL and the park management's possibilities to improve the park residents' QoL. Based on Study 2, using the observations in the three parks (gross sample n = 2'409), we estimate the effects on overall satisfaction via OLS regression models to derive potentials on QoL and pool the models to compare the three parks. Further, we present the results of an index that shows the management needs for park management and the wishes of the park's population to the management in order to support QoL in a sustainable manner. The overall life satisfaction of the

inhabitants is high, on average. The key results suggest that park managers can help to increase and safeguard QoL mostly by offering activities that improve health, social relations and sustainable mobility. In conclusion, the paper proposes that park managers set new priorities on positive outputs not only on topics relating to the natural world but also on QoL. The potentials and their opportunities for enhancements indicate that the promotion of QoL and sustainability often leads to joint positive outputs.

5. Discussion and Conclusion

This thesis aimed to identify the perception of the inhabitants of Swiss rural regions on their QoL and its sustainability and to find possibilities to connect QoL with sustainability. This is the first time that a definition of SQoL was proposed as a detailed and comprehensive concept and that data on life satisfaction, sustainability indicators and opinions on the challenges and potentials of SQoL have been collected and analysed in Swiss rural areas and regional nature parks. In addition, this thesis contributes to understanding the link between resource use and QoL in wealthy societies at the individual level.

5.1 Key Insights

The results of this thesis show that QoL is high in the rural areas investigated (see Article 4), as it is for the whole of Switzerland (OECD 2020). On the other hand, this thesis also indicates challenges in terms of the ecological and social sustainability in the rural regions analysed (see Articles 1, 2 and 3). Thus, the results echo studies that, for example, indicate that resource use in the whole of Switzerland is too high (Federal Statistical Office 2019b; Global Footprint Network 2017).

However, this thesis also supports studies which claim that reducing resource use does not necessarily mitigate QoL (Ambrey and Daniels 2017; O'Neill et al. 2018; Verhofstadt et al. 2016) in the sense that the most critical components in rural inhabitants' opinion for their SQoL are non-material, such as social relations, health and nature (see Article 1); these components are not in conflict with sustainability. Moreover, another result of this thesis shows that the rural inhabitants' decreasing resource use increases their life satisfaction (see Article 3). The relation can also be interpreted as follows: decreasing life satisfaction increases the rural inhabitants' resource use.[4] In any case, these findings on the individual level indicate a negative relationship between satisfaction and resource use, in contrast to studies on the national level that claim mostly a positive relation at the country level (Fanning and O'Neill 2019; O'Neill et al. 2018). Furthermore, this rejects several sociological theories

[4] Based on the data of Study 2 and the analysis in Article 3, it cannot be stated for sure whether resource consumption influences life satisfaction or if life satisfaction influences resource consumption, or if a third variable influences both kinds of relation.

suggesting that consumption is a marker of social status (Bourdieu 1984; Veblen 1973) and thus serves satisfaction. The situation of Switzerland, with an above-average GDP (OECD 2020), may give material values a lower status as they are sufficiently available and basic needs are met. This may allow, at least in specific social groups, such as the rural ones investigated, other values to be given higher importance (Inglehart 2015). Although the cross-sectional data do not allow predictions, the findings of this thesis suggest that improvements in QoL positively influence sustainability and could be of particular sustainable value in promoting the QoL of a society. This suggestion can be supported by other studies that claim the positive effects of happiness or well-being on social sustainability or pro-ecological behaviour (Kasser 2017, 2018; Sameer et al. 2021).

Contrary to studies and the Swiss government's description of regional parks, which indicate that parks promote "well-being" (Bonet-García et al. 2015; Federal Office for the Environment 2019; Lemieux et al. 2012) and sustainable development (Federal Office for the Environment 2019), this thesis rejects a significant difference between parks and non-park regions in this regard (see article 3). Accordingly, the parks do not yet provide a significantly higher SQoL to their inhabitants. One explanation for this could be that a large part of the activities and goals of park management has so far been geared towards nature and culture protection, the sustainable economy and education for sustainable development (Federal Office for the Environment 2019). Activities that focus on components of social relations and social challenges, or leisure time offers for, e.g., young people, for integration and interculturality are little or no part of the parks' activities. This thesis shows that SQoL is multidimensional and probably needs attention on all its components and social relations and equality. Thus, further activities with a broader perspective are needed if the parks and the Swiss governments aim to promote SQoL (see Article 4).

5.2 Recommendations for Practice

A larger part of the practice recommendations to enhance SQoL in my articles concerns infrastructures (see Articles 1, 2 and 4). The lack of accessible infrastructures, such as sustainable mobility and renewable energies, is a significant challenge in European rural areas (Berg and Ihlström 2019; Bosworth et al. 2020; Clausen and Rudolph 2020) and of the Swiss rural areas investigated in this thesis (see Articles 1 and 4). Infrastructure, such as sustainable mobility and energy, concerns essential human needs and should be equally accessible to everybody (Szulecki and Overland 2020). In addition, infrastructure should support the population in pro-ecological behaviour (see Articles 1, 2 and 4). In terms of renewable energy development, local development bodies and park management should function as stakeholders, advisors and cooperators to negotiate with different stakeholders and create a link between national and local levels (Clausen and Rudolph 2020). Smart technologies and digital communications offer a range of sustainable forms of mobility suitable for rural areas (Bosworth et al. 2020) and should be promoted by park managers and local development bodies (see Article 4).

Another major part of my recommendations concerns non-formal/informal school education and lifelong learning (English and Carlsen 2019) on sustainability topics. A stronger focus on all three pillars of sustainability could increase long-term and networked thinking that enables individuals to make sustainable decisions and advocate for them politically (Rieckmann 2018). Regarding SQoL, examples include understanding global effects and interrelationships (Rieckmann 2018), global inequalities and interculturality. In addition, knowledge about different economic systems that offer alternatives to growth-oriented economics could lead to a way of thinking that focuses on the intangible values of QoL instead of growth. For example, parks and other regional management bodies could incorporate this concept of economic and social sustainability and its corresponding values, which stand for a return to immaterial values, more strongly in their education and leisure time offers (Stoll-Kleemann and O'Riordan 2017).

5.3 Remarks on Transdisciplinarity

In research on sustainability, understood as a transformative research field, cooperation with non-university research actors is of particular importance as it enables mutual learning, the alignment of interests and values, and the creation of solution options (Lang et al. 2012). Overall, my thesis can be seen as a successful transdisciplinary exchange between research and praxis (Lang et al. 2012). From the beginning, in cooperation with the three park managements, mutual interests were clarified, a communication concept was agreed upon, and relevant indicators and items for the questionnaires were collected together in workshops for the research project in which this thesis is embedded. Moreover, based on the results of this thesis, the three park managements decided to include more social aspects and the topic of QoL in their agenda and to focus their activities more on the corresponding requirements of this.

The re-integration of research results into social practice and towards the population, in the sense of successful transdisciplinary sustainability research (Flick et al. 2004; Lang et al. 2012), was followed up by publishing results and an interview with me in a local newspaper, together with the management of the Gantrisch Nature Park. The Gantrisch Nature Park will continue further articles on our results in the local newspaper. To communicate my results to the Entlebuch, the UNESCO Biosphere Entlebuch initiated an exhibition called "We Love Äntlibuech" in cooperation with us, for which we jointly developed the concepts and contents presented in the exhibition.[5]

[5] The management of the Nature Park Gantrisch presented some results of the research project at events and conveyed playfully ecological and social sustainability education. In the exhibition "We Love Äntlibuech", the UNESCO Biosphere Entlebuch communicated sustainability issues by focusing on the local quality of life and identity. To discuss and reflect on the collaboration with the park management, the communication of results to the public and the incorporation of the project results into the activities of the park management, the project leader, Thomas Hammer, and I organised workshops at conferences and invited the project partners as panellists.

5.4 Limitations

The literature-based concept of SQoL provided an adequate base for conducting the empirical studies (Opp 2005) and was validated by integrating the views of the rural inhabitants. The qualitative interviews, moreover, provided explanations and justifications for the definition of SQoL and behaviours, challenges and opinions of rural life. The cross-sectional data of the survey made it possible to analyse relations and compare different groups of rural populations. However, this thesis's method approach must be reflected in light of its limitations (see more on limitations in the discussions of Articles 1–4).

First, it is important to mention that the survey (Study 2) investigated only cross-sectional data for time and financial resources. Thus, only a snapshot of a single moment in time was observed, and the data allows no causal effects, or considerations of past or future changes in the behaviours of a population, to be identified (Gideon 2012).

Second, designing a comparable sampling of the control group around the parks was a significant challenge of the survey (study 2). It is not possible to know for sure if the municipalities of the control groups were too close to the park regions to find significant differences or if the results, on the other hand, could differ depending on a too far distance. According to Tobler's "first law of geography", geographical proximate phenomena have stronger correlations (Tobler 1970). To test this, we should have chosen the municipalities of the control groups according to several specific distances, e.g. circling the parks. Due to financial and time resources, using this kind of sampling of the control groups was not possible. It might be worth testing a method that follows Tobler's assumption in future studies to establish if different results would have been obtained.

A third limitation to mention here concerns the calculation of CO_2 emissions in the survey (Study 2). The most challenging items of the questionnaire for the participants might be those we included to calculate the CO_2 emissions (see Article 3) (Jungbluth and Meili 2017). These items ended in a much smaller number of cases than other variables. Furthermore, the item selection allowed only a calculation of part of the ecological footprint and was therefore not precisely comparable with the average Swiss CO_2 emissions.

5.5 Possible Future Research

The question of reconciling people's QoL with sustainability will continue to occupy research. For future research, I suggest the following four main points.

First, future research may benefit from longitudinal studies as this would make it possible to establish several observations on the subject SQoL over time and help observe social change, trends, and cause-and-effect relationships (Gideon 2012). In the context of SQoL, the region's resource consumption, environmental awareness and values, and infrastructures could be observed.

Second, to evaluate the population's resource use in future research, it could be helpful to use vignettes instead of the footprint calculation. As the variable of CO_2 emissions contained a high number of missing values, we used vignettes on lifestyles as indicators for resource use in Article 3.[6] This led to an interesting insight: vignettes[7] were revealed to be a valid proxy for resource use. As the vignettes are easier to understand and answer than questions relating to calculating the footprint, the answers might be even more accurate (Auspurg, Hinz, and Liebig 2009). However, it is essential to note that the vignettes would also not give a precise picture of the population's footprint and that developing new vignettes as a proxy for resource use needs to be tested in future research.

Third, future research may have the opportunity to investigate objective indicators to collect indicators that are not suitable to be measured via subjective perception. According to the concept of SQoL (see Article 1), examples of appropriate objective indicators could relate to life expectancy and the homicide rate to measure health and safety (OECD 2020), working hours to measure work–life balance (OECD 2020), election numbers (OECD 2020) to measure participation (Schlosberg 2009), and air and noise pollution to measure environmental justice (Preisendörfer 2014).

Fourth, investigating SQoL in further types of investigation areas in future research may lead to new insights. For example, urban societies in wealthy countries are of great interest to different social groups. These groups could establish insights into different values and different behaviour. This might influence the results on the definition of SQoL and its components, the challenges and potentials of SQoL and the relationship between resource use and life satisfaction. Further future research can be in countries where societies come closer to an SQoL than Switzerland – for example, Vietnam or Bhutan. In a study by O'Neill et al. (2018), Vietnam scores the best among the countries studied in terms of providing a good life within planetary boundaries. Another frequently cited example, which could be included as a future investigation area, is Bhutan, as it is the only country shoe government has a Gross National Happiness Index (Centre for Bhutan & GNH Studies 2015) and is in the research debated as an example of development beyond economic growth (Brooks 2013)

[6] The results based on the calculation of the CO_2 emissions were, however, useful for the reports to inform the park management. The calculation could, of course, still be used for further articles. Moreover, the analyses in Article 3 could have been analysed with this variable, in addition to the check, and the missing values could have been filled with multiple imputations, for example.

[7] Note the vignettes were not used as usually in a factorial analysis. The vignettes were surveyed only as three items and served as an index-variable in regressions without, e.g., randomisation being applied.

5.6 Concluding Remarks

This thesis addressed the research question of how high QoL can be promoted to be more sustainable. Based on the research done in this thesis, there are several possibilities to bring these concepts together – conceptually and in practice. It can be concluded that a change in values towards a high QoL is required, which defines QoL less in terms of material values. This thesis suggests that a shift towards values that define QoL as more intangible could be underway – at least in such social groups as in the rural areas investigated. However, for QoL to become more sustainable, authorities, politicians and local actors are needed to create the necessary infrastructure and educational opportunities. The thesis reveals the potential of regional management bodies, such as regional parks, in promoting developments towards SQoL in rural areas. These local actors can create social exchange and promote the inclusion of disadvantaged groups, contribute to the health of the population and help to develop innovative and sustainable forms of mobility and access to renewable energies. For policymakers, the development of the QoL of the population is attractive for achieving sustainable development goals. This thesis, thus, shows that not only sustainable development is essential for people's QoL: by the enhancement of QoL also, sustainable development can potentially be better achieved.

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Part II – The Articles

Article 1

sustainability

MDPI

Article

Sustainable Quality of Life: A Conceptualization That Integrates the Views of Inhabitants of Swiss Rural Regions

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Abstract: In most socioeconomically wealthy countries, a high quality of life is associated with a high consumption of natural resources. It is, therefore, essential to define what constitutes sustainable quality of life—that is, quality of life that is simultaneously high as well as ecologically and socially sustainable. This issue was addressed in a study on the promotion of sustainable quality of life in rural regions of Switzerland. We interviewed 90 people with the intention of developing a concept of sustainable quality of life. The concept that emerged from our research consists of nine components: *social relations and equality; nature and landscape; education and knowledge; participation, identification, and collective emotions; living; mobility; health and safety; leisure and recreation; and income and employment*. Each component is formulated in an integrated way, combining social, environmental, and personal aspects. The concept provides a basis for managing regional development and promoting sustainable quality of life in rural areas. In this regard, we propose starting points in the areas of social relations and equality, nature and landscape, and education and knowledge.

Keywords: quality of life; well-being; sustainability; rural regions; regional development; Switzerland; Europe

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1. Introduction

Among the countries of the Organisation for Economic Co-operation and Development (OECD), Switzerland offers above-average quality of life (QoL) [1]. However, Switzerland's high QoL comes with a high level of resource usage that contributes to global environmental problems. According to the Global Footprint Network, Switzerland's ecological footprint is more than four-and-a-half times as high as its biocapacity [2]. Many other wealthy countries exceed the planetary boundaries (downscaled to country level) by two to six times [3].

Recent studies have found that lower resource usage does not automatically reduce QoL [3–5]. In fact, Ambrey and Daniels found that a higher carbon footprint can even be associated with lower levels of well-being [6]. For example, a high carbon footprint can lead to negative emotions such as guilt, whereas a sustainable lifestyle can offset such feelings [6]. Furthermore, Verhofstadt et al. [5] found that a sustainable lifestyle can create win-win situations: for example, purchasing local food has positive effects on both health and environmental protection. These results suggest that reconciling high QoL with sustainability is not impossible.

The debate on how to reconcile high QoL with sustainable development began some time ago (e.g., with Boersema [7], Collados and Duane [8], or Levett [9]). Meanwhile, related concepts, such as well-being, have become important in inter- and transdisciplinary discussions on sustainable development [10,11]. The Sustainable Development Solutions Network and the OECD intensified the discussion on alternative measures of prosperity under the heading of well-being; they have annually published World Happiness Reports

since 2012 [12] and the Your Better Life Index since 2011 [1]. The Your Better Life Index includes the environment as one indicator.

The Human Development Index (HDI) claims to measure and compare the development of states by measuring life expectancy, gross national income per capita, and length of education [13]. However, the HDI does not include the state of the environment or other similar indicators.

Switzerland, like other European countries, began to develop its own concept [14]. Like the Your Better Life Index, the Swiss concept contains environmental criteria in the form of a separate indicator.

The term "QoL" has often been associated with concepts such as well-being, life satisfaction, or happiness. Sometimes these terms are used synonymously. Related terms are particularly widespread in inter- and transdisciplinary expert discussions, with examples including "sustainable well-being" [15–26], "sustainable happiness" [20,27,28], and "sustainability through happiness" [29]. Costanza et al. conceptually linked an index of well-being with the UN's Sustainable Development Goals (SDGs) [10], Rogers et al. related well-being to the social aspects of sustainability [30], Bakar et al. linked economic well-being to social sustainability [16], and da Silva et al. investigated empirical ecological intensity of general well-being [31]. In contrast, sustainable QoL has rarely been used as a concept. Higgins and Campanera used the term "sustainable QoL" in empirical investigations to refer to enjoying life "without compromising future generations" [20], and Kowaltowski et al. [32] investigated links between QoL and sustainability in the context of low-income housing in Brazil.

Most of the concepts described above treat the environmental dimension and/or the social dimension of sustainability in a reductionist manner, for example, in terms of environmental quality, without including issues of justice and equality. Moreover, the environmental dimension is usually treated as a separate factor. We propose to define "Sustainable Quality of Life" (SQoL) as QoL that is linked to sustainability in all its components. Based on the United Nations' definition [33], we understand intergenerational and global justice as main aspects of sustainability. While QoL is centered in the present and focuses on the individual perspective, SQoL connects the local with the global and the present with the future. Within SQoL, we understand QoL as a holistic concept that includes subjective and objective indicators and comprises sustainability as a social and ecological as well as global and intergenerational concept.

The concept presented here results from a research project (2017–2021) in which the question of what constitutes SQoL was investigated with the overarching aim of bringing together the two concepts of "quality of life" and "sustainable development" and proposing ways of promoting SQoL in rural regions in Switzerland. Rural regions are undergoing wide-ranging structural and demographic change [34], which generally includes young people's migration to cities, job scarcity, population aging [35], urban sprawl, and the fragmentation of natural habitats [36]. Furthermore, rural regions have less infrastructure than urban ones; for example, they have less public transport. This poses specific challenges to rural regions, not only in Switzerland but also in other European countries [34]. The project was designed from the outset to include the views on SQoL of people living in rural areas.

The following research question guides this paper: How can QoL and sustainable development be integrated into one concept? Our aim was to provide a concept that enables regional management bodies of rural regions to promote high QoL and sustainable development at the same time. To develop this concept, we addressed the following sub-questions:

- What are the essential components of SQoL in the view of inhabitants of Swiss rural regions?
- How do inhabitants' perspectives on SQoL differ from perspectives discussed in research literature?
- What concept of SQoL results when inhabitants' perspectives are linked with perspectives compiled from the literature?

In Section 2 (Materials and Methods), we first introduce components of SQoL derived from selected key literature, which we prepared as a theoretical background for the qualitative survey. We then describe the methodological design of the survey and 90 interviews. Section 3 (Results) presents the participants' views on what constitutes SQoL (Section 3.1), the discrepancies between their views and the preliminary components derived from the literature (Section 3.2), and the concept developed by combining participants' views with the theoretically based components (Section 3.3). In Section 4 (Discussion), we discuss the most important findings. In Section 5 (Conclusion), we propose starting points for managing regional development in a way that promotes SQoL.

2. Materials and Methods

Our investigation of how inhabitants of Swiss rural regions conceive of SQoL was based on a qualitative approach [37,38]. We developed a preliminary set of components of SQoL based on key literature (Section 2.1), a guiding questionnaire (Section 2.3), and conducted interviews in four Swiss rural regions based on a theoretical sampling strategy (Section 2.2). Finally, the interviews were transcribed and evaluated using content analysis (Section 2.4).

2.1. Preliminary Definition of Sustainable Quality of Life (SQoL)

In preparation for the qualitative survey, we developed a preliminary definition of SQoL and its essential components based on key literature. This included philosophical concepts and empirical research underpinning the indicator systems mentioned in Section 1 [1,14]; along with seminal works on (environmental) justice [39,40], as well as "quality of life" [41] and related concepts, such as "life satisfaction" [42] and "happiness" [43,44]; and well-known sources used in development studies and sustainability science, such as reports published by the United Nations and secondary literature [33,45–47]. A complete list of the literature included can be found in Supplementary Information 1.

We began by defining QoL. In doing so, we excluded concepts that refer to snapshots of life (e.g., "bliss"), as our work focuses on long-term states. The term "good life" is often used in the context of German-language sustainability transformation research (e.g., Schneidewind [48]). The terms "satisfaction" and "happiness" are used often in economics (e.g., Frey and Stutzer [42], Layard [43]), and the term "eudaimonia" is employed in philosophy (e.g., Bentham and Mill [49]) and psychology (e.g., Waterman [50]). In German-language indicator systems, such as that of the Swiss Federal Statistical Office [14], the terms "welfare", "prosperity", and "well-being" are often used. "Welfare" or "prosperity" often refer to material wealth [51]. "Well-being" often describes concepts related to mental and physical health (e.g., Diener [52]). In contrast, "quality of life" mostly refers to a holistic concept with several dimensions (e.g., "The Quality of Life" by Nussbaum and Sen [41]). For this reason, we chose QoL as the underlying concept for our approach. "Objective data", such as life expectancy or income, make it possible to assess the external conditions in which a population lives, and to compare these among different populations [15]. "Subjective data" based on people's self-assessment of their satisfaction make it possible to integrate their perspectives and emotions. Following Costanza et al., we define QoL as consisting of both subjective and objective aspects [15].

The definition of "sustainability" that we chose is based on the UN's "Brundtland definition" and their 2030 Agenda with its SDGs. Accordingly, "sustainability" in our preliminary definition of SQoL means that all people should be able to live a good life, both now and in the future [45–47]. Due to this distribution-oriented, global, and intergenerational understanding of sustainability, we consider justice to be an essential link between QoL and sustainability, and thus a condition for SQoL. A sustainability concept consisting exclusively of the three-pillar model—with the pillars representing the social, economic, and environmental dimensions of sustainability [53]—offers little differentiation and is strongly reduced in complexity. The so-called "Brundtland definition" goes further by including global and intergenerational justice; it defines sustainability as including judicious use of resources, protection of nature, the satisfaction of basic needs, and poverty

eradication [47]. The 2030 Agenda and its SDGs extend the focus from developing countries to include industrialized countries as well, and the 169 targets connect ecology and economics to disparity and human rights [33]. We refer to this most recent UN understanding of intra- and intergenerational sustainability, as it lays the foundations for placing a collective, distribution-oriented claim on high QoL.

To address ecologically and socially problematic areas of life that commonly contribute to the QoL of individuals, we selected literature with a focus on individuals' ecological footprint, as well as on environmental and social justice [39,40,54,55]. We chose Rawls's theory—(one of) the most influential theories of justice published in the 20th century that has also been critically discussed—to define justice for SQoL. Approaches such as liberalism (e.g., Hayek [56], Nozick [57]), which focus on maximum individual freedom, seemed less appropriate in the context of an intergenerational and global understanding of sustainability. On the other hand, utilitarian approaches (e.g., Mill [58], Bentham [49]), in which justice is sought through the greatest benefit for all and the maximization of happiness, seemed too generalized for our purpose. Rawls's theory is convincing because it does not reduce justice to universalistic claims or an aggregation of utility. His theory offers an in-depth understanding of the spatial and temporal dimensions of sustainability that is highly useful in defining SQoL, and makes it possible to combine the particular (individual claims) with the universal (pluralistic claims). Firstly, it states that one generation's behavior should not diminish another generation's options [39]. Therefore, any orientation towards the greatest benefit for a society should include future generations [39]. Secondly, Rawls's definition of justice includes the inherent principle of difference. This principle states that people start from different, more or less advantageous positions. Justice, in this context, means arranging social and economic inequalities in a way that they are "to the greatest benefit of the least advantaged" [39]. This focus on the least advantaged members of society can imply an unequal distribution of resources if legitimate [45].

The selected literature suggests that SQoL consists of several components. We compiled these by combining elements of QoL and sustainability derived from the selected literature. We purposely formulated the components in an integrated way, with sustainability forming an integral part of all components rather than a separate dimension. An overview of the components, including a description and justification of targets, and the respective literature sources is provided in Supplementary Information 1.

The first component we defined was *social relations and equality*, drawing on Schlosberg [40] and Nussbaum [59], among others. In addition to the definition of justice based on Rawls, we derived equality from the principle of difference described above and from Schlosberg's concept of recognition [40]. According to Schlosberg, the recognition of other groups and different concerns is essential in designing consensual sustainable development strategies and in achieving distributive justice [40]. The partial component of *social relations* mainly refers to Nussbaum's "list of capabilities" [59]. The ability to bond with people, form friendships, and engage in social interactions are integral elements of Nussbaum's list of capabilities, and thus of QoL [59]. Derived from these key sources, the component *social relations and equality* comprises the target of freedom and equal opportunities for social relations, recognition, and no discrimination within SQoL.

Based on Schlosberg's definition of justice [40] and on Nussbaum's list of capabilities [59], we included *participation and identification* as a second component of SQoL. The criterion of participation is in line with Schlosberg's definition of "environmental justice" [40]. Based on the capability approach of Sen and Nussbaum, Schlosberg shows that environmental justice is not only concerned with the distribution of resources, but also with the ability to use and apply them [40]. Furthermore, the capability approach implies that opportunities and self-determination are important preconditions for a successful life [59]. A successful life includes the freedom of action and decision needed to shape one's life independently [59]. Drawing on Fraser and Young's concepts of justice, Schlosberg argues that "procedural justice" should ensure that all individuals can participate in political and economic processes [40]. The partial component of *identity* in our definition of SQoL is in

line with Nurse, among others, who argues that cultural identity is an essential element of sustainable development because identities shape systems of meaning and views of the environment and development [60]. In summary, *participation and identification* as a component of our definition of SQoL is achieved if the individual enjoys freedom of choice, has the right to have a say, participates effectively in social processes, and identifies with their social environment and home area.

Drawing on Nussbaum's arguments, we added *nature and landscape* as a third component of SQoL. Nussbaum's list of capabilities [40] contains affection for nature and other species. Referring to this capability, Schlosberg argues for an understanding of justice that is not purely anthropocentric but extends to other species, such as animals [40]. Likewise, we considered what Nussbaum describes as "being able to have attachment to things and people outside ourselves" [59] to be an obvious prerequisite for sustainable development. It is an important way of regarding nature and its resources, and it is required in order for an individual to be able to distribute them fairly. Research shows that nature and landscape are essential to mental and physical health. They are important for identity creation, positive emotions, and awareness of sustainable development [61–67]. Accordingly, the component of *nature and landscape* added to SQoL the target of a high quality of nature and landscapes for all present and future generations.

Further, we included *education and knowledge* as well as *health and safety* as fourth and fifth components of SQoL. They are likewise derived from Nussbaum's list of capabilities [59]. According to Sen's and Nussbaum's capability approach, good education and knowledge are essential for an individual—for their development, for shaping their own life, and for participating in social life [59,68]. The target for this component within SQoL is a good education and knowledge on general and specific topics as well as on sustainability. This comprises the ability to absorb and process information, think critically, and use personal knowledge.

Another capability in Nussbaum's list is bodily integrity, which enables the physical and mental constitution necessary to have a successful life [59]. The target for the component *health and safety* in our preliminary definition of SQoL is thus a long and healthy life without fear and without the danger of conflicts or negative environmental and climatic influences.

Leisure and recreation as well *as income and employment* were added as the sixth and seventh components of SQoL. These components, or parts thereof, are included in many indicator systems [1,14,33] and in the above-mentioned empirical studies of satisfaction [42–44]. For example, the "Your Better Life Index" of the OECD and the "Well-being indicators" of Switzerland's Federal Statistical Office, among others, contain the indicator "work-life balance" [1,14]. "Work-life balance" in the "Your Better Life Index" is justified by the importance of general well-being, family life, and the possibility to reconcile professional and private commitments [1]. The Federal Statistical Office also justifies the inclusion of work-life balance with gender equality, since it should increase women's career opportunities [14]. We included work-life balance in SQoL as part of the component *income and employment*. This component included the target of employment that is freely chosen, meaningful, and provides sufficient income and a good work-life balance within the framework of a resource-efficient and environmentally friendly economy [33].

The fact that leisure activities are needed for expression and social life [59] justifies the component *leisure and recreation*. Furthermore, according to Kurt and Wagner [69], culture as part of sustainable development enables dialogue among diverse individuals and groups, as well as openness, creativity, and changeability of areas such as economy and ecology. We defined the target of this component as including leisure activities, recreation, and cultural activities that are as environmentally friendly as possible and compatible with the conservation of renewable natural resources.

The eighth component we included in SQoL is *living*. According to Preisendörfer [55] or the Federal Statistical Office [14], among others, we defined living conditions appropriate to the individual situation and free of environmental pollution as essential to well-being

and sustainability. Accordingly, the target of the component *living* is to have appropriate, environmentally friendly, and resource-efficient living conditions.

Finally, we included *mobility* as the ninth component of SQoL. Based on the Federal Statistical Office's [14] and Nussbaums' arguments [59], we consider *mobility* to be fundamental for the supply of goods and services and for the resulting individual freedom as a capability [14,59]. Based on Meschik and Meth's [70] work on pro-environmental mobility behavior and the Federal Statistical Office's indicator system [14], we defined the target of the component *mobility* as resource-efficient and accessible mobility for everyone.

According to the Global Footprint Network's national footprint calculations, mobility, energy, and agriculture have the greatest impact on the national footprint in most countries [54]. We included energy in SQoL mainly in the *mobility* and *living* components; agriculture is included via nutrition in the *health and safety* component. *Mobility* and energy may also be included indirectly in other components of SQoL. For example, mobility might be necessary to visit friends and family (*social relations and equity* component) or to reach the workplace (*income and employment*).

Overall, this preliminary definition of SQoL consists of nine components that are referred to by different terms in the literature. Compared with other concepts discussed in the literature that focus on QoL or environmental aspects, our preliminary definition of SQoL links QoL and sustainability within each component.

2.2. Study Areas and Sampling

We decided to conduct interviews in four regions in order to cover a variety of rural regions. Since we intended to include representative and comparable municipalities in the four areas, we selected them accordingly based on the typology of municipalities published by the Swiss Federal Statistical Office [71]. All four regions are relatively densely populated compared to the alpine regions; for example, the Aargauer Jura has 168 inhabitants per square kilometer. This makes them typical of a large part of Switzerland [14].

To ensure that our survey would include a diversity of perspectives within each region, we planned to conduct at least 20 interviews per region. In total, we conducted 90 interviews in the four regions, namely 22 interviews each in the Freiamt and Entlebuch regions and 23 interviews each in the Gantrisch and Aargauer Jura regions. Our sampling strategy followed the theoretical sampling method of Glaser and Strauss [72]. This allowed us to adjust the sampling to the sociodemographic situation of the villages and to include participants with diverse backgrounds. We explicitly avoided snowball sampling in order to minimize sociodemographic biases. Participants were recruited in public places, in consideration of the sampling targets. This approach resulted in the sample presented in Table 1. The 90 interviews provided sufficient material and qualitative insights alongside satisfactory variance across sociodemographic groups. Although we did not aim for a representative quantitative study, this sample of 90 participants is large enough to cover the views of a wide variety of groups among the rural population.

Table 1. Sample of interview participants.

Sociodemographic Factors	*n*	%
Sex		
Male	44	48.8
Female	46	51.1
Total	**90**	
Occupation		
Forestry/agriculture	13	14.4
Trade/industry	9	10.0
Services	36	40.0
Undergoing education	15	16.6
Unemployed	1	1.1
Retired	16	17.7
Total	**90**	
Education		
Lower secondary education	11	12.2
Upper secondary education	61	67.7
Tertiary degree	18	20.0
Total	**90**	
Age		
16–29 years	26	28.8
30–59 years	38	42.2
≥60 years	26	28.8
Total	**90**	

N = 90.

2.3. Qualitative Interviews

We used a semi-structured interview guide based on the components of SQoL introduced in Section 2.1. The guide was ordered flexibly and followed the conversational flow (see guide in Supplementary Information 2). Before conducting the interviews, we tested and refined the questionnaire in several iterations. Then, the first author and an assistant conducted the interviews. Both interviewers carefully avoided suggestive questions and elicited opinions, feelings, or justifications in an open way by asking, for example, "Why do you think so?" or "How do you feel about this?". The interviews took 50 min on average.

The first part of the interview included open questions about what SQoL is in the participant's view, and what concrete components constitute SQoL. Thereafter, the interviewers asked the participants about their opinions on the components derived from the literature.

The second part of the interview focused on the idea of linking QoL with sustainability, and on the feasibility of doing this. The interviewers explained our definition of sustainability and asked the participants for their general opinion on sustainability and on the link to QoL. The participants were then asked about their opinion on our preliminary set of components of SQoL—this time with our definition of sustainability (described in Section 2.1) in mind. This procedure made it possible to approach the topic of sustainability openly in the first part of each interview, and in the context of the UN's understanding of sustainability in the second part.

2.4. Transcription and Content Analysis

The interviews were transcribed verbatim in Swiss German using the content analysis method described by Breuer et al. [73] and Dresing and Pehl [74] (see transcription guide in Supplementary Information 3). Text passages that deviated greatly from the subject of the research question were only summarized [73].

The subsequent content analysis allowed us to organize the transcribed data and its content systematically. We followed the method proposed by Mayring [75] and used MAXQDA, a software for computer-assisted qualitative data and text analysis.

First, we formulated deductive categories based on the components of SQoL as described in Section 2.1. Subsequently, the first author and the assistant began coding (see guide for content analysis in Supplementary Information 4). After coding the interviews using the deductive categories, they recoded them in an iterative process, formulating new inductive categories and subcodes based on the context of the interviews (see codebook in Supplementary Information 5). A precise description of the coding rules, anchor examples, and justifications were added in a code memo for each newly created code to create a mutual understanding of how the code should be employed (see code memos in Supplementary Information 5). The first interviews were coded by both researchers, and whenever they disagreed, the interviews and codes were discussed in detail to achieve consensus. The first five documents coded in this way showed that the researchers had a very similar coding style. They then no longer coded the same interviews in parallel, but still frequently consulted each other. Once the first 40% of the interviews had been coded, the content no longer required any new codes. While coding, the two coders routinely recorded their thoughts and initial interpretations in text memos. Once all interviews had been coded, certain codes that might have been used discontinuously were checked again and recoded as needed. Finally, the researchers read over each other's coded data and supplemented the coding whenever necessary.

For the final interpretation, the subcodes were regrouped into broader categories where appropriate, and were compared to the components of our preliminary definition of SQoL. Finally, we merged the empirical results with the preliminary definition by adding to the latter the subcomponents and respective justifications emerging from the interviews. This resulted in our final concept of SQoL.

3. Results

In Section 3.1, we present the interview participants' views of SQoL and its components. In Section 3.2, we describe the main discrepancies between the interview participants' views and our preliminary definition. Finally, in Section 3.3, we present the SQoL concept that results from merging the empirical results with the preliminary definition.

3.1. The Interview Participants' Views on SQoL

Across all interviews, about two thirds of the respondents said spontaneously that family, friends, and the natural environment surrounding them were most important to them. These statements concern the two components *social relationships (and equality)* and *nature and landscape.* For example, one respondent stated:

> *"Family, my parents, my siblings—if there is anything you need help with, you know where you can go. This is probably a basic trust, and it is clearly quality of life for me. That I somehow know that this will always be dependable. And then to be here in nature also provides a quality of life that might be a little less available in the city and which is certainly one reason why we are here."* (IP 44, female, 30–59 years, services, completed upper secondary education)

The participants stated that relationships with family and friends give them a sense of consistency. In addition, around one third of the participants mentioned loyalty within the village neighborhood as being important to them. We included this as a further part of the *social relations and equality* component. Across all respondents, the interviews confirm the basic human need for social relations.

The importance of nature and landscape was revealed to be associated with social relationships. *Nature and landscape* were often described as locations for sports like hiking, cycling, and skiing, and as a place to visit with family and friends. The participants thus described *social relationships* as part of their *leisure and recreation*. In addition, *leisure and recreation* was described as an enabling factor in forming relationships. In addition, participants mentioned proximity to nature as a criterion for choosing their place of residence.

The remaining (sub)components that we had prepared for the interviews were mentioned far less frequently by the interview participants. However, when the researchers asked about them, most participants agreed to counting these components as part of SQoL.

The following example illustrates how certain components—in this case *safety* (as part of *health and safety*)—were considered important, but were usually not present in the participants' minds because they more or less take them for granted:

> *"Safety is certainly very important for life. But it is a bit more abstract in Switzerland, because the issue isn't pressing, at least not for me. At least not concerning physical, legal, or financial safety, or that I will find a job later. In these regards, I feel safe. But it is important."* (IP 94, male, 16–29 years, agriculture, tertiary degree)

A good state of *health* was considered to be a fundamental basis for QoL. People in the age groups above 30 described health as something transient that should be valued. Some participants explained that the health component was only considered important when an illness occurred. As one respondent stated:

> *"Health is very valuable, but you wouldn't think of it as long you are healthy. Only if you or somebody else in your family is ill, do you become aware of it. But we should appreciate it more when we are healthy."* (IP 71, male, over 60 years, retired, completed secondary school)

In addition, participants also mentioned regionally sourced food as a benefit of rural life. The possibility of buying directly from farmers is seen as sustainable and as an indicator of QoL.

The *living* component was mostly associated with the possibility of having one's own garden, and with the landscape and nature in the surrounding area. Both were often described as important criteria for living in rural areas. It can be assumed that this requires an unspoiled environment. Another criterion that influenced many participants' decision to move to a village was the possibility of buying their own home. Some owners of a house mentioned having photovoltaic cells.

Although participants rarely addressed the *participation (and identification)* component on their own, they strongly agreed when asked whether this was part of SQoL. Many of them explained that direct democracy with votes on substantive issues is important, even if they do not always make use of their right to vote. At work, they consider it important to contribute their ideas and opinions. Participants in the young age group (16–29 years) often mentioned that they lack this opportunity. Participants also considered participation important in the context of being able to make independent decisions within a partnership. These considerations are in line with the description in our preliminary definition. One respondent stated:

> *"Very important, I indeed have something to say (laughs). And it is also important to me that we move ahead together, be it because you are in an association, I am in the women's sports club, and there, too, I think it is important that one is asked or that one can contribute ideas. And particularly in our business, of course, which my husband and I lead and direct together."* (IP 08, 30–59 years, female, agriculture, completed upper secondary education)

Self-determination, as part of the component *participation and identification*, was also stressed as being very important by participants when asked. The term was used in relation to several areas of life, and self-determination was considered particularly important with regard to work, hobbies, family life, and one's role as a woman. The young age group (16–29 years) often raised the subject on their own initiative and emphasized their desire for independence from authorities. As one respondent stated:

> *"I would not want to live in a place where others would decide for me. I think this would reduce the quality of life for me personally and certainly also for many others. At work there is of course a certain reality that you can't determine everything yourself, and that's okay. But*

> *even there, simply to choose a job and not be forced to do one, this means a lot."* (IP 82, male, 16–29 years, undergoing education, completed upper secondary education)

When asked, the participants agreed that they could clearly identify with their home area, and they mentioned this as important for a good life. Another 13 participants said of themselves that their sense of *(participation and) identification* was based more on their social relationships than their area. Another five participants identified strongly with the surrounding nature and landscape. One respondent said:

> *"But being rooted in the village... Rather in the surroundings, in nature here. I regularly go running, you can put on your shoes and go running across the fen. That's what I mean."* (IP 23, female, 30–59 years, services, tertiary degree)

When questioned on the *education and knowledge* component, participants agreed that education and knowledge is important. Some stated that education on the environment and sustainability should also include ecological behavior in everyday life. These participants described everyday situations in which they sometimes did not know for sure which behavior would be less resource-intensive.

The *income and employment* component was confirmed to be important when we asked participants about it. Participants who had chosen a reduced workload said it was significant for QoL and the associated reduction in income and consumption was not very relevant to them. As one respondent stated:

> *"I don't think I could ever work 100 percent. [...] We've reached a point in Switzerland where many people no longer have to work to survive, and I think it's a pity if we don't make use of this privilege to do what we want or find another purpose in life than getting a lot of money and a house."* (IP 94, male, 16–29 years, agriculture, tertiary degree)

Participants' opinions about work-life balance and meaningful *employment* are consistent with the literature. Moreover, *income* was indeed referred to as a relatively important component of SQoL. However, the participants often compared *income* to components like *health*, which they considered to be more important for QoL.

The interview participants also mentioned elements that we had not included in our preliminary definition of SQoL. Nine participants mentioned emotions, such as calmness as a common mood, or familiarity as a typical characteristic of rural life and a very important part of SQoL in their view. According to the descriptions in the interviews, such emotions form in a collective, arise from shared attitudes, can result in trust and freedom, and represent the mood of an entire society. The participants often contrasted the common calmness with city life, which they perceive as hectic and characterized by pressure to perform. One respondent stated:

> *"I don't know whether I could live in the city, because I'm not used to it. And I think it's quite nice actually, just quiet, coming home, no stress and no hectic."* (IP 90, female, 16–29 years, undergoing education, completed upper secondary education)

Twenty-three participants mentioned membership in associations as an essential part of their QoL. Being a member of an association or club is particularly relevant with regard to social relationships, loyalty, communication, and networking. Moreover, it can facilitate the integration of newly arrived inhabitants.

As many as 36 participants mentioned the importance of efficient and frequent access to cities by public transport. Many of them justified the importance attached to ease of *mobility* with reference to reaching a meaningful workplace or a wider choice of cultural and leisure activities. Furthermore, participants often explained that they had chosen their place of residence based on the train connections to larger cities.

Based on these findings, it can be stated that the interview participants considered all nine components in our preliminary definition to be essential for SQoL. Moreover, they did not mention any completely new components in addition to the ones we had included in the preliminary definition. (We cannot fully rule out the possibility that respondents might have agreed with further components if they had been mentioned by

the interviewers.) However, within the nine components in our preliminary definition, the interviews revealed new and important justifications and aspects: (1) the feeling of calmness, (2) membership in associations, and (3) access to cities. Furthermore, the interview results indicate interrelations between the different components. In particular, *nature and landscape* is connected to *health and safety*; to *social relationships and equality*; to *living*; and to *leisure and recreation*.

3.2. Discrepancies between Inhabitants' and Theoretical Perspectives on SQoL

Comparison of the empirically collected views with our preliminary definition (see Section 2.1) reveals a number of discrepancies between the two. Overall, most interview participants considered QoL that is both high and sustainable—as described in our preliminary definition of SQoL—to be difficult to achieve and unrealistic. While participants regarded their QoL as very high, they perceived sustainability as an acute challenge. As one respondent put it:

> *"We no longer need to improve our quality of life. Of course, we have to look after the environment. See that people have good cars, that they cycle more, or travel by train. I think such things are okay. But quality of life, that we should be even better off—we are far too well off as it is."* (IP 73, male, 30–59 years, services, tertiary degree)

Of all the components, *equality* (as part of *social relations and equality*) proved to show the greatest discrepancies between the participants' descriptions and our description based on the literature. Firstly, when asked, participants described gender equality as being highly desirable, but not fully achieved at present. Thirteen participants—more women than men—clearly agreed that gender equality is important, and showed a critical attitude. As one participant stated:

> *Somehow gender equality hasn't arrived here yet. We're a bit slower here.* (IP 04, female, 16–29, undergoing education, completed upper secondary education)

A few young male participants described the topic as obsolete, whereas people in the medium and older age groups said that gender equality remained insufficient. Their criticisms related to lower incomes and fewer opportunities for women in professional life and politics.

Secondly, some participants (n = 3) criticized the low acceptance of homosexuality. They also disapproved of the legal complexity of same-sex parenthood.

Thirdly, 29 participants clearly agreed that the topic of accessibility to people with disabilities was important to them. Other participants did not see this as a priority because it affects only a minority. Some participants criticized the fact that there was still a lack of barrier-free apartments for rent, or they mentioned examples of insufficient accessibility experienced in civic engagement.

Fourthly, equality among people of different nationalities seems to be less socially desirable for participants. They do not necessarily see such equality as unconditional or self-evident. Most participants associated equality among people of different nationalities with migration. As many as 27 participants clearly disagreed with equality between natives and different immigrant groups in Switzerland. Of these participants, 12 expressed a nationalistic attitude, and the well-being of Swiss people was clearly the foremost priority in their minds. Some of them described their fears of migrants or expressed their disparagement of other ethnic groups. One respondent stated:

> *"Basically, I think that we need to look after Swiss people first. And if things go well for us here, you can still look after those from abroad, because that's exactly what I think the idea of the nation state is [...]. Refugee policy should also be approached more restrictively [...]."* (IP 15, male, 16–29 years, undergoing education, completed upper secondary education)

Meanwhile, another group—13 of the 90 participants—replied that they do not perceive equality between people of different nationalities, and that the villagers are not open to newcomers.

A certain discrepancy between the descriptions of the participants and our preliminary definition of SQoL also emerged in the *mobility* component. The majority of participants (n = 79) agreed that *mobility*—and in particular sustainable mobility—is important. Public transport in general was described as an environmental benefit and as beneficial for elderly people as well as for everybody without a driving license. The participants emphasized the high quality of train transport in Switzerland. Nevertheless, most of them said that they themselves drive a car, and the car was the most important means of mobility in their area. Accordingly, participants' perceptions and their main mobility settings were not in line with the idea of sustainable *mobility*.

A discrepancy also emerged with regard to renewable energies within the component *living*: Tenants complained that they cannot choose renewable energy in the municipality they live. As one interview participant stated:

> *My neighbor installed these photovoltaic panels on his roof. But that's no use to me and I'm not allowed to do that because I don't own the house.* (IP 11, female, 30–59 years, housewife, completed compulsory school)

In summary, participants' descriptions of the current situation related to equality, *mobility*, and *living* differ to some degree from the theoretical views compiled in our preliminary definition of SQoL. This points to challenges in the investigated rural regions. Furthermore, some interview participants' perceptions of *equality* are not in line with the theory underpinning our preliminary definition of SQoL, which can be viewed as another challenge facing the investigated rural regions.

3.3. An Integrated Concept of SQoL

This subsection presents our concept of SQoL that resulted from merging our empirical results with the preliminary definition. Table 2 lists the components of SQoL, ordered by the number of participants that regarded them as clearly important.

Four additional sub- and partial components are added to our preliminary set of components: *collective emotions*, *membership in associations*, *part-time employment*, and *access to cities*. According to participants, mobility is fundamental for accessing employment, education, and cultural activities. We therefore integrated sustainable access to cities as part of the target and justification of the component *mobility* (see Table 2).

We named the emotions of calmness and familiarity "collective emotions" and added this as a partial component to *participation and identification*. According to the interviews, these emotions are related to, or partly dependent on, participation and identification. For example, several interview participants mentioned membership in associations as enabling social and intercultural participation. Therefore, we integrated this as a justification of the component *participation, identification, and collective emotions.*

Table 2. Components of Sustainable Quality of Life (SQoL). Justifications and targets emerging from the interviews are set in bold script.

Component	Target	Justification
Social relations and equality	The greatest possible freedom and equal opportunities. Intra- and intergenerational justice. Opportunities for social relations. No discrimination based on gender, ethnicity, religion, species, or other affiliation. Recognition of potentially excluded groups as a basis for (environmental) justice.	Justice and recognition are fundamental to living a self-determined life with equal opportunities, in freedom, without environmental pressures, and with sufficient resources. Living in a society, having relationships, and thus feeling empathy for other people and other living beings satisfies the human need for closeness and enables joint development.
Nature and landscape	High quality of nature and landscapes for all present and future generations.	High-quality nature and landscapes stimulate positive emotions and have a positive influence on physical and mental health. Nature and landscape enable recreation and community experiences outdoors.
Education and knowledge	A good general and specific education and knowledge. Education on the environment and sustainability. The ability to absorb and process information, think critically, and use one's personal knowledge.	A good education and knowledge is essential to individual development, to shaping one's own life, and to participating in social life. Education on the environment and sustainability enables people to increase sustainability in their own lives and to contribute to development.
Living	Appropriate, environmentally friendly, and resource-efficient living conditions that are not impaired by environmental pollution.	Living conditions appropriate to the individual situation that are not impaired by environmental pollution are essential to well-being. To reduce environmental pollution, it is important that living should be as environmentally friendly and resource-efficient as possible for everyone.
Participation, identification, and **collective emotions**	Freedom of choice, the right to have a say, and effective participation in social processes. Identification with one's social environment and home area **and a positive collective mood.**	Participation and freedom of choice are important for self-determination and the control over one's personal well-being. Identification promotes participation in social processes and reduces the likelihood of conflict. **Positive collective emotions are essential for mental well-being as well as for trust and freedom in a society. Membership in associations enables social and intercultural networking and integration**.
Mobility	Environmentally friendly and resource-efficient mobility for everyone, **including efficient and frequent access to cities.**	Mobility is fundamental for the supply of goods and services, **for accessing appropriate employment and education, for cultural activities**, for individual freedom, and for the maintenance of social relationships.
Health and safety	A long and healthy life without fear and without the danger of conflicts or negative environmental and climatic influences. **Availability to all individuals of fresh and locally produced food, without overuse of resources**.	A good physical and mental individual constitution, safety, and an intact environment are essential conditions for a successful life. **Fresh food is essential for health and enjoyment. Local, ecological production and moderate consumption enable a fair distribution of food while keeping nature intact.**
Leisure and recreation	Leisure activities, recreation, and cultural activities that are as environmentally friendly as possible and compatible with the conservation of renewable natural resources.	Leisure activities, recreation, and cultural activities satisfy the need for expression, social life, entertainment, and education. Culture and art offer opportunities for sharing, creativity, and an understanding of common values that can promote sustainable development.
Income and employment	Employment within a resource-efficient and environmentally friendly economy. Employment that is freely chosen, meaningful, and provides sufficient income, a good work-life balance, and **the option of working part-time.**	Sufficient income and meaningful work are essential for a successful life. **Sufficient time, and hence part-time employment, can benefit the environment and increases personal satisfaction**. To counteract scarcity of natural resources and existing environmental and social problems, it is important that income and work are generated within a resource-efficient and environmentally friendly economy that ensures fair distribution.

According to the participants, working part-time can benefit the environment while increasing personal satisfaction. Consequently, we included participants' arguments for an appropriate workload under *income and employment*.

Finally, the participants considered locally and ecologically produced food to be important for their health. Accordingly, we included sustainable and healthy food in the target and justification of the health and safety component.

The concept proposed in Table 2 contains nine components that all constitute SQoL in the view of the interview participants. Furthermore, in addition to the justifications and targets compiled from the literature, it includes additional targets mentioned by the interview participants.

4. Discussion

This study resulted in a concept of SQoL consisting of nine components with specific targets and justifications: *social relations and equality; nature and landscape; education and knowledge; participation, identification, and collective emotions; living; mobility; health and safety; leisure and recreation; and income and employment*. Our results showed that developing a concept of SQoL requires a comprehensive, broader approach than similar concepts that focus more narrowly on aspects like basic needs (e.g., Kowaltowski et al. [32]), health-related well-being (e.g., Abraham et al. [61]), or climate or carbon emission indicators (e.g Verhofstadt et al. [5]). SQoL integrates social and ecological sustainability in all its components. This sets it apart from concepts that treat ecological factors as a separate dimension (e.g., Federal Statistical Office [17] and others [1,3,25,76])

The interviews revealed important justifications and relationships between components of SQoL: *social relations* and *nature and landscape* emerged as the components that interview participants considered most important, and connections were frequently established between them. *Income and employment* as well as *education and knowledge* were perceived as enabling other components of SQoL, such as *leisure and recreation* or *living*.

Social relationships and equality as well as *nature and landscape*, in contrast, seem to be experienced as beneficial in themselves. The views of the interview participants on *nature and landscape* underline arguments in the literature: *nature and landscape* enable recreation and community experiences outdoors and, therefore, have a positive effect on mental and physical health [61,77,78]. The discussion on "place attachment" in literature also links *nature and landscape* with *identity*, for instance based on its function of mental stabilization [64]. According to Nussbaum, landscapes can evoke feelings of identification, and social relations can generate empathy for a region [79].

The *collective emotions* and the importance of being a member of associations revealed in the interviews provide further related insights on SQoL. According to Nussbaums' theory in "Political Emotions", emotions are a prerequisite for a successful life and are rational and essential parameters for decisions [79]. Loyalty, as well as shared positive emotions, are therefore important for politics and society in that they make it possible to achieve common goals [79]. In the present context, sustainable development represents such a goal. Furthermore, collective action can, according to Ostrom, overcome the central problem of commons overuse ("the tragedy of the commons" [80]) by enabling joint organization and coordination of resource use. Collective emotions and membership in associations as part of SQoL can thus be interpreted as levers for establishing common governance of resource use in a sense similar to Ostroms' "governing the commons" [80].

The mention of part-time employment by the interview participants revealed another important perspective on SQoL. Some of the respondents seemed to prefer more time to higher income. Accordingly, consumption seems less important to these individuals than leisure time. Based on this, we see part-time employment not only as beneficial to individuals' QoL but also as likely to benefit the environment. Empirical studies confirm that in many high-income OECD countries, working hours and the associated consumption have an impact on the per capita ecological footprint [81].

However, our study also showed that a considerable proportion of people in the investigated rural regions in Switzerland identify the overall idea of linking QoL with sustainability as a major challenge. This confirms findings from the literature: while QoL goals have already been achieved in Switzerland [1,3], the integration of sustainability remains problematic [82,83]. Furthermore, the results show that topics concerning *equality* are challenging. Another major challenge is *mobility*; this, too, has been shown in previous studies on mobility in rural regions [84].

An important question is how representative the results of this study are. The transferability of our results to urban areas is likely to be limited, as the importance of some components of SQoL might differ between contexts. Concepts such as QoL and well-being are typically seen as context-specific [30]. Sociodemographic characteristics, the natural environment, and infrastructure might influence people's perceptions of SQoL. For example, the need for travelling by car is smaller in most cities than in rural areas [85]. This may shape opinions on mobility. Above all, nature and landscape, identification (with one's home area), collective emotions, and membership in associations may have a different meaning for villagers than for city dwellers. In cities, social proximity, which our interviewed inhabitants of rural regions view as positive, might also be perceived as social control. Developing a concept of SQoL in urban areas could thus be an interesting field for further investigations.

Since our sample included four rural regions that each included several types of municipalities and diverse sociodemographic groups, it can be assumed that the results of our study can be transferred to other rural regions in Switzerland and to comparable rural regions in other wealthy countries.

5. Conclusions

Based on our results, we would like to conclude this paper by proposing five starting points for regional development management bodies, such as governmental and non-governmental organizations, to promote SQoL in rural regions.

1. Given the importance of family, friends, and social relationships for SQoL, we propose that regional development actors strengthen social relationships, for example by offering more sports and cultural activities as well as leisure activities in nature. The latter could also function as awareness-raising programs.
2. Our results concerning nature and landscape suggest that by preserving the quality of nature and landscapes, regional development actors can simultaneously promote other components of SQoL, especially leisure and recreation, living, health and safety, as well as social relations and equality. This does not mean, however, that measures related to nature and landscapes should be the only priority. Our findings indicate that the majority of respondents considered all nine components to be important for SQoL.
3. Since some of the interview participants expressed views or described situations that are not compatible with equality, regional development actors could focus on raising awareness of equality issues and equal rights of minorities to promote SQoL.
4. The discrepancy between high levels of environmental concern and lower levels of actual pro-environmental behavior can be addressed by promoting infrastructures and social innovations that enable more ecological behavior. This includes widely accessible supply of renewable energies, targeted spatial planning, the expansion of public transport services along with more attractive pricing, and support of electric mobility and alternative mobility concepts such as car-sharing.
5. All of the above starting points are connected to knowledge, sensitization, innovative action, and the development of projects and measures of various kinds. Therefore, knowledge on sustainability—including a wide range of topics from green technologies to human rights—seems essential. We propose that regional development actors further expand environmental and sustainability education as a cross-cutting way of promoting SQoL.

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Article 2

Discover Sustainability

Discover

Research

How can Quality of Life be Achieved in a Sustainable Way? Perceptions of Swiss Rural Inhabitants

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Abstract
Rural regions in Europe are often structurally weaker than urban areas and are subject to strong socio-economic development. At the same time, they offer opportunities for a high quality of life and sustainability. The key question of this article is how quality of life in high-income countries can be achieved more sustainably. Little is known about the perception of the rural population itself on the reconciling of high quality of life with sustainability. Thus, based on a concept of sustainable quality of life, qualitative interviews with 90 rural residents were conducted to ask them which factors benefit sustainable quality of life. In the perception of the interview participants, a change in attitudes and values would be a starting point for shaping many other areas to enhance sustainable quality of life; social and legal norms should provide reference points for individuals and economic actors; infrastructure should support individuals in their ecological behaviour; and the economy should serve the common good. We derive four strands of recommendations for decision-makers from these results: the enhancement of education on applicable environmental behaviours, equal access to renewable energies and local productions and services.

Keywords Quality of life · Well-being · Sustainability · Rural areas · Regional development · Europe

1 Introduction

Although basic material needs are a prerequisite for quality of life (QoL) [1],[1] it can be assumed that consumption only has a limited influence on QoL [4, 5]. Instead, excessive consumption of natural resources can cause environmental and social problems and thus decrease QoL [6–8]. A sustainable quality of life (SQoL) would mean QoL would not only be guaranteed for some individuals or societies but for all present and future generations globally [9]. Several studies indicate, that most countries globally do not yet manage to achieve a high QoL which is sustainable at the same time [4, 5]. Nevertheless, this does not preclude the possibility of wealthy nations reducing the negative global impacts of

[1] We define the term "quality of life" here as it is understood in several disciplines, such as psychology, philosophy and economics. It is mostly used to describe or measure the fulfilment of human needs and the satisfaction of individuals and groups with various aspects of life and is, thus, defined as a multidimensional construct [1, 2]. In many cases, so-called subjective and objective indicators are used for the measurement. For subjective indicators, individuals are asked about their assessment of their life satisfaction with various areas of life. Objective indicators include numbers, for example, about income or life expectancy and are often used to collect standardized data as they are seen as more valid for social comparisons [1–3]. However, in this article, we conducted interviews about possible improvements in the linkage of quality of life and sustainability and did, thus, not measure the quality of life of the individuals.

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over-consumption without impairing QoL [4, 5, 10–12]. A key question, however, is how QoL can be achieved in a sustainable way [13].

The initial conditions for QoL and its sustainability (e.g. possibilities for environmentally friendly behaviour) vary by region and by the level of urbanization [13, 14]. The different infrastructures, services, and lifestyles of urban and rural area types require differentiation of public policies in relation to the living environment. In this article, we focus on rural areas in Europe.

A major trend towards urbanisation occurred during the twentieth century and Europe's rural regions have undergone major structural changes in recent decades [15, 16]. In many cases, these structural changes include socio-demographic changes, such as the ageing of the population; socio-economic changes, such as a decline of the employed individuals in agriculture; and cultural changes, caused by globalisation and urbanisation [17]. The challenges regarding QoL are particularly prominent in the service sector and the provision of infrastructure: in job security, care and health services and public transport [18–26]. On the other hand, rural regions also offer a particularly good basis for a high QoL due to good access to natural and cultural landscapes, the possibility of acquiring residential property and a sense of belonging to the local community and security [18, 26–30]. A larger extent of quantitative studies has been examined on (sustainable) QoL depending on the degree of urbanisation and rurality [13] and suggests that inhabitants of rural or intermediate rural areas in Europe [18, 31, 32] and in the USA [33] have a significantly higher life satisfaction than inhabitants of urban areas. In some cases, as in rural Western Europe, residents benefit indirectly from the advantages of urban regions without suffering from the negative effects of cities [32]. In addition, rural areas offer a high potential for the implementation of sustainable regional economic approaches and value creation through regional and seasonal products. Furthermore, rural areas can encourage a lifestyle in which cultural heritage, identity, originality and self-determination, as well as "community-based and charitable action", play a more important role than consumption [17].

While so far research provides valuable insights into the challenges and differences in the QoL in rural areas, often from a quantitative perspective, to our knowledge rural inhabitants' perception on linking QoL with sustainability is hardly known. In order to support sustainable development, it is essential that decision-makers are aware of public perception, as this means they can develop strategies and initiate measures that are viable and supported by society [34]. Hence, the goal of this paper is to ascertain rural inhabitants' perceptions of the factors beneficial for SQoL, and derive recommendations for decision-makers of rural areas from these findings.

The study draws on qualitative interviews with Swiss rural inhabitants. Switzerland, scores above average in terms of QoL and resource consumption [1] and, thus, Swiss rural regions serve in this article as a suitable example of the dilemma between high QoL and sustainability in high-income countries. As in other European countries, major changes in urbanisation have taken place in Switzerland in recent decades. At the same time, Switzerland offers an example of a relatively dense population (app. 215 people per square kilometre) and a high proportion of rural settlement areas, as a large part of the migration from mountain regions has ended up in the relatively well-accessible villages and agglomerations near the cities [35].

In the following sections, our concept of "Sustainable Quality of Life" will be summarised, the qualitative approach explained and the benefits for SQoL in the perception of the rural inhabitants will be presented. Accordingly, we provide recommendations for local decision-makers to enhance SQoL in rural areas.

1.1 Sustainable quality of life

The concept "Sustainable Quality of Life" (SQoL) in Wiesli et al. [9] served as the theoretical basis for this article. Following, the United Nations' (UN) understanding of sustainable development [36], SQoL is defined concretely as high QoL in a healthy environment, without overuse of natural resources, for present and future generations globally. Accordingly, social, equality and ecological demands are linked to high QoL. QoL is thus not only seen from the perspective of individuals but from an intragenerational and intergenerational perspective [9]. Our literature analysis and the subsequent comparison of the results with rural inhabitants' perception, by means of qualitative interviews in Wiesli et al. [9], showed that SQoL must be considered a multidimensional concept. The concept consists of nine components (see Table 1): "Social relations and equality, participation, identification and collective emotions, nature and landscape, education and knowledge, leisure and recreation, living, health and safety, mobility, and income and work" [9]. The distinguishing feature of the concept is that each component integrates social, economic and ecologically sustainable development into the dimensions of QoL.

Table 1 Components of the sustainable quality of life concept [9]

Component	Target
Social relations and equality	The greatest possible freedom and equal chances. Intra- and intergenerational justice. Opportunities for social relations. No discrimination based on gender, ethnicity, religion, species or other affiliation. Recognition of potentially excluded groups as a basis for (environmental) justice.
Nature and landscape	High quality nature and landscape for all present and future generations
Education and knowledge	A good general and specific education and knowledge. Education on the environment and sustainability. The ability to absorb and process information, think critically and use one's personal knowledge.
Living	Appropriate, environmentally friendly and resource-efficient living conditions that are not impaired by environmental pollution.
Health and safety	A long and healthy life without fear, the danger of conflicts or negative environmental and climatic influences.
Participation, identification and collective emotions	Freedom of choice, the right to have a say and effective participation in social processes. Identification with one's social environment and home area. A positive collective mood and common managements.
Mobility	Environmentally friendly and resource-efficient mobility for everyone, including efficient and frequent access to cities.
Leisure and recreation	Leisure activities, recreation and cultural activities that are as environmentally friendly as possible and compatible with the conservation of renewable natural resources.
Income and employment	Employment within the framework of a resource-efficient and environmentally friendly economy. Employment that is freely chosen and meaningful and provides sufficient income and a good work-life balance.

2 Materials and methods

2.1 Study regions

The 90 interviews were conducted in municipalities in the four large Swiss regions Gantrisch, Freiamt, Entlebuch and Aargauer Jura [9]. All four areas are in the German-speaking part of Switzerland and contain several types of rural municipalities with typical characteristics for a large proportion of Switzerland's rural areas, such as the infrastructure, middle or larger population density (e.g. 168 inhabitants per square kilometre in the Aargauer Jura) and landscape characteristics including lowland and mountain areas [23]. We planned to include a diversity of perspectives and, thus, to conduct at least 20 interviews per region. We selected the municipalities according to the typology of municipalities published by the Swiss Federal Statistical Office [37]. The majority of the individuals in the sample are residents of peri-urban municipalities or rural but centrally located municipalities. These types of peri-urban municipalities are the most common municipality type in rural areas [38].

In these rural areas, major structural change has taken place as in other OECD-countries [39]. In recent years, significantly more individuals started to work in the service sector and significantly fewer individuals work in agriculture [38]. Due to the decline of basic service supply, the distances required for reaching basic services have increased. In peri-urban rural areas, the geographical separation of work and living space has led to heavy commuter flows to the cities, which constitute a challenge for mobility infrastructures [38]. Furthermore, higher educational and occupational requirements have arisen in rural regions of Switzerland [39]. In contrast to several European countries, the rural population of Switzerland (especially in peri-urban municipalities) has increased by 7% since 2000 [38]. In peripheral rural areas, however, migration to other areas and demographic ageing are common [38]. Ecologically valuable areas in rural Switzerland are threatened by ground sealing, fragmentation, pollution and intensification of land use practices [38]. All of these challenges can be seen as comparable to similar other European countries. Our investigations in these areas, thus, can give hints for the enhancement of SQoL in comparable European countries.

2.2 Procedure of data collection

A semi-structured interview guide with open and narration-generating questions was developed for the 90 interviews. The interview guide can be consulted in the supplementary materials of Wiesli et al. [21]. Before we conducted the actual interviews from June to August 2019, we subjected the interview guide to several test interviews and adjusted it accordingly. The interview questions were posed according to the content of the participants' discussion as opposed to following a strict question chronology. In order to discuss the term "sustainability" based on a common understanding, the definition of sustainability used in the concept of SQoL was explained: "We understand it to mean that all people in

the world have a good life now and in the future without harming the environment" [21]. The interviews lasted on average 40 min. With the participant's consent, a voice recording was made of the interview.

The aim of the interviews for this article was to identify the main factors perceived as beneficial for SQoL by the rural inhabitants. For this purpose, the interview participants were asked to describe beneficial factors to the combination of high QoL with sustainability (see results in Sect. 3).

2.3 Sampling and participants

The sampling method was conducted according to the theoretical sampling by Glaser and Strauss [40]. The participants were randomly selected by asking in the villages to be part of an interview and avoided snowball sampling to minimize sociodemographic biases [21]. We recruited participants in public places, such as in front of stores, schools, train stations, in the field or in the village square in consideration of the sampling targets. Before the interview, we informed the participants in detail about the recording, the anonymous and coded use of the interview and about the publication of their statements and asked them for their consent to the use of their statements. Furthermore, we asked the interviewed participants if they were interested in receiving the results of the studies as a report. Interested participants were sent a short report after the analysis and evaluation of the interviews, which was written especially for them. The addresses, we collected for this purpose were encrypted and subsequently deleted.

The demographical characteristics, namely sex, age, education, occupation and place of residence classified according to municipality typology, were recorded and checked during the whole field research in order to obtain a balanced sample. We, thus, adjusted the sampling to the sociodemographic situation of the villages and included participants with diverse backgrounds as much as possible. Towards the end of the field research, demographical groups who have not been involved in the sample were targeted and included in the sample.

The proportion of men and women in the sample was almost equal; 44 men, 46 females (see Table 7 in the Appendix). Three different age groups are included in the sample; young (starting from 16 years), middle (starting from 29 years) and elderly (starting from 60 years). The middle group, the 29- to 59-year-olds, is the largest group in the sample. The majority of people in the sample held a secondary school diploma. This diploma corresponds to basic vocational training or an upper secondary school diploma (level 3) and entitles the holder to study at higher educational institutions such as universities. Most participants are employed in the service sector. In other rural regions of Switzerland, women are also slightly more than men, 29- to 59-year-olds also constitute the largest age group and the majority of people in Switzerland work in the service sector [41]. Most people in Swiss rural areas have a secondary school degree [42]. Hence, regarding these socio-demographic characteristics, we assume that the sample corresponds to the Swiss rural average. In addition, many statements in the interviews were similar after less than half of the interviews and we were able to detect saturation of the content. We, therefore, assume that the statements apply to many individuals in Swiss and comparable European rural regions. However, based on our data from the 90 interviews and the qualitative methods used, the transferability of the socio-demographic characteristics and the messages in the interviews to other contexts is limited.

2.4 Content analysis

The recorded interviews were transcribed according to the semantic content transcription method [43, 44]. Thus, the content in Swiss German was transcribed literally and not in summary. The qualitative content analysis was carried out according to Mayring's [45] method. Using this method, the categories were initially generated deductively on the basis of theory, and, after 90 interviews had been conducted, additionally supplemented inductively from the text content. The deductive codes were derived from the SQoL concept and its components. A coding guide contained the coding rules and anchor examples, which specified what the content of the interviews needed to contain in order to fall into the respective categories (see codebook in Wiesli et al. 2021, supplementary material).

In order to evaluate the perception of rural inhabitants regarding factors benefiting SQoL, the two categories "benefits" and "obstacles" were deductively formulated. Corresponding statements by the participants were assigned to these two categories and inductive sub-codes were continuously formulated.

The new codes were invented during the first 40% of the interviews [21]. After this, no new benefits or obstacles that would have led to new sub-codes were identified in the analysed transcripts. The intercoder reliability between the two researchers was tested and newly created sub-codes were afterwards communicated among the researchers using the exact descriptions in the coding guide and discussed in order to avoid ambiguities.

During the final evaluation, it was found that the codes with the obstacles implicitly always corresponded to benefits to SQoL. Therefore, the sub-codes of the obstacles were classified into the category of benefits. Finally, in order to arrive at a superordinate structure, as suggested in Mayring's approach [45], categories into which all benefits to SQoL could be classified were searched inductively and interpretatively. In this way, four categories of benefits to SQoL were created.

3 Results

The four categories of benefits to SQoL were named "attitudes and values", "social and legal norms", "physical infrastructure" and "economic structures" (see Table 2). These four categories are introduced in the following. Afterwards, the results of these categories and their mapping into the nine components of the concept SQoL are presented.

The first thing that stood out during the coding process was, that a larger part of the benefits of SQoL was related to attitudes and values. For example, some participants mentioned personal responsibility or specific political perceptions as beneficial factors for SQoL. Hence, the category "attitudes and values" was created. In accordance with Schwartz [46], values are understood as something that individuals represent in many different ways and that determine what is important or less important to individuals in their lives. Attitudes are determined by values and take the form of an evaluation of "states", "objects and behaviour" ([46], p. 16).

It was also discovered that some of the aforementioned benefits to SQoL relate to social and legal norms. According to a large proportion of the interview participants, social and legal standards are necessary to achieve SQoL. Based on Schwartz [46], social norms are understood as rules that most members of society use to guide their behaviour. Values determine whether social norms are accepted or not [46]. Social norms are not necessarily subject to official laws and are not necessarily enforced or sanctioned. In the perception of the interviewed participants, norms contributing to SQoL should be socially rooted in society. In contrast, legal norms are defined as norms that are enforced by authorities and can be imposed without the consent of individuals. The majority of participants primarily called for legal standards that would govern how natural resources could be used.

In addition, the interview participants named some benefits to SQoL that relate to the existence of appropriate physical infrastructure. Thus, the category "physical infrastructure" was formulated. "Physical infrastructure" is defined as equipment and buildings that are available to the community and support its activities. Beneficial factors of this kind refer in particular to participants' environment and prevailing circumstances. According to the participants, these should be improved in terms of SQoL in order to enable individuals to behave accordingly.

Further benefits for SQoL that were mentioned, such as "sustainable tourism", were assigned to the category "economic structures". The category "economic structures" is defined as the totality of all facilities, actions and systems that serve the organised satisfaction of human needs through goods and services. Beneficial factors of this kind primarily concern various areas of the economy that, in the perception of the participants, should be aligned with the interests of the broader population, for example by ensuring fair distribution.

3.1 Benefits to SQoL in the category of attitudes and values, based on the perception of the participants

Three benefits for SQoL can be classified under the category "attitudes and values": attitudes towards sufficiency, personal responsibility and a common political perception that is compatible with SQoL (see Table 3). Two-thirds of the participants saw an attitude of sufficiency as beneficial to SQoL. From their point of view, individuals with this attitude are satisfied with a certain contingent of goods and services and do not strive for further consumption. Personal fulfilment should furthermore be less strongly connected to material values. On the one hand, this would lead to higher satisfaction, and on the other hand, lower consumption would reduce resource overuse and inequality. An interview participant explained:

> *"In principle, every luxury is harmful to the environment. If everyone lived more simply, we would have far fewer problems. Then it would be enough even for those who have less."* (IP 55, >60 years, male, retired, secondary school degree, peripheral municipality)

According to these respondents, and with regard to the nine aspects that constitute the concept of SQoL (see Table 1), an attitude of sufficiency could benefit all areas of life in which lower resource use contributes to SQoL. This beneficial factor could thus contribute to several aspects of SQoL, such as mobility, living and leisure and recreation. Overall, sufficiency would mainly support the component of *social relations and equality*. This is because, according to the respondents,

Table 2 The four categories of benefits to SQoL based on the perception of the interview participants

Attitudes and values	Social and legal norms	Physical infrastructure	Economic structures
Values are represented in many and varied ways and determine what is important or less important. Attitudes constitute values and are manifested as evaluations of states, objects and behaviours.	Social norms are rules that most members of society use to guide their behaviour. Legal norms are enshrined in law and can also be enforced independently of consent.	Physical infrastructure includes facilities, equipment and buildings that are available for communal use and co-determine people's behaviour.	Economic structures include facilities, actions and systems that serve the organised satisfaction of human needs with goods and services.

Table 3 Benefits to SQoL in the category of attitudes and values, based on the perception of participants, and the corresponding components from the SQoL concept

Benefits to SQoL in the category of attitudes and values	Mentioned by …% of 90 participants	Mentioned by … people out of 90 participants	Concerns component … in the SQoL concept[a]
The majority of individuals represent an attitude of sufficiency.	65.5	59	Concerns several components
The majority of individuals take personal responsibility.	62.2	56	Concerns several components
Society and its parties have a common political stance, which is oriented towards SQoL.	20	18	Concerns all components

[a]A maximum of four components is listed in the tables.

frugality reduces the overexploitation of resources, which means that more goods and services are available and can be distributed more evenly.

Furthermore, two-thirds of the participants believe that an attitude of personal responsibility would be conducive to SQoL. They argued that individuals should frequently consciously reflect on their own behaviour, think about the consequences of their own actions and thus behave in a more solidary and responsible manner. This behaviour is related to different areas, such as resource overuse, climate change, empathy and helpfulness towards other people.

> *"I believe that everyone can start with themselves. This was also a reason why we came here, because of the heating, so that we don't need the car and so that the children can play outside. We didn't have a television for a long time either so that the children could experience something other than just consumption."* (IP 50, 30–59 years, female, service, tertiary degree, peri-urban municipality)

This benefit to SQoL, as stated by the participants, relates to several components. Responsible behaviour, which leads to more ecological behaviour, mainly affects components such as *mobility*, *living, work and income, nature and landscape, leisure and recreation* and *education and knowledge*. Responsible behaviour, which leads to empathy and helpfulness, can contribute to the components of *social relations and equality* and *participation, identification and collective emotions*.

About one-quarter of the participants see specific political perceptions as conducive to SQoL. The participants mainly referred to a progressive political perception in line with sustainable development and interest in common QoL. Some of these respondents also believe that a consensus among villages on political matters could contribute to freedom of expression and participation on the part of the village population. This could strengthen social relations between people. Some individuals among this participant group described themselves as politically left or green, and see politically conservative, right or populist attitudes as inhibiting the progress of processes and developments in society.

> *"For example, when it comes to gays and lesbians or foreigners. We are still too right-wing in Entlebuch."* (IP 75, 30–59 years, male, service, secondary degree, rural central municipality)

Political attitudes compatible with SQoL could contribute to all SQoL components. Above all, the consensus among individuals could strengthen freedom of expression, common emotions and a sense of belonging, and thus could contribute to the component *participation, identification and collective emotions*.

3.2 Benefits to SQoL in the category of social and legal norms, based on the perception of participants

Six benefits to SQoL were assigned to the category of "social and legal norms" (see Table 4). A significant proportion of participants saw legal norms, such as laws, sanctions and price regulations, as important for achieving SQoL. Other participants opined that civic engagement and changed habits should be established as social norms in order to direct society towards SQoL. Further beneficial factors mentioned by participants concerned nature conservation, sustainability and environmental education and changes in agricultural policy.

The majority of participants (75.5%) saw legal standards and thus legal regulations and sanctions as necessary to achieve SQoL. More than half of these participants were in favour of legal regulations to reduce plastic waste. From their point of view, reducing household waste is impeded by food packaging from wholesalers. In this context, people in the youngest age group (16–29 years) mentioned no-waste stores, presently mainly found in cities, and indicated that they would like to see the opening of such stores in their villages. People in the oldest age group (> 60 years) stated that they

Table 4 Benefits to SQoL in the category of social and legal norms, based on the perception of participants, and the corresponding components from the SQoL concept

Benefits to SQoL in the category of social and legal norms	Mentioned by …% of the 90 participants	Mentioned by … people out of the 90 participants	Concerns component … in the SQoL concept
Laws, sanctions and price regulations supporting SQoL exist.	75.5	68	Concerns several components
Sustainability and environmental education is aimed at specific target groups.	45.5	41	Concerns several components
Individuals get involved in civil society.	40	36	Concerns several components
Individuals change their habits	23.3	21	Concerns several components
Nature and species are strictly and widely protected.	20	18	Nature and landscape Leisure and recreation Education and knowledge
Agricultural policy is based on the quality of production methods.	5.6	5	Income and employment Nature and landscape

would like to refill more products, as they used to do in shops in the past. A third of these participants also suggested legal requirements for spatial planning, restrictions on long-distance animal transport, higher prices for petrol, the declaration of carbon emissions on product packaging and greater transparency regarding the origin of products.

"Petrol needs to be much more expensive, even if it would hurt me. We also drive a little bus, but petrol needs to be more expensive [...]. Wholesalers would have to be obliged to declare the facts, and not write "market-fresh grapes" even though they are from Israel or someplace like that. They should be forced to inform consumers better." (IP 44, 30–59 years, female, service, secondary school degree, peri-urban municipality)

Laws, sanctions and price regulations mentioned by participants concern several components of SQoL, in particular *mobility, living, work and income, nature and landscape* and *education and knowledge*.

Similarly, about half of the participants are of the perception that sustainability and environmental education should be part of the educational curriculum and this way established as a social norm. From the point of view of these respondents, some people are not sufficiently aware of intergenerational and global equality and had insufficient knowledge about the connections between their own behaviour and global impacts. The respondents argued that this was leading to unconscious actions, in particular overconsumption, that leads to the exploitation of individuals in other countries. They further stated that even target groups that were not explicitly interested in sustainability issues would need to be reached, for example through extracurricular education. Some of these participants also claimed that they often did not know how to act more sustainably in everyday life. School and extracurricular sustainability and environmental education should therefore include specific and practical tips.

"In my case, there is sometimes such a prevalence of pseudo-knowledge. This scares me a little. [...] There should be basic knowledge. Because, in such complex environmental issues, there would still be so much more to consider, for example, technical knowledge." (IP 26, >60 years, male, service, secondary school degree, peri-urban municipality)

Sustainability and environmental education essentially concern the component of *education and knowledge*. According to the interview participants, sustainability and environmental education are accompanied by a greater amount of ecological behaviour, which affects other components of SQoL (e.g. mobility). The participants also wanted all relevant target groups to be exposed to sustainability and environmental education. This demand for equality contributes to the component of *social relations and equality*.

Almost half of the participants perceive activities that increase public welfare, such as civic engagement, as conducive to SQoL. They believe it strengthened the cohesion and development of society when individuals were regularly active in organisations and associations on a voluntary basis for no material gain. These participants claimed that this was beneficial to a culture of loyalty and could lead to social and ecological developments in society.

"I do a lot for the handicapped and I always get the idea that a lot of things are free. I don't always have to get something out of it. I don't always have to earn money. That's sustainable for me although I don't know if this is the correct meaning of sustainability." (IP 57, >60 years, male, retired, tertiary degree, peri-urban municipality)

With regards to the concept of SQoL, various components are indirectly or directly affected by this factor, depending on the type of activity. However, according to the participants, the resultant relationships and public welfare would primarily affect the components of *participation, identity and collective emotions* and *social relations and equality*.

A quarter of the participants see a change in personal habits as a prerequisite for SQoL. In their view, people's everyday behaviours and actions should change in a way that rendered them compatible with SQoL. The participants explained that they sometimes behaved unsustainably out of habit, although they were aware of the negative consequences. Such behaviours include shopping habits, car driving and dietary habits.

"You can start small and change habits. Maybe you ensure that you don't have any leftovers so that you don't have to throw anything away." (IP 29, >60 years, female, services, tertiary degree, peri-urban municipality)

This beneficial factor can be applied to different components of SQoL because, according to the participants, changing habits should also change behaviour in terms of SQoL. These behaviours could, for example, lead to more sustainable *mobility* and also contribute to the components *living, work and income* and *leisure and recreation,* based on the participants' statements.

A quarter of the participants see nature conservation as important for SQoL. They referred both to strictly protected areas and to places for leisure activities. They described low-nutrient meadows and traditional high-trunked tree species as having significant effects on landscapes and on positive emotions. Some of these participants are also convinced that nature conservation goes hand in hand with the communication of values that are beneficial to SQoL. For example, they

preserve habitats for insects, reptiles and other small animals in their gardens, or save frogs from being run over by cars. According to these participants, such activities also serves, besides nature, an educational purpose for their children:

> *"I think that children or the younger generations notice when you give them this [nature awareness]. This should be encouraged (laughs), so that society will eventually move away from mass commodities."* (IP 35, female, service, 30–59 years, secondary school degree, rural central municipality)

The protection of nature affects the component *nature and landscape*. Similarly, based on the statements made by the participants, the components *education and knowledge* and *leisure and recreation* are supported because the participants regarded nature as a place where *education and knowledge* and value teaching, as well as leisure, could take place.

Five out of the 13 farmers among the interview participants are in favour of changes in Swiss agricultural policy. In their perception, instead of the area of a farm, the added value and quality of the production method should be the criterion for state financial support. In this way, smallholder farmers who farm organically would receive more support. These farmers see the current agricultural policy as un-ecological and as a mental burden that reduces their QoL, due to financial insecurities.

> *"That you do not trip them up unnecessarily [...]. And that all farms are treated equally, no matter how many hectares they have. That everyone has the same rights."* (IP 89, male, 16–29 years, forestry and agriculture, tertiary degree, rural central municipality)

The call for more ecological farm management concerns the component *nature and landscape* of the concept SQoL. Furthermore, the component *work and income* is affected, as the participants hoped that a change in agricultural policy would improve income.

3.3 Benefits to SQoL in the category of economic structures, based on the perception of participants

Five benefits to SQoL are classified as "economic structures": the availability of seasonal and locally produced products; the availability of local gastronomy, cultural attractions and shopping facilities; an economy based on the interests of the general population; an increase in added value; and sustainable tourism (see Table 5).

Around three-quarters of the participants sees regional products and their direct marketing as a benefit to SQoL. They associate local foods with better quality, enjoyment, higher animal welfare, sustainable agriculture and the region's heritage, culture and tradition. However, in the participants' perception, regional products are often hard to purchase even though they were produced in the region. As a result, the participants mainly use their cars when food shopping, although they see car-driving as harmful to the environment; the alternative was not buying local products. For this reason, 20% of these participants suggest direct marketing at weekly markets in their respective villages.

> *"This should actually be brought together somewhere. You don't go shopping in such a way that you buy potatoes from one person and then drive ten minutes so that you can buy meat from the next. So direct marketing is good, but somewhere there would have to be a place where you bring it all together."* (IP 49, 30–59 years, service, tertiary degree, peri-urban municipality)

This proposal can be ascribed to several of the nine components of SQoL, as it could support different areas of life. The benefit to SQoL of regional products and direct marketing can contribute to *mobility,* as, according to the participants, it creates shorter distances for produce to travel. The component *nature and landscape* can also be supported, as regional products would, in the participants' view, lead to more sustainable agriculture. By promoting local traditions and heritage culture, the component *participation, identity and collective emotions* could also be supported.

In the perception of about one-third of the participants (mostly in the 16–29 and 30–59 age groups), local shops, cultural attractions, services and restaurants benefit SQoL. In their view, these services are increasingly disappearing in rural areas. However, they see it as important that such services were maintained. In their perception, these services would help to maintain jobs and cultural and social village life, and prevent migration of the population to cities.

> *"What scares me is when a shop or restaurant closes and nothing happens to it for months or a year. [...] Then village life is not about sitting together once a week in the evening and drinking a beer, but instead, people are simply at home. [...] I think community suffers like this."* (IP 26, >60 years, male, service, secondary school degree, peri-urban municipality)

Based on the participants' statements, local restaurants, cultural attractions and shopping facilities could thus contribute to the component *income and employment* of SQoL. Restaurants and cultural attractions are also places for leisure and social life, according to the participants. They could therefore contribute to the component *leisure and recreation*

Table 5 Benefits to SQoL in the category of economic structures, based on the perception of participants, and the corresponding components from the SQoL concept

Benefits to SQoL in the category of economic structures	Mentioned by … % of the 90 participants	Mentioned by … people out of the 90 participants	Concerns component … in the SQoL concept
Regional, seasonal and locally produced products are available locally.	68.8	62	Mobility Nature and landscape
Restaurants, cultural attractions and shopping facilities are available locally.	28.8	26	Participation, identification and collective emotions Income and employment Leisure and recreation Social relations and equality Mobility
The economy is fairly distributed in line with the interests of the population at large.	24.4	22	Income and employment Leisure and recreation Social relations and equality
The added value of the products is higher.	18.8	17	Income and employment Social relations and equality
Tourism is sustainable and stronger.	15.5	14	Income and employment Leisure and recreation Nature and landscape

and *social relations and equality*. As restaurants, cultural attractions and shopping should, according to the participants, stay as local as possible, the component *mobility* could also be supported by reduced driving.

A third of the participants believe that a change in the overall economic structures is necessary to achieve SQoL. They see large companies as hegemonic players in our society and other members of society as powerless against them. These participants, therefore, see measures directed at making such players more accountable for appropriate tax payments and carbon emission compensation as an opportunity to support SQoL. Some criticised the one-sided focus and wage conditions of the current economic system, which is focused on growth. They also criticised the resultant increase in goods and consumption as well as in workload, pressure to perform and unequal distribution of wealth and income. They believe that economic structures should instead be geared towards the interests of the broader population.

> *"I don't think we are on such a good path. Especially for the future. And yes, everything is so unfairly distributed. Many have a lot and many have very little. I think we should definitely change something [...]"* (IP 66, 16–29 years, female, basic school degree, in education, rural central municipality)

Based on the participants' statements, this benefit to SQoL affects several components. Given the described effects on work and leisure time as well as on wages, the components *income and employment* and *leisure and recreation* could be supported by changing the overall economic structures. Similarly, the component *social relations and equality* could be supported, as participants would like to see a fairer distribution of income and wealth.

Almost one-third of the participants, especially farmers (10 participants), are of the perception that the added value of food should be stronger in order to support SQoL. They complained that food in Switzerland was too cheap and argued that, therefore, its prices should be increased. With higher prices, local small farms would also receive more income.

> *"So that those who live here receive an added value from their product. That they not only produce more, but more or even less, but to a better added value."* (IP 39, 30-59 years, male, forestry and agriculture, secondary school degree, rural peripheral municipality)

Regarding the concept of SQoL, this benefit would primarily affect the component *income and employment*. In addition, it could contribute to the component of *social relations and equality* because, according to the participants, smaller farms would be entitled to more income and the added value of products could contribute to a more equal distribution of income.

Almost a quarter of the participants sees sustainable tourism as beneficial to SQoL. It was mainly activities such as skiing, restaurant and hotel visits and farm holidays that were mentioned in this context. These participants argued that in their region, tourism was an important source of income that could reduce the migration of the local population. The participants feel that the type of tourism in highly frequented and well-known places is impossible and inappropriate for their region. In their perception, sustainable tourism could prevent negative effects on landscapes and the environment that commonly occur in places with strong conventional tourism.

> *"We are not a tourist region like St. Moritz or other top destinations that only generate income with tourism. We are almost forced to practice sustainable, soft tourism, but we should try to get more out of it with little input, in a positive sense that it is really sustainable."* (IP 31, 30-59 years, male, services, secondary school degree, rural central municipality)

Based on the participants' statements, sustainable tourism would contribute to regional income and create jobs. With regard to the nine components of SQoL, it can thus contribute in particular to the component *income and employment*. In addition, sustainable tourism could be beneficial for the component *nature and landscape*, as the participants refer to moderate, ecological forms of tourism.

3.4 Benefits to SQoL in the category of physical infrastructure, based on the perception of participants

In the category "physical infrastructure", there are two types of benefits to SQoL: availability of alternatives to motorised private transport; and renewable energy (see Table 6). The majority of participants (79%) see alternatives to motorised private transport as beneficial to SQoL. They argued that motorised private transport caused carbon emissions, air pollution, hazards, noise and ground sealing and reduced the QoL. Despite this, most participants explained that they drove cars because public transport services were inadequate. Participants in the oldest age group (15 participants over 60 years) and in the youngest age group (31 participants between 16 and 29 years) would welcome closer access to public transport and more frequent public transport, as this would contribute to their freedom and thus to their QoL.

Table 6 Benefits to SQoL in the category of physical infrastructure, based on the perception of participants, and the corresponding components from the SQoL concept

Benefits to SQoL in the category of physical infrastructure	Mentioned by …% of the 90 participants	Mentioned by … people out of the 90 participants	Concerns component … in the SQoL concept
Alternatives to motorised private transport are available.	78.8	71	Mobility Health and safety
Renewable energy for the home is available to everyone.	25.5	23	Income and employment Living Social relations and equality

"I would like to travel by train, but I have an orchestra rehearsal which finishes at half past ten in Zurich. I can get home in 25 minutes by car, by train I get home at twelve. Being home at half past ten is also quality of life. Then you can still have a drink, do something and go to sleep at twelve." (IP 73, 30–59 years, male, service, tertiary degree, rural central municipality)

With regard to the nine components of SQoL, alternatives to motorised private transport could, according to the descriptions of the participants, support the component *mobility*. This benefit to SQoL could also contribute to the component of *health and safety* since it is associated with the physical and mental health and safety of the population.

The second physical infrastructure, which almost a third of participants sees as favourable to SQoL, was renewable energy. Tenant interview participants complained that they could not freely choose their heating energy; they stated that they would like to see equal access to renewable energy for everybody. Homeowners, including farmers, said that they had installed solar panels or would like to do so because they saw solar panels as having financial and ecological advantages over other energy sources.

"I have to say that we live really well here. What we still want is photovoltaics on our roof. We will probably change that." (IP 70, > 60 years, female, service, secondary school degree, rural central municipality)

Based on the participants' statements, renewable energy could benefit the SQoL component *income and employment*, as some of the participants saw this as an option to save costs. In addition, the component *living* could also benefit, as the participants primarily discussed heating private living spaces. Some of the participants also opined that renewable energies should be equally available to everyone. In this sense, renewable energies could contribute to the component of *social relations and equality*.

4 Discussion

This article aimed to evaluate the perception of Swiss rural inhabitants on beneficial factors for SQoL and to derive recommendations for local decision-makers. The rural participants concretely consider the following factors as beneficial to SQoL: access to renewable energy, alternatives to motorised private transport, seasonal and locally produced products, local services and leisure offers, common welfare economy, local products, sustainable tourism, changes in agricultural policies, nature and species protection, environmental habits, sufficiency, civil engagement, sustainability and environmental education for specific target groups, laws, sanctions and price regulations and policy focused on SQoL.

These results indicate that a relatively large proportion of the rural inhabitants had rather concrete ideas and awareness of ways how SQoL could be supported. Three-quarters of all interview participants named at least one benefit for SQoL that concerned attitudes and values, social and legal norms, economic structures or infrastructure.

The benefits for SQoL in all four categories affect several or all of the SQoL concept's components (see Tables 3, 4, 5, 6 above). In addition, all nine components are targeted by the benefits for SQoL discussed in the interviews. The rural inhabitants in the interviews seem not to see the benefits as unilateral or limited to one component. It can be interpreted, that measures to support SQoL should simultaneously address attitudes and values, social and legal norms as well as physical infrastructure and economic structures. Besides direct official or state intervention, the mentioned benefits concern individuals and their life circumstances. Current discourses on sustainable development in the literature have a strong claim on complementary and comprehensive transformations. Accordingly, innovations should ideally address all three dimensions of sustainability (social, economy, ecology) at the same time [47]. With the inclusion of the social and economic dimensions into measurements, (sustainable)QoL would be addressed more strongly.

The category of physical infrastructure includes mobility and renewable energies, two technically complex areas that represent key challenges in rural regions of Switzerland [48, 49]. In addition, both areas primarily relate to the environmental dimension of sustainable development. A relatively large proportion of the rural inhabitants considered it important to create an environment that would facilitate more ecological behaviour. Infrastructures, such as renewable energy and sustainable mobility, contribute to the attractiveness of rural areas and, thus, to QoL and enable ecological behaviours [48–52]. Focus on changing structures, rather than individual attitudes and behaviour is also demanded in the literature on social and sustainable transitions [53], whereby the importance of the long-term policy, the election and decisions for adequate infrastructure is emphasized [54]. Certain infrastructures are especially important for specific social groups. For example, public transport is in the rural context particularly relevant for the young and elderly age groups who have no driver's licences as it allows access to education, work, medical care and social inclusion [55–57].

The benefits for SQoL placed in the category "economic structures" shows that a relatively large proportion of the rural inhabitants interviewed consider structural economic changes to be essential for SQoL. This echoes, for example, Höflehner and Meyer [17] who recommend the promotion of regional value chains using decentralised technologies. The public perception of high-quality regional and seasonal food, farm shops and weekly markets can lead to social trends and shifts in values [17]. The resultant increase in added value created through local products provides local actors with economic opportunities that are both, realistic and sustainable [17, 58, 59]. Appreciation of the local services, the community, culture and identity associated with these products can contribute to social and cultural innovations and charitable activities [17]. The associated values are often independent of material claims [17] and contribute highly to the QoL of individuals. The enhancement of local productions, services and culture is especially important in light of local employment. The majority of the population in rural areas has a secondary degree and works in the field of agriculture, services and production. An existing functioning local economy could generate employers and, thus, more employment for the rural inhabitants.

The results in the category "attitudes and values" represent an important starting point for supporting opportunities in other categories. It would be difficult for changes in the environment, including physical infrastructure and economic structures, to arise independently of attitudes and values, social and legal norms or the transformation in society's attitude [60]. In a democracy, decisions to support SQoL are mainly made by the part of society eligible to vote. The mindset of society and politics steers a paradigm shift towards sustainable development [60].

Our qualitative study and its derived recommendations must be also considered in light of its limitations. Depending on the context (e.g. the infrastructure), its degree of periphery and national legislation, the rural residents' may weigh the benefits for SQoL differently or even consider other aspects as benefits. In particular, the detailed measures to enhance SQoL should be determined in light of the specific contexts. Future studies could evaluate the perception of rural residents during the development of such measurements for SQoL. Knowing the perceptions might help to evaluate if the measurements are adequate to the context and if inhabitants can benefit from them. In addition, future studies could reflect the perceptions of urban residents to find relevant factors to enhance SQoL in urban areas or compare the perceptions of rural and urban inhabitants. The latter might contribute to the understanding of the mutual effects of rural and urban areas on SQoL.

5 Conclusion

In conclusion, according to the interviewed rural inhabitants, challenges and potentials for SQoL mainly affect key areas of society that are mutually reinforcing in the investigated rural Swiss regions. Attitudes and values guide social and legal norms, and social and legal norms can guide both—physical infrastructure and economic structures.

The following recommendations for decision-makers can be derived from the results of this research article: (1.) The support of applied environmental and sustainability education in schools and the extracurricular context in a targeted group-specific manner seems crucial. For example, tips on more specific resource-efficient behaviour and a deeper understanding of SQoL could be given to contribute to behaviours and political voting in a way that is in the interest of SQoL. Likewise, the participatory involvement of the population could be facilitated and bottom-up processes thus initiated; these are important for regional sustainable development [61]. With regard to the ecological dimension of sustainable development, it can be recommended (2.) to make renewable energies available for everyone, including tenants, and to create incentives for the use of sustainable mobility. For cultural and social life and the fair distribution of income, it is recommended (3.) to promote the local productions and services and thus cyclic economy and ecology [17], and (4.) to involve economic actors in supporting SQoL through appropriate legal conditions, regulations and incentives.

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Author contributions Both authors whose names appear on the submission. (1) made substantial contributions to the conception or design of the work, the analysis and the interpretation of data; (2) drafted the work or revised it critically for important intellectual content; (3) approved the version to be published; and (4) agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. Both authors read and approved the final manuscript.

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Data availability The full dataset generated and analysed during the current study is not publicly available as the manuscripts are Swiss German and very extensive. Insights into the used data are given in the results chapter in the form of quotations. However, the full dataset is available from the corresponding author on request.

Code availability Codebook and questionnaire are available in the supplementary material Wiesli et al. [21].

Declarations

Ethics approval and consent to participate All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and national research requirements. Ethical approval is not required. The need for ethical approval was clarified with the Ethics Committee at the WISO Faculty of the University of Bern. The fully consenting individuals involved in the interviews provided informed consent for the use of their interview content in this study and for its publication. Their statements are anonymised and not traceable to their identity. Information on the individuals was first encrypted and after analysis eliminated.

Competing interests The author has no competing interest to declare.

Appendix

See Table 7.

Table 7 Sociodemographic characteristics of the participants

Feature	Characteristics	Interview participants
Sex	Male	44
	Female	46
Age	16–29 years	26
	30–59 years	38
	60 < years	26
Highest education	Basic school degree	11
	Secondary school degree	61
	Tertiary degree	18
Employment sector	Forestry/agriculture	13
	Trade/industry	9
	Services	36
	Unemployed	1
	In education	15
	Retired	16
Municipality type (derived from the categorization by the Swiss Federal Office for the Environment, FOEN, 2012)	Peri-urban municipality	47
	Rural central municipality	28
	Rural peripheral municipality	15

n = 90

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Article 3

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ORIGINAL RESEARCH

Does Living in a Protected Area Reduce Resource Use and Promote Life Satisfaction? Survey Results from and Around Three Regional Nature Parks in Switzerland

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Abstract
Regional nature parks in Switzerland are, for the most part, protected areas that aim to promote sustainable development and residents' well-being. In recent years, research on regional nature parks and comparable protected areas has focused on questions regarding local populations' acceptance of such areas, their governance, and their economic effects. However, we know surprisingly little about the impact of protected areas on environmental resource use and life satisfaction, two essential ingredients of sustainable regional development. In this study, we survey people living in and around three regional nature parks in Switzerland on their resource use and life satisfaction (gross sample $n = 3358$). We propose a novel measurement of resource use based on vignettes describing different lifestyles, which we validate against the carbon footprint obtained for a subsample of our respondents. With these indicators, using multiple regression analyses, we test several hypotheses derived from the literature on the relationship between resource use and life satisfaction in and around protected areas. Contrary to our expectations, we do not find differences in resource use or life satisfaction, or the relationship between resource use and life satisfaction, across park and non-park regions. We discuss potential explanations for our findings and their implications for nature park authorities and future study designs.

Keywords Protected areas · Nature parks · Life satisfaction · Resource use · Ecological footprint

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1 Introduction

Protected areas cover 26.4% of Europe (EEA, 2022). How do these protected areas affect people's use of natural resources and their life satisfaction? We address this question with an empirical case study that focuses on a category of protected areas in Switzerland: called "Regional Nature Parks" (RNPs). In Switzerland, regions with high natural and landscape values and a traditional, cultural, scenic, or historical character can be nominated to be labeled as RNPs. The Swiss government's aim in establishing such areas is to promote sustainable development and to contribute to people's well-being (Federal Office for the Environment, 2019). Existing RNPs comprise a large number of rural communities and sometimes extend across several cantons (i.e. federal states). RNPs are of different sizes but include those that are over 100 km^2 in area, and are sometimes fairly populated (Federal Office for the Environment, 2019).

If an area is nominated to become an RNP, the people living in the designated area vote on whether their region should receive the RNP label. If their consent is given, a park body is established that consists of experts in biodiversity, forestry, environmental education, renewable energies, scientific cooperation, etc. (Federal Office for the Environment, 2019). Together with representatives of the population and other interest groups, the park body develops a 10-year charter, which serves as a planning instrument, and is responsible for implementing the charter's objectives in cooperation with the municipalities included within the RNP's area. The general objectives of these charters are to promote people's environmental awareness, advance the federal biodiversity strategy, improve the quality of the landscape, promote local production chains and cycles, and promote sustainable tourism (Federal Office for the Environment, 2019). The park management body receives financial support from each of the three levels of government (municipalities, cantons, federal government). In light of these investments, the question arises as to how RNP status contributes to sustainable regional development.

Previous studies suggest that environmental awareness and public infrastructure supporting pro-environmental behavior (e.g. hiking and bicycle trails, public transport) can reduce individuals' use of natural resources (Bruderer Enzler & Diekmann, 2019; Kennedy et al., 2015; Moser & Kleinhückelkotten, 2018; Schneidewind, 2013). Moreover, research shows that high levels of landscape quality and biodiversity are positively related to people's well-being (e.g. Bieling et al., 2014; Bignante, 2015; Carrus et al., 2015; Mossabir et al., 2021). For example, Bonet-García et al. (2015) found that the inhabitants of a large protected area in southern Spain rated their personal well-being higher than respondents in surrounding communities. According to the authors, this was a result of the efforts of the Andalusian regional government, which had made attempts to increase the well-being of the population by means of establishing protected areas since 1989. These efforts included, for example, promoting sustainable farming, public infrastructure, nature-based tourism, and forest management (Bonet-García et al., 2015). However, previous studies have also found a positive relationship between the degree of resource use and well-being (e.g. O'Neill et al., 2018), which is detrimental to sustainable development.

To our knowledge, no previous study has investigated the potential impact of RNPs on the relationship between people's resource use and their well-being. This is a notable omission, given the multiple goals of protected areas to reduce resource use and increase well-being, on the one hand, and the common finding that resource use and well-being are positively related, on the other. We therefore ask the following two questions: (1) Is resource use lower and well-being higher in RNPs than in comparable rural regions without park

status? (2) Is the positive relationship between resource use and well-being weaker in RNPs than in comparable rural regions without park status?

Addressing similar questions, Vita et al. (2020) compared resource use and socio-economic variables that influenced well-being between members and non-members of environmental grassroots initiatives. They found that membership was associated with a lower carbon footprint and higher well-being. In the study at hand, we survey individuals living in three Swiss RNPs and comparable non-park regions on their resource use and well-being in terms of *life satisfaction*. In line with Vita et al. (2020), we conceive of life satisfaction as "the cognitive component of subjective well-being"(2020, *p*. 4) (see also Brulé, 2022; Ortiz-Ospina & Roser, 2013); we define life satisfaction as a person's current subjective attitude toward their life in general. Moreover, we define resource use as any human activity that triggers the emission of greenhouse gases (e.g. CO_2) (Brulé, 2022; Vita et al., 2020; Wackernagel, 1994). In our study, we measure resource use by means of a proxy that captures individual lifestyles in terms of the consumption of food, and use of different modes of shelter and mobility—spheres of life that are most strongly associated with resource use (Jungbluth et al., 2011). Our measure does not account for resource use in the production of goods and services.

The remainder of our paper is structured as follows. We first outline our theoretical argument and state our hypotheses. We then describe our measurement and data analysis strategy, followed by presenting our results. Finally, we discuss our findings in light of previous research and conclude.

2 Theory and Hypotheses

2.1 The Relation Between Resource Use and Life Satisfaction

The relationship between income, which is highly related to resource use and CO_2 emissions (Baiocchi et al., 2010; Bruderer Enzler & Diekmann, 2019; Büchs & Schnepf, 2013; Notter et al., 2013), and well-being has been repeatedly explored. The Easterlin paradox, for example—one of the early findings in this area—suggests a positive influence of income on life satisfaction up to a specific point; when income exceeds this point, life satisfaction no longer increases (Easterlin, 1974). In a similar vein, the "treadmill of production" theory (Schnaiberg et al., 2002) and the threshold hypothesis on "economic growth and quality of life" (Max-Neef, 1995) suggest that a society's economic growth benefits, respectively, hedonic happiness and life satisfaction, but only up to a certain point. The decline at high levels of economic development is explained by high levels of consumption, which harm nature and the environment. Thus, beyond a certain threshold, "if there is more economic growth, quality of life may begin to deteriorate" (Max-Neef, 1995, p. 117).

These theories are supported by empirical evidence at the country level. Within their sample of 150 nations, O'Neill et al. (2018) did not find a single nation capable of meeting the basic needs of its citizens without overusing natural resources. One of the nations investigated was Switzerland (O'Neill et al., 2018). Average life satisfaction in Switzerland is high (OECD, 2020). At the same time, with an average of 13.2 tons of carbon emissions per capita, Switzerland far exceeds the planetary boundary benchmark of 1.6 tons per capita (O'Neill et al., 2018; Swiss Federal Statistics, 2006). However, in their analysis of 120 countries with growing per capita consumption, Fanning and O'Neill (2019) did not find significant changes in happiness (as a dimension of

well-being). They even found that happiness slightly decreased above a certain level of income. Apergis and Majeed (2021) reported results from a study of 95 countries showing that greenhouse gas emissions reduce cross-national happiness levels, although economic affluence enhances these levels.

Rational choice theory argues that individuals act in a way that maximizes their utility by, for example, consuming goods and services that benefit them (e.g. Jackson, 2005; Varian, 1992). Relatedly, the capability approach suggests that goods also enable people to pursue certain goals (Nussbaum & Sen, 1993). Hence, capabilities are essential prerequisites for achieving a satisfactory life (Nussbaum & Sen, 1993). Books, computer equipment, electricity, and cars, for example, are goods that enable people to be mobile and to obtain an education, which is known to increase people's life satisfaction. In addition, Veblen's "theory of the leisure class" links consumption and excessive lifestyles to a prestige-generating function, which mainly serves increasing people's social status (1973). Veblen (1973) thus suggests that the effects of consumption go beyond the fulfillment of basic needs. In summary, these theories underline that consumption plays a major role in people's ability to achieve life satisfaction (although life satisfaction does not depend on consumption alone). At the same time, individuals' consumption and use of economic goods trigger a large proportion of carbon emissions (Jungbluth et al., 2011).

To our knowledge, there is no empirical evidence for the relationship between individuals' resource use and life satisfaction in Switzerland. However, several empirical results from other countries corroborate our expectation of a positive relationship between the two constructs. For example, based on an analysis of 14,960 households in China, Wang et al. (2015) provided evidence for a positive relationship between consumption expenditure and life satisfaction. However, in their analysis, the relationship between consumption expenditure and life satisfaction varies in strength depending on the consumption category. Wang et al. (2015) concluded that what money is spent on has a substantial bearing on life satisfaction. In line with this conclusion, Lenzen and Cummins (2013) showed that among different areas of household consumption that contribute to the carbon footprint, car ownership is positively related to well-being (see also Brulé et al. 2020). These theoretical considerations, along with the empirical evidence, lead us to our first hypothesis:

Hypothesis 1a People's resource use is positively related with their life satisfaction.

O'Neill et al.'s study of 150 nations (2018) not only found a positive relationship between the use of environmental resources and life satisfaction, but they also found that the more environmental resources are used, the slower the rate of the increase in life satisfaction. We have no reason to assume that this will be different for individuals as compared to countries. Since income and carbon footprint are linked (Baiocchi et al., 2010; Bruderer Enzler & Diekmann, 2019; Büchs & Schnepf, 2013; Notter et al., 2013), we assume that satisfaction also increases with resource use at a decreasing rate at the individual level. Due to the diminishing marginal utility of consumption, increases in consumption will affect life satisfaction to a lesser extent at high levels of consumption than at low levels. This leads us to our second hypothesis:

Hypothesis 1b People's resource use increases their life satisfaction but it does so at a declining rate: the more resources they use, the slower the increase in life satisfaction.

2.2 Resource Use and Life Satisfaction in and Around RNPs

Given the challenges posed by climate change, RNPs in Switzerland can be considered as model regions for sustainable development (Hammer et al., 2016; UNESCO, 2017). Pilot projects in RNPs are used to test new sustainable infrastructure (e.g. bicycle roads), with the results of these projects then used to guide the expansion of sustainable infrastructure throughout Switzerland (Hammer et al., 2016). Evidence that RNPs do more than non-RNP areas to promote sustainable development and environmental education, which in turn can influence ecological behavior (Bruderer Enzler & Diekmann, 2019; Kennedy et al., 2015; Moser & Kleinhückelkotten, 2018), leads us to conjecture that park inhabitants use fewer environmental resources than people living in regions where these efforts are not made.

Spatial factors (Brereton et al., 2008), climate, and air pollution (Cuñado & De Gracia, 2013) are also significant determinants of well-being. Evidence indicates that infrastructure can be designed in accordance to have a positive influence on well-being (Brereton et al., 2008; Sarmiento et al., 2022), and significant differences by region have been observed in this regard (Sarmiento et al., 2022). According to several studies, high-quality landscapes and ecosystems contribute to greater well-being in terms of mental and physical health (Abraham et al., 2010; Bieling et al., 2014; Bignante, 2015; Carrus et al., 2015; Skärbäck, 2007; Summers et al., 2012). Moreover, in line with the aims of the park label, the promotion of sustainable local economies could prevent the aging of society in rural areas, due to the phenomenon of rural exodus. Economic development also fulfills basic needs and can thus—at least up to a certain level—contribute to life satisfaction (Max-Neef, 1995). In addition, regions are nominated for the RNP label because they have a special cultural heritage, which can induce a sense of identity. For example, the participation of local actors in park management activities can be expected to strengthen inhabitants' regional identity (Federal Office for the Environment 2019). Both cultural heritage (Hammer et al., 2011) and identity (Lengen, 2016) have been shown to contribute to people's life satisfaction. On this basis, we anticipate that the life satisfaction of park inhabitants will be higher than that of people living in comparable non-park regions. This leads us to our next hypothesis:

Hypothesis 2a People living in RNPs exhibit lower use of resources and higher life satisfaction than people living in comparable non-park regions.

Based on the current state of research, we assume that certain factors moderate (i.e. affect the strength of) the relationship between individuals' resource use and their life satisfaction. Verhofstadt et al. (2016) suggest that an environmentally friendly diet and not using electricity for heating simultaneously decrease individuals' resource use and increase their life satisfaction. In addition, empirical studies (O'Neill et al., 2018) and theoretical work (Schneidewind, 2013) suggest that infrastructure helps individuals adopt behaviors that reduce resource use. We expect that these factors not only affect resource use and life satisfaction directly but can also act as moderators of the relationship between the two constructs. The goals of RNPs include promoting local seasonal products (e.g. through marketing and development of product labels), renewable energy (e.g. through cooperation with municipalities, energy forums and providers, scientists, and other experts in park management), landscape and nature (e.g. through voluntary work, co-work with agriculture and forestry organizations, nature excursions, and nature

conservation zones), and footpaths and cycle routes (e.g. through the initiation and maintenance of co-work with municipalities and forestry organizations). We thus expect these efforts to affect people's lives in RNPs. Based on these arguments, we formulate our next hypothesis:

Hypothesis 2b The positive relationship between resource use and life satisfaction will be weaker for people living in RNPs than for people living in comparable, non-park regions.

2.3 RNP Age as a Moderator of the Relation Between Resource Use and Life Satisfaction

The study areas in our sample are three Swiss RNPs: Gantrisch Nature Park (GNP), Jurapark Aargau (JPA), and UNESCO Biosphere Entlebuch (UBE). The UBE is the oldest of the three RNPs. It received the "UNESCO Biosphere Reserve" label in 2001, became an RNP in 2008, and has been pursuing activities since 1998. The GNP and the JPA were both established in 2012. The UBE is thus 14 years older than the other two RNPs. Accordingly, we expect the UBE to exhibit stronger effects on inhabitants' resource use and life satisfaction than the GNP and the JPA. In accordance with the argument leading up to hypotheses 2a and 2b, we state our last two hypotheses:

Hypothesis 3a People living in the UBE exhibit lower resource use and higher life satisfaction than people living in the GNP and the JPA.

Hypothesis 3b The positive relationship between resource use and life satisfaction will be weaker for people living in the UBE than for people living in the GNP and the JPA.

3 Materials and Methods

We conducted an analysis of survey data to test our hypotheses. The survey data were collected by means of a postal and online survey in the three RNPs and in the surrounding control regions in 2019. The following sections describe the study areas, the data collection procedure, the data, and the analyses we conducted.

3.1 Study Areas

The three RNPs are the GNP, JPA, and the UBE. UNESCO biosphere reserves in Switzerland are subsumed under the RNP label. The three RNPs are comparable as they are located at the edge of the Swiss Plateau (see Fig. 1), are easily accessible from densely populated conurbations, and have a high population density compared to smaller alpine RNPs (e.g. 167.63 people per square kilometer in JPA) (Wiesli et al., 2022). These are typical features of RNPs in Europe. Accordingly, this selection of study areas makes it likely that the results of this study can be generalized to other Swiss and European parks.

Another reason to choose these three RNPs was their difference in age. Since we hypothesized that the age of an RNP has a moderating effect on the relationship between resource use and life satisfaction (see Hypotheses 3a and 3b), we chose to include the oldest existing RNP in Switzerland, the UBE. However, with 17,600 inhabitants, the

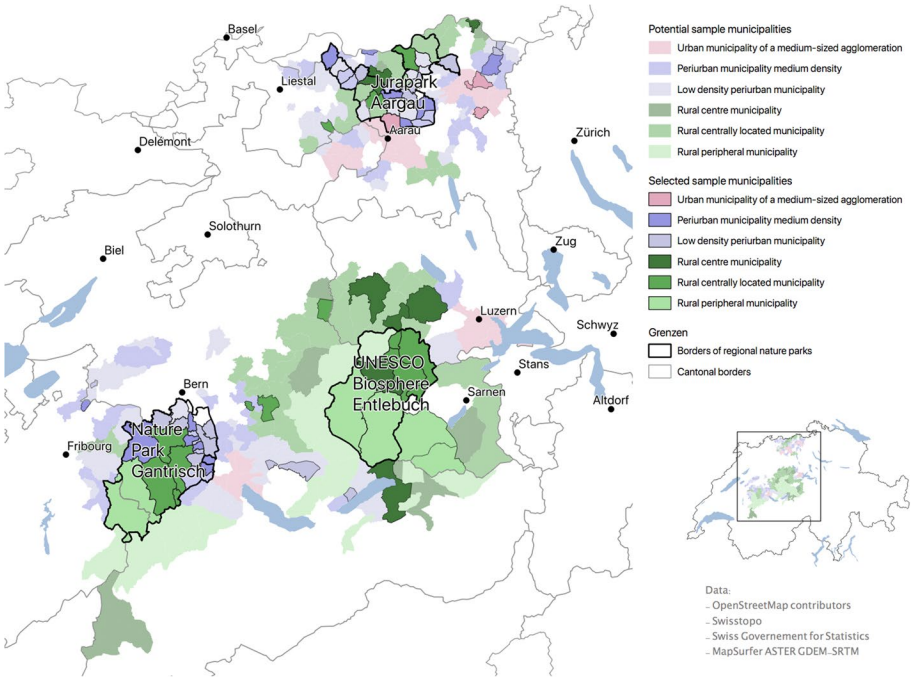

Fig. 1 Location of the RNPs and the control group (light colors). Source: Open Street Map Contributors, Swisstopo, ESRI. Map: Anon

UBE also has the smallest population of the three RNPs (Wiesli et al., 2022). It covers an area of 394 km^2, which is less than the GNP and more than the JPA. According to the Swiss government's typology of municipalities, the seven municipalities of the UBE are central rural and peripheral rural municipalities (Federal Statistical Office, 2012). The UBE thus has a decidedly rural character within the Swiss context. However, the UBE is located near the city of Luzern.

With 46,500 inhabitants, the GNP has the largest population of the three RNPs (Wiesli et al., 2022). Its 20 municipalities include peri-urban municipalities with medium and low population densities, as well as central rural and peripheral rural municipalities (Federal Statistical Office, 2012). The GNP is located near the city of Bern.

The JPA covers an area of 245 km^2 and has a population of 40,400 (Wiesli et al., 2022). Its 28 municipalities include peri-urban municipalities of medium density, central rural municipalities, and medium-sized urban municipalities (Federal Statistical Office, 2012). In contrast to the other two RNPs, the JPA is more strongly characterized by urban agglomeration. The JPA is located near Zurich, the most highly populated city in Switzerland.

The control group consists of people living in municipalities around the three RNPs (see Fig. 1). Their data serve to show differences between park residents and non-park residents and to verify the influence of the RNP status on resource use and life satisfaction. To ensure comparability between the two groups, the non-park municipalities were selected so that the municipality types, the cantons, and the language spoken (German)

matched those within the RNPs. Apart from these criteria, the control municipalities were selected randomly. Their degrees of urbanization and population densities are similar to those of the park municipalities, according to the typology of the Swiss Federal Statistical Office (2012). All of the sampled municipalities are shown in Fig. 1.

3.2 Sampling

In the GNP, the JPA, and the control regions, we first sampled the municipalities and then drew a random sample of the adult population (Wiesli et al., 2022). In the UBE, due to the small number of municipalities, we selected all municipalities. In line with the Swiss municipality typology of 2012 (Federal Statistical Office, 2012), we grouped the municipalities according to their degree of urbanization and their population density (Wiesli et al., 2022). Stratified sampling was then applied to each municipality type, meaning that the sample size was proportional to the total population of the relevant municipality type.

The study was described to respondents living in the RNPs as investigating the quality of life in the park, and to respondents living in the control regions as investigating the quality of life in the given region (Wiesli et al., 2022). The ecological topic was not mentioned in the postal letter or in the online project description, in order to avoid the inclusion of a disproportionate number of people with an above-average interest in environmental topics. One reminder was sent. The resulting response rate was 25% ($n=3358$) (Wiesli et al., 2022). The returned questionnaires covered an average of 3% of the population in the three parks.

The mean age of the sample was 50.8 years in the RNPs ($n=2409$) and 51.4 years in the control regions ($n=949$) (Wiesli et al., 2022) (see Table 2). The majority of participants were female, both in the RNPs (53.04%) and in the control regions (53.6%). About one-quarter of participants in the RNPs (24.4%) and control regions (25.8%) were housewives or househusbands. 43.1% of the park sample and 42.9% of the control group sample had completed an apprenticeship as their highest level of education. Moreover, 16.6% of the RNP sample and 17.2% of the control group sample worked in the service sector, and 12% of the RNP sample and 11.2% of the control group sample worked in education or the social sector. Finally, in the park sample, 73.05% were employed and 6.55% were retired, while in the control group sample, 72.3% were employed and 7.2% were retired.

Official statistics on gender and age in the park municipalities show that our sample is comparable to the park population in these respects (see Table 2) (Federal Statistical Office, 2016). Data on education and employment were not available at the municipality level, so we can only compare our sample to the whole of Switzerland. Our sample resembles the Swiss population in both regards: 40% of people living in Switzerland have an apprenticeship as their highest qualification, and 68.1% are employed (Federal Statistical Office 2016).

3.3 Life Satisfaction

The main outcome variable was respondents' general life satisfaction ("How satisfied are you with your life in general?"), measured on a scale from 0 (="not at all satisfied") to 10 ="fully satisfied"). To validate this variable, we created a global index of satisfaction including 21 items ($M=7.98$, Cronbach's $\alpha=0.837$, $n=3358$) relating to satisfaction with specific areas of life (e.g. "How satisfied are you with your job?"), measured on the same 11-point scale as general life satisfaction. We calculated the relationship between the general life satisfaction variable and the global index by using Spearman correlation and ordinary

Table 1 Correlation using Spearman and OLS regression to validate the resource use indicator with the carbon footprint

	Satisfaction					Resource use				
	a	b		c		d	e		f	
	r	Coef	SE	Coef	SE	*r*	Coef	SE	Coef	SE
Satisfaction index (21 variables)	0.505***	0.697***	0.020	0.674***	0.333					
Carbon footprint [kg CO_2 eq.] (log.)						0.177***	1.078***	0.168	1.242***	0.188
Age (years)				0.006**	0.002				− 0.017*	0.008
Gender (female = 1)				0.122*	0.059				− 0.733***	0.209
Household income (in 10 CHF)				0.002*	0.001				− 0.012***	0.003
Education (years)				0.002	0.015				− 0.108*	0.052
Swiss passport (yes = 1)				− 0.214	0.120					
Parent (yes = 1)									− 0.062	0.244
Constant		2.785	0.165	2.642***	0.340		1.156	1.465	3.280	1.767
Number of observations	3303	3303		1189		1358	1358		1202	
Adjusted R^2		0.260		0.283			0.029		0.061	

The table lists Spearman correlation in Model a, a simple OLS regression in Model b, and a multiple OLS regression in Model c, with general life satisfaction as the outcome variable and a global index of satisfaction composed of 21 items of satisfaction with several life areas as income variable (***$p < 0.001$, **$p < 0.01$, *$p < 0.05$). Model d presents a Spearman correlation, Model e a simple OLS regression, and Model f a multiple OLS regression with a proxy of resource use, measured by lifestyle descriptions as the outcome variable and the carbon footprint as the income variable

Table 2 Descriptive statistics of the variables included in the regression models

	Full sample			Park sample			Park population			Control group sample		
	M	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*
Satisfaction (0–10)	8.36	1.34	3328	8.38	1.32	2387	–	–	–	8.31	1.39	941
Resource use (1–21)	10.44	3.58	2782	10.49	3.60	2001	–	–	–	10.31	3.53	781
Age (years)	51.41	17.60	3358	50.85	17.55	2409	49.6	7.2	78,939	51.41	17.75	949
Gender (female = 1)	0.53	0.50	3347	0.53	0.50	2400	0.50	–	78,939	0.54	0.50	947
Single household (no = 1)	0.86	0.34	3308	0.87	0.34	2370	–	–	–	0.86	0.35	938
Household income per month (in CHF 10)	371	183.94	2822	371.35	184.60	2012	–	–	–	370.40	182.40	810
Education (years)	12.58	2.27	3312	12.61	2.29	2383	–	–	–	12.50	2.22	929
Swiss passport (yes = 1)	0.92	0.28	3297	0.91	0.28	2354	–	–	–	0.92	0.26	943
Parent (yes = 1)	0.66	0.47	3349	0.66	–	2403	–	–	–	0.67	0.47	946
Residence duration (years)	31.44	20.4	3301	31.20	20.50	2368	–	–	–	32	20.3	933
Environmental concern	2.95	0.57	3300	2.95	0.57	2367	–	–	–	2.94	0.57	933

The number of observations (*n*) in the samples corresponds to the sample before multiple imputations. After multiple imputations, the number of observations (*n*) including imputed cases in the OLS models is 3005 (see Tables 3–5)

least squares (OLS) regression (see Table 1). Since the correlation coefficient ($r = 0.505$, $p < 0.001$) and the coefficients from simple ($b = 0.697$, $p < 0.001$) and multiple OLS regressions ($b = 0.674$, $p < 0.001$) were positive and statistically significant, we conclude that our single variable of general life satisfaction is a valid measure of life satisfaction. The control variables included in the OLS regression are known to influence individuals' life satisfaction (e.g. Frey & Stutzer, 2018). In our models, age, gender, and household income confirm other studies and influence life satisfaction significantly (see Table 1). Variables of education (years of education) and residency status (whether or not individuals are in possession of a Swiss passport) do not have a statistically significant influence on our findings.

We furthermore conducted an exploratory factor analysis (EFA) with the 21 items used to create the global index. These items loaded on two factors, one measuring satisfaction with infrastructure (e.g. public transport) and another measuring satisfaction with the respondent's financial situation (e.g. cost of housing). We conducted additional analyses with these two factors, instead of general life satisfaction, as the outcome variable, in order to compare and validate our main results. These additional analyses are reported in Appendix A.

3.4 Resource Use

The main explanatory variable was an indicator of resource use ($n = 2782$). This variable was constructed on the basis of three vignettes that were presented to every respondent. These vignettes contained short lifestyle descriptions focusing on the most resource-intensive behaviors at the individual and household levels in countries such as Switzerland. According to the carbon footprint calculation of the World Wide Fund for Nature (WWF, 2019), these behaviors relate to mobility, housing, and nutrition. For example, vignette C described a lifestyle with high resource use and read as follows:

> *Person C lives in a spacious house in the countryside and appreciates having a lot of space. In terms of energy sources for the house, the person mainly uses electricity from mixed sources and gas for heating. […] He/she enjoys traveling to warm countries and flies to South Africa once a year. His/her goal is to see New Zealand soon […].*

Vignettes A and B described lifestyles with low and medium resource use, respectively. The survey participants were asked to indicate, on an 11-point scale from 0 (= *"does not apply"*) to 10 (= *"applies"*), to what degree each of the three lifestyles applied to them. We excluded 142 cases in which respondents scored less than four on all three vignettes in total, as these did not provide sufficient information on respondents' resource use. We created the indicator of resource use by subtracting the vignette A item (low resource use) from the vignette C item (high resource use) and adding 11 so that the resulting variable of resource use ranged from 1 (= lowest resource use) to 21 (= highest resource use).

Furthermore, we calculated a shortened version of the carbon footprint for a subsample of our survey participants ($n = 1526$). This variable was calculated for each respondent based on a procedure developed for WWF (2019) by Jungbluth and Meili (2017). In contrast to the calculation by WWF, we only included the consumption categories of mobility, shelter, and food (Jungbluth et al., 2011).[1] To obtain the corresponding data,

[1] The complete WWF calculation includes carbon emissions from non-food consumption, services, cruises, construction of houses, and the relative proportions of seasonal and non-seasonal food.

participants were asked to provide information about their behavior relating to these three categories (e.g. "Do you use a car or motorbike in your private life?", "How big is your apartment/house?", "Which of the statements below describes your diet? Meat or fish daily, …weekly", etc.). The carbon footprint of nutrition was calculated as a function of the consumption of meat and dairy products. The carbon footprint of mobility was calculated as a function of kilometers traveled by private transport (e.g. car), by public transport (e.g. train), and by air. The carbon footprint of shelter was calculated as a function of the respondent's living space, the type of heating, and the number of people in the household. Based on the combination of these categories, the estimated carbon footprint expressed in annual kg of CO_2 equivalents was calculated for each respondent in this subsample.

However, since the carbon footprint variable contained significantly fewer cases than the full sample, we only used it to validate our vignette-based indicator of resource use. We calculated the relationship between the log-transformed carbon footprint variable and the indicator of resource use by using Spearman correlation and OLS regression (Table 1). Since the correlation coefficient ($r = 0.177$, $p < 0.001$) and the coefficients from simple ($b = 1.078$, $p < 0.001$) and multiple OLS regressions ($b = 1.241$, $p < 0.001$) were positive and statistically significant, we conclude that our vignette-based indicator is a valid measure of resource use.

The control variables included in the OLS regression are known to influence individuals' resource use (e.g. Bruderer Enzler & Diekmann, 2019; Diekmann & Preisendörfer, 2001). Age, gender, household income, and years of education influence resource use significantly. The variable indicating whether the respondent had children does not have any significant influence.

3.5 Control Variables

When testing our hypotheses by means of multiple regression, we controlled for age, gender, household size and income, education, and whether the respondent was a Swiss citizen (Table 2). According to Frey and Stutzer (2018), on average, women are slightly more satisfied with their lives than men, younger and older people are more satisfied with their lives than middle-aged people (suggesting a u-shaped relation between age and life satisfaction), nationals are more satisfied with their lives than foreigners, and people living in collective households are more satisfied with their lives than people living in single households. The influence of income on life satisfaction is controversial. Life satisfaction does not increase gradually and infinitely with rising income (Frey & Stutzer, 2018). Nevertheless, Frey and Stutzer summarized that people with high incomes reported higher satisfaction than people with low incomes. In our sample, income was assessed as gross household income, in income classes (e.g. CHF 4001–6000 = class 3). This ordinal variable was recoded into a continuous variable using category means and divided by 10 to simplify interpretation in the OLS regression models.

In addition, we controlled for parenthood, assuming that individuals choose their place of residence based on their family life and assuming that parenthood influences individuals' resource use. We also controlled for participants' period of residence, as we assumed that the period of residence would be related to individuals' life satisfaction (possibly due to a selection effect).

Furthermore, we used respondents' level of environmental concern as an explanatory variable (Table 2). Environmental concern was measured by a set of items capturing the affective, cognitive, and conative dimensions of environmental concern, as suggested by

Diekmann and Preisendörfer (2001). In our case, six items (e.g. "Politics in our country does far too little for environmental protection") were combined into one index ($M=2.9$, Cronbach's $\alpha=0.80$, $n=3300$). Higher values indicate higher environmental concern.

3.6 Dealing with Missing Cases

Since the variable household income contained 536 missing values (15.96%) and our vignette-based indicator of resource use contained 576 missing values (17.15%, not including the 142 we excluded from the outset), we conducted multiple imputations using the statistics software Stata (Allison, 2001). After excluding cases with missing values in categorical variables, such as the index of the municipality in which the respondent lived, we used the multivariate normal model for data augmentation and included all variables used in the final analytical models: that is, the dependent and independent variables and all control variables. We imputed 30 (m) datasets. Higher imputations were no longer able to increase relative efficiency ($RE=0.99$). In order to test the robustness of our results based on imputed values, we also fitted OLS regression models without imputations. These additional analyses are reported in Appendix B. We found no substantial differences between the results with and without multiple imputations.

3.7 Data Analysis Strategy

We tested our hypotheses regarding the association between resource use and general life satisfaction and its functional form using OLS regression models with cluster-robust standard errors, accounting for clustering at the municipality level. We used $\alpha=5\%$ as the cut-off for statistical significance for two-sided tests. First, we conducted a simple OLS regression to obtain the relationship between resource use and life satisfaction, which is postulated as a positive relationship in Hypothesis 1a. To test whether the positive relationship increases at a decreasing rate, as postulated in Hypothesis 1b, we compared multiple OLS regression models including control variables with and without log-transformed independent variables. To test the difference between the RNPs and the control regions, as postulated in Hypothesis 2a, we included a binary variable that distinguished between park and non-park regions (0 = control region, 1 = park) as an independent variable. We used one model to test the difference in life satisfaction and another model to test the difference in resource use between the RNPs and the control regions. To test whether the relationship between resource use and life satisfaction was weaker for park inhabitants than for individuals living outside the RNPs (Hypothesis 2b), we tested the interaction between these variables in another model by multiplying the park/non-park dummy with the resource use variable (park/non-park × resource use). To identify explanations for the results regarding our hypotheses, we included environmental awareness as an independent variable. To test Hypotheses 3a and 3b, we used the categorical variable indicating the region (the UBE, GNP, JPA, or control regions) and tested its interaction with the resource use variable, respectively. In addition, we fitted models with factors computed by an EFA to test the relations between specific areas of satisfaction, such as infrastructure and personal financial situation, and resource use. These additional analyses are reported in Appendix A.

Table 3 OLS regression models of life satisfaction with and without log transformation of the resource use variable

	Life satisfaction							
	M1		M2		M3 (log.)		M4 (log.)	
	Coef	SE	Coef	SE	Coef	SE	Coef	SE
Resource use (1–21)	−0.032***	0.007	−0.032***	0.007	−0.287***	0.061	−0.277***	0.065
Age (years)			−0.012	0.008			−0.012	0.008
Age × age			0.000**	0.00008			0.000*	0.000
Gender (female = 1)			0.116**	0.048			0.115*	0.048
Single household (no = 1)			0.368**	0.128			0.365**	0.128
Household income per month (in CHF 10)			0.001	0.001			0.001	0.001
Education (years)			0.005	0.012			0.005	0.012
Swiss passport (yes = 1)			0.075	0.098			0.079	0.098
Parent (yes = 1)			0.119	0.074			0.116	0.074
Residence duration (years)			0.001	0.002			0.001	0.002
Environmental concern			−0.128*	0.059			−0.125*	0.059
Constant	8.699***	0.067	8.386***	0.259	9.021***	0.132	8.670***	0.415
Number of observations	3005		3005		3005		3005	
Number of clusters	54		54		54		54	
Adjusted R^2	0.007		0.037		0.008		0.037	

The table lists coefficient estimates and cluster-robust standard errors (***$p < 0.001$, **$p < 0.01$, *$p < 0.05$) for two-sided tests of simple and multiple OLS regression models with multiple imputations of missing values. The outcome variable is life satisfaction. In models 3 and 4 the satisfaction variable is log-transformed. The income variable of all four models is resource use. The number of clusters corresponds to the number of municipalities

4 Results

Table 3 reports the results of four OLS regression models examining the relationship between individuals' resource use and life satisfaction. The result of the simple OLS regression (M1) shows that, contrary to Hypothesis 1a, the relationship is negative ($b = -0.032$, $p < 0.001$). This result does not change substantially when multiple regression is used (M2). A 10-point increase in the vignette-based measure of resource use (about half the scale) decreases the index of life satisfaction by 0.32 points. Although statistically significant, this coefficient evidences a substantially weak relationship. The additional analyses with OLS models using satisfaction with infrastructure, satisfaction with work and financial matters, and the global index of satisfaction as outcome variables support this finding (see Appendix A). These results led us to reject Hypothesis 1a.

Table 4 OLS regression models for resource use and life satisfaction and park and non-park regions, including park/non-park x resource use as an interaction term

	Life satisfaction				Resource use	
	M5		M6		M7	
	Coef	SE	Coef	SE	Coef	SE
Resource use (1–21)			−0.031	0.015		
Lives in park (yes = 1)	0.057	0.059	0.074	0.185	0.145	0.200
Resource use × lives in park			−0.001	0.017		
Age (years)	−0.010	0.008	−0.012	0.008	−0.063*	0.028
Age × age	0.000**	0.000	0.000**	0.000	0.001	0.000
Gender (female = 1)	0.128 **	0.049	0.116**	0.048	−0.358*	0.136
Single household (no = 1)	0.370**	0.129	0.367***	0.128	−0.090	0.266
Household income per month (in CHF 10)	0.002	0.001	0.001	0.001	−0.008**	0.003
Education (years)	0.007	0.012	0.004	0.012	−0.071	0.038
Swiss passport (yes = 1)	0.099	0.101	0.077	0.098	−0.673*	0.274
Parent (yes = 1)	0.129	0.073	0.119	0.074	−0.303	0.205
Residence duration (years)	0.001	0.002	0.001	0.002	0.005	0.005
Environmental concern	−0.088	0.058	−0.128*	0.058	−1.239***	0.146
Constant	7.770***	0.365	8.337***	0.419	18.041***	0.848
Number of observations	3005		3005		3005	
Number of clusters	54		54		54	
Adjusted R^2	0.030		0.036		0.071	

The table lists coefficient estimates and cluster-robust standard errors (***$p < 0.001$, **$p < 0.01$, *$p < 0.05$) for two-sided tests of simple and multiple OLS regression models with multiple imputations of missing values. The outcome variable of M5 and M6 is life satisfaction. The outcome variable of M7 is resource use. The income variable is the region (park and non-park). M6 includes the interaction term of resource use and respondents living in RNPs (= 1) or in the control regions (= 0). The number of clusters corresponds to the number of municipalities

The rejection of Hypothesis 1a made testing Hypothesis 1b obsolete. Instead, and because the relationship turned out to be negative, we tested whether the relationship between resource use and life satisfaction decreases at a decreasing rate. Since the log transformation of the resource use variable (M3 and M4) does not substantially improve model goodness of fit, we did not find support for this ad hoc hypothesis either (adj. R^2 of M1 = 0.007 and adj. R^2 of M3 = 0.008, adj. R^2 of M2 = 0.037 and adj. R^2 of M4 = 0.037).

The results for most of the control variables included in the multiple regression models M2 and M4 in Table 3 are in line with our expectations, as derived from other studies and theories. Female respondents were more satisfied with their lives than male respondents, younger and older people were more satisfied with their lives than middle-aged people (the negative coefficient of age and the positive coefficient of age squared indicates a u-shaped relation between age and life satisfaction), and people living in collective households were more satisfied with their lives than people living in single households. Environmental concern shows a negative relationship with life satisfaction. However, contrary to previous studies, we found no evidence that nationals (owning a Swiss passport) are more satisfied

than foreigners or that education, parenthood, household income, or the residence duration are related to life satisfaction.

Table 4 reports the results of the OLS regressions testing whether the resource use of people living in RNPs is smaller and their life satisfaction higher than those of people living in comparable non-park regions, as postulated in Hypothesis 2a. The multiple regression model M5 shows an insignificant relationship between regions (park and non-park) and life satisfaction. The relation between regions and resource use shown in model M7 is also insignificant. This finding is corroborated by the additional analyses of the relationships between regions and satisfaction with infrastructure, satisfaction with work and financial matters, and the global index of satisfaction. The effects are not significant for these alternative operationalizations of satisfaction either (see Appendix A). These results indicate that the resource use of individuals in RNPs is not lower and that their life satisfaction is not higher than in the control group. This leads us to reject Hypothesis 2a.

Hypothesis 2b suggested a weaker positive relationship between resource use and life satisfaction for park inhabitants than for individuals living outside RNPs. Given that we found a negative relationship between the two variables (Table 3), we tested whether this negative relationship was stronger for park inhabitants than for the control group. M6 in Table 4 presents the results of the interaction model. The interaction term (park/non-park × resource use) is not significant, meaning that there is no support for our hypothesis of either a weaker positive or a stronger negative relationship between resource use and life satisfaction for park inhabitants as compared to individuals living outside RNPs.[2]

Table 5 provides the results of the OLS regressions testing whether the resource use of individuals in the UBE is lower and their life satisfaction higher than those in the GNP and JPA (Hypothesis 3a). The results of M8 indicate a significant difference in resource use between the UBE and the two other RNPs. On the 21-point scale of our resource use variable, the JPA scores 0.634 points lower and the GNP scores 0.639 points lower than the UBE.

Model M9 indicates a significant difference between the UBE and the JPA in terms of life satisfaction. On the 11-point scale of the satisfaction variable, the JPA scores 0.219 points lower than the UBE. We found no evidence for a difference in life satisfaction between the UBE and the GNP. Based on these results, we reject Hypothesis 3a: although life satisfaction is higher in the UBE than in the JPA, so is resource use.

Hypothesis 3b suggests that the strength of the positive correlation between resource use and life satisfaction would be moderated by the age of the RNPs. The two models with interaction terms included (M10, M11) do not substantially differ in terms of effects or significance (with and without control variables). In both models, the interaction terms are not significant. Thus, the strength of the relationship between resource use and life satisfaction is not moderated by the age of the RNPs, and Hypothesis 3b must be rejected.

[2] The p-value of the coefficient of resource use in M6 is insignificant ($b = -0.031$, $p = 0.052$). This can be explained by the interaction term, which drains the power of the model. If the interaction term is removed, the coefficient is significantly negative ($b = -0.032$, $p < 0.001$), as in model M2, for example.

Table 5 OLS regression models for resource use and life satisfaction, including the three regional nature parks (and the control group) x resource use as an interaction term, clustered by municipalities

	Resource use		Life satisfaction					
	M8		M9		M10		M11	
	Coef	SE	Coef	SE	Coef	SE	Coef	SE
Resource use (1–21)					−0.018	0.011	−0.020	0.011
UBE (ref. cat.)								
JPA	−0.634*	0.257	−0.219**	0.064	0.086	0.173	−0.007	0.169
GNP	−0.639*	0.297	−0.082	0.059	0.133	0.136	0.060	0.132
Control group	−0.560*	0.236	−0.151*	0.070	−0.030	0.190	−0.077	0.200
Resource use variable x the four regions								
JPA					−0.031	0.017	−0.026	0.017
GNP					−0.022	0.014	−0.016	0.014
Control group					−0.013	0.018	−0.010	0.019
Age (years)							−0.011	0.00008
Age x age							0.000*	0.000
Gender (female = 1)							0.110*	0.048
Single household (no = 1)							0.373	0.127
Household income per month (in CHF 10)							0.002	0.001
Education (years)							0.007	0.012
Swiss passport (yes = 1)							0.052	0.094
Parent (yes = 1)							0.116	0.071
Residence duration (years)							0.000	0.002
Environmental concern							−0.116	0.059
Constant	10.915***	0.166	8.478***	0.052	8.671***	0.099	8.305***	0.381
Number of observations	3005		3005		3005		3005	

Table 5 (continued)

	Resource use		Life satisfaction					
	M8		M9		M10		M11	
	Coef	SE	Coef	SE	Coef	SE	Coef	SE
Number of clusters	54		54		54		54	
Adjusted R^2	0.004		0.002		0.010		0.041	

The table lists coefficient estimates and cluster-robust standard errors (***$p < 0.001$, **$p < 0.01$, *$p < 0.05$) for two-sided tests of simple and multiple OLS regression models with multiple imputations of missing values. The outcome variable of M8 is the resource use indicator. The outcome variable of M9 to M11 is life satisfaction. The income variable of M8 and 9 represents the regions. M10 and 11 include resource use as the income variable and the interaction term of resource use and the four regions. The number of clusters corresponds to the number of municipalities

5 Discussion and Conclusion

The aim of this study was to investigate whether RNP status affects resource use, life satisfaction, and the relationship between the resource use and life satisfaction of RNP inhabitants. Also, the moderating effect of the age of RNPs on the relationship between resource use and life satisfaction was examined. Contrary to existing literature showing that the establishment of protected areas is positively related to the well-being of the inhabitants of these areas (Bonet-García et al., 2015), we find no significant differences in resource use or life satisfaction between people living in RNPs and people living in comparable, non-park regions—either overall or for the three investigated RNPs separately. Moreover, contrary to theoretical arguments (Schor, 2001; Veblen, 1973) and empirical evidence (Lenzen & Cummins, 2013; Wang et al., 2015) suggesting a positive relationship between resource use and life satisfaction, our results indicate a statistically significant, albeit substantially small, negative relationship between resource use and life satisfaction. We also do not find support for the hypothesis that the relationship between resource use and life satisfaction is moderated by the age of RNPs. Although people living in the oldest RNP (the UBE) score higher on life satisfaction, their resource use is also higher on average.

What conclusions can we draw given that we did not find the expected differences in resource use and life satisfaction between RNPs and control regions? On the one hand, one interpretation of our results can be that the activities of the RNPs have an effect on resource use and life satisfaction beyond the parks' borders. The nearby control regions might benefit from the RNPs' activities, and therefore the two types of areas will not significantly differ in regard to the relation between resource use and life satisfaction. On the other hand, the insignificant result can be interpreted as suggesting that the activities of the RNPs are not sufficiently effective to affect individuals' lives to a greater extent than those in other areas, or else that these activities are not of the kind that are capable of affecting individuals' lives. Here it is worth observing that important factors relating to individuals' life satisfaction, such as social relations and equality (e.g. Wiesli et al., 2021), might not be influenced by RNPs, since these factors are not a specific target of RNP activities (Federal Office for the Environment, 2019), which mostly focus on nature and landscape conservation. Moreover, the activities that are carried out in RNPs are restricted by the limited financial and staff resources of RNP management.

It might be expected that the RNPs' activities regarding environmental education should influence park inhabitants' intentions and behavior so as to induce them to use fewer resources than individuals living in the control regions, as we argued. However, our insignificant result seems not to confirm this hypothesis. In seeking to understand our result, it is worth bearing in mind that although environmental education and knowledge are important prerequisites for resource-saving behavior, empirical studies have repeatedly found that environmental education and knowledge do not necessarily affect resource-saving behavior (Kollmuss & Agyeman, 2002; Liobikienė & Poškus, 2019; Tofighi & Jackson, 2022). People tend to focus on behavior (i.e. sorting waste) that has a relatively low impact on resource-saving (Moser & Kleinhückelkotten, 2018). To lead individuals to lower their resources use in an effective and ecologically beneficial way it is important for environmental education to enable individuals to get knowledge about the ecologically relevant life areas and the behaviour that reduces their resource use in an efficient way. Importantly, government regulations and incentives, as well as infrastructure—for example, renewable energies or public transport—should elicit this ecologically beneficial behavior (Brand & Wissen, 2021). In regard to RNPs, such regulations and incentives are beyond their remit,

as they require political and legal processes. Thus, although RNPs can initiate infrastructure projects, such as hiking or cycling routes, and can indirectly influence the development of sustainable infrastructure (for example, by their advice to and co-work with responsible bodies such as municipalities), they have so far limited possibilities to directly provide infrastructure.

What can we conclude from the finding that resource use and life satisfaction are weakly negatively related? According to Inglehart, individuals' pursuit of materialistic values decreases as a society becomes more prosperous (Inglehart, 2015). In Switzerland, both average life satisfaction and household income per capita are above the OECD average (OECD, 2020). In our studied regions, social status might therefore no longer be achieved through obtaining material goods (Veblen, 1973), and individuals may thus no longer strive extensively to obtain material goods (Inglehart, 2015). Excessive consumption might even be associated with negative values in certain societies and lead to social disapproval—also due to people's increasing awareness of the negative impacts such consumption has on the environment and climate. Rejection by social peers might decrease individuals' satisfaction.

Our study does not show whether there is a causal relation going from higher satisfaction to lower resource use. However, assuming that the negative relation between resource use and life satisfaction is due to a decrease in materialistic values and the social disapproval of excessive consumption, the maintenance of a high level of life satisfaction would achieve a double social gain. For policy- and decision-makers, this means that efforts to maintain individuals' life satisfaction at a high level by means of non-material qualities could further reduce individuals' desire for consumption and resource use.

A further explanation for the negative relationship between resource use and life satisfaction could be that people with higher incomes also spend much of their time working. Several findings indicate that too high a workload, and associated work pressure, can reduce life satisfaction (e.g. Amagasa & Nakayama, 2013; Hsu et al., 2019; Zadow et al., 2021). Moreover, many empirical studies suggest that high income is linked to high resource use (e.g. Bruderer Enzler & Diekmann, 2019). Thus, an interpretation of our result could be that working less decreases resource use and increases life satisfaction. However, the discussion on whether part-time work, as compared to full-time work, significantly leads to higher life satisfaction is controversial (e.g. Logan et al., 1973; Montero & Rau, 2015).

Our study has some limitations. Due to the scope of the survey, we cannot compare our measures of resource use and life satisfaction with other regions of Switzerland that are further away from the selected RNPs. Moreover, our selection of control groups in non-park regions was restricted by the criterion of being neither too different nor too similar to the park regions. The geographical proximity made it harder to find significant differences in the relationship between resource use and life satisfaction across the regions we studied. Future surveys should compare resource use and life satisfaction in park regions with the averages of statistically similar populations in regions of Switzerland that are located further away from the selected park regions. Such a comparison would allow us to ascertain whether the first (positive) or the second (negative) explanation for our findings is more plausible. If, in regions located further away, the average resource use is higher and the average life satisfaction lower, it would mean that our null finding results from a spillover effect. If the averages are the same, or if resource use is higher and life satisfaction lower in the RNPs, it would instead mean that our null finding provides evidence that RNP activities have no effect on the relationship between resource use and life satisfaction.

Further studies, going beyond the scope of the present study, could, for example, compare urban and rural areas and give insights into social or cultural differences that might explain the negative relation between life satisfaction and resource use. Moreover, future research could address the role of individuals' participation in the RNPs and their effects on resource use and life satisfaction. Research has shown that community participation and the resulting identification with sustainable development and nature protection in, for example, UNESCO Biospheres is crucial for promoting sustainable development and nature protection (Berghöfer & Berghöfer, 2006; Cohen-Shacham et al., 2019; Jordan & Adger, 2009; Stoll-Kleemann & Welp, 2008; Stoll-Kleemann et al., 2010). The Swiss bottom-up approach to establishing an RNP entails a different starting position with regard to participation from the very beginning and might have a different effect on the relationship between resource use and life satisfaction than the establishment of nature parks in other countries, which do not result from a direct democratic process. A comparison of RNPs and parks in other countries with other establishment processes could elicit new insights into the effects of democracy on the relationship between resource use and life satisfaction. Moreover, investigations into the effects of different types of participation in the activities of the RNP might provide insights into the way RNPs can engage individuals in their activities to help manage their resource use and life satisfaction.

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Declarations

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Appendix of Article 3

Appendix to the article "Does Living in a Protected Area Reduce Resource Use and Promote Life Satisfaction? Survey Results from and Around Three Regional Nature Parks in Switzerland"

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Appendix A: OLS regression with factors and global index of satisfaction

In order to provide more specific information and validate our results, we tested in additional analyses whether the relation between life satisfaction and resource use is qualitatively different if we use specific factors of life satisfaction and a global satisfaction index instead of the variable on general life satisfaction (see the "Results" section in the article). We ran factor analyses on 21 variables about people's satisfaction and called one of the two resulting factors "satisfaction with infrastructure". This includes the variables satisfaction with leisure offers, satisfaction with footpaths, satisfaction with cycle routes, satisfaction with road infrastructure, satisfaction with public transport, and satisfaction with basic supplies, such as streets, electricity, water etc. ($\chi^2(210) = 8129.81$, $p < 0.001$; KMO = 0.870; 2.52% of variance explained, $n = 1{,}644$). The other resulting factor is called "satisfaction with work and financial matters" and includes the variables satisfaction with one's financial situation, satisfaction with employment, and satisfaction with rent costs ($\chi^2(45) = 3835.44$, $p < 0.001$; KMO = 0.831; 2.20% of variance explained, $n = 1{,}680$). Taking these two factors as outcome variables, we ran OLS regression models with multiple imputations (see Tables S1 and S2).

The models including the factor "satisfaction with infrastructure" as the outcome variable indicate a significantly negative relation between satisfaction with infrastructure and resource use (Table S1), as does the model presented in the article that uses the global satisfaction index as the outcome variable (see Table 3). The coefficients in models M12 and M13 in Table S1 do not substantially differ from the ones in the article (Table 3; M1: $b = -0.032$, $p < 0.001$, M2: $b = -0.032$, $p < 0.001$).

Table S1
OLS regression models for satisfaction with infrastructure and resource use, clustered by municipalities

			Satisfaction with infrastructure	
	M12		M13	
	Coef.	SE	Coef.	SE
Resource use (1–21)	-0.013***	0.003	-0.006**	0.002
Age (years)			0.045***	0.003
Age x age			-0.001***	0.000
Gender (female = 1)			-0.082***	0.016
Single household (no = 1)			-0.049*	0.022
Household income per month (in CHF 10)			0.001***	0.000
Education (years)			0.018***	0.004
Swiss passport (yes = 1)			0.017	0.033
Parent (yes = 1)			0.061*	0.024
Residence duration (years)			0.001*	0.000
Environmental concern			0.021	0.017
Constant	0.645***	0.028	-0.594***	0.095
Number of observations	3,005		3,005	
Number of clusters	54		54	
Adjusted R^2	0.008		0.252	

Notes: The table lists coefficient estimates and cluster-robust standard errors (***$p < 0.001$, **$p < 0.01$, *$p < 0.05$, for two-sided tests) of simple and multiple OLS regression models with multiple imputations of missing values. The outcome variable of models 12 and 13 is a factor of satisfaction, namely satisfaction with infrastructure. The income variable represents individuals' resource use. The number of clusters corresponds to the number of municipalities.

The simple model including the factor "satisfaction with work and financial matters" as the outcome variable likewise indicates a significant negative relation (Table S2). The coefficients in the models M14 and M15 in Table S2 are only slightly lower than those in the models using the life satisfaction variable presented in the article (Table 3, M1: $b = -0.032$, $p < 0.001$, M2: $b = -0.032$, $p < 0.001$). Both models indicate a significant negative relation between satisfaction with infrastructure and resource use, as does the model using the global satisfaction index presented in the article (see Table 3).

Table S2
OLS regression models for satisfaction with work and financial matters and resource use, clustered by municipalities

			Satisfaction with work and financial matters	
	M14		M15	
	Coef.	SE	Coef.	SE
Resource use (1–21)	-0.014***	0.003	-0.007**	0.002
Age (years)			0.046***	0.003
Age x age			-0.001***	0.000
Gender (female = 1)			-0.073***	0.016
Single household (no = 1)			-0.057*	0.022
Household income per month (in CHF 10)			0.002***	0.000
Education (years)			0.017***	0.004
Swiss passport (yes = 1)			0.006	0.033
Parent (yes = 1)			0.065**	0.024
Residence duration (years)			0.001*	0.000
Environmental concern			0.020	0.016
Constant	0.664	0.028	-0.572***	0.090
Number of observations	3,005		3,005	
Number of clusters	54		54	
Adjusted R^2	0.009		0.260	

Notes: The table lists coefficient estimates and standard errors (*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$) of a simple and multiple OLS regression model with multiple imputations of missing values. The outcome variable in models 14 and 15 is a factor of satisfaction, namely satisfaction with work and financial matters. The income variable represents individuals' resource use. The number of clusters corresponds to the number of municipalities.

In the "Results" section of the article, we present the results of models testing whether people living in parks have lower resource use and higher self-reported life satisfaction than people living in comparable, non-park regions (HP 2a). Here we tested the same hypothesis with the factors "satisfaction with infrastructure" and "satisfaction with work and financial matters" as outcome variables. Like the models reported in the article (Table 4; M5: $b = 0.057, p > 0.5$, M7: $b = 0.145, p > 0.5$) the models M16 and M17 in Table S3 indicate an insignificant relation between the two regions (park and non-park) and the two factors. Estimating the models with "satisfaction with infrastructure" and "satisfaction with work and financial matters" thus does not provide support for our hypothesis either. Levels of satisfaction with these specific aspects (infrastructure, work, and financial situation) are not higher for park inhabitants than for the control group.

Table S3
OLS regression models for satisfaction with infrastructure, satisfaction with work and financial matters and park and non-park regions, clustered by municipalities

	Satisfaction with infrastructure		Satisfaction with work and financial matters	
	M16		M17	
	Coef.	SE	Coef.	SE
Lives in park (yes = 1)	-0.006	0.019	-0.007	0.019
Age (years)	0.046	0.003	0.046***	0.003
Age x age	-0.001***	0.000	-0.001***	0.000
Gender (female = 1)	-0.079***	0.015	-0.070***	0.016
Single household (no = 1)	-0.049***	0.022	-0.057*	0.022
Household income per month (in CHF 10)	0.001***	0.000	0.002***	0.000
Education (years)	0.019***	0.004	0.018***	0.004
Swiss passport (yes = 1)	0.021	0.033	0.011	0.033
Parent (yes = 1)	0.063***	0.024	0.067**	0.024
Residence duration (years)	0.001	0.000	0.001*	0.000
Environmental concern	0.029	0.017	0.029	0.016
Constant	-0.699***	0.085	-0.689***	0.080
Number of observations	3,005		3,005	
Number of clusters	54		54	
Adjusted R^2	0.250		0.258	

Notes: The table lists coefficient estimates and cluster-robust standard errors (***$p < 0.001$, **$p < 0.01$, *$p < 0.05$, for two-sided tests) of simple and multiple OLS regression models with multiple imputations of missing values. The outcome variables in models 16 and 17 are factors of satisfaction. The income variable represents individuals living either in RNPs or in the control group. The number of clusters corresponds to the number of municipalities.

To test the validation of the life satisfaction variable in the main analyses of the article (see Table 2) and the factors above, we also created a global index of all of the 21 variables relating to people's life satisfaction. Here we tested in an additional analysis whether the relation between satisfaction and resource use is qualitatively different if we use the global satisfaction index (see Table S4) instead of the variable general life satisfaction, as in the model of the article. The models (18 and 19) in Table S4 including the global index "satisfaction" as the outcome variable indicate a significantly negative relation between satisfaction with resource use, as does the model presented in the article that includes the single variable of general life satisfaction as the outcome variable (Table 3; M1: $b = -0.032$, $p < 0.001$, M2: $b = -0.032$, $p < 0.001$).

Table S4
OLS regression models for the global index of life satisfaction and resource use, clustered by municipalities

	Life satisfaction (index)			
	M18		M19	
	Coef.	SE	Coef.	SE
Resource use (1–21)	-0.021***	0.005	-0.024***	0.005
Age (years)			-0.018**	0.005
Age x age			0.000***	0.000
Gender (female = 1)			0.134***	0.030
Single household (no = 1)			0.006	0.068
Household income per month (in CHF 10)			0.002**	0.001
Education (years)			-0.013	0.009
Swiss passport (yes=1)			0.287**	0.082
Parent (yes = 1)			0.052	0.039
Residence duration (years)			-0.116**	0.001
Environmental concern			8.345***	0.037
Constant	8.234***	0.051	0.005***	0.259
Number of observations	3,005		3,005	
Number of clusters	54		54	
Adjusted R^2	0.006		0.057	

Notes: The table lists coefficient estimates and cluster-robust standard errors (*** p < 0.001, ** p < 0.01, * p < 0.05) for two-sided tests of simple and multiple OLS regression models with multiple imputations of missing values. The outcome variable of models 18 and 19 is the global index of satisfaction and the income variable is the indicator of resource use.

In the "Results" section of the article, we present models testing whether people living in parks have lower resource use and higher self-reported satisfaction than people living in comparable, non-park regions (HP 2a). Here we tested the same hypothesis with the global index of satisfaction. Like the models reported in the article (Table 4; M5: $b = 0.057$, $p > 0.5$, M7: $b = 0.145$, $p > 0.5$), the models M20 and M21 in Table S5 indicate an insignificant relation between the two regions (park and non-park) and the index of satisfaction. Thus, estimating the models with the index does not provide support for our hypothesis either.

Table S5
OLS regression models for global index of satisfaction and park and non-park regions, clustered by municipalities

			Life satisfaction (index)	
	M20		M21	
	Coef.	SE	Coef.	SE
Lives in park (yes = 1)	-0.010	0.066	0.004	0.055
Age (years)			-0.016**	0.005
Age x age			0.000***	0.000
Gender (female = 1)			0.143 ***	0.029
Single household (no = 1)			0.008	0.069
Household income per month (in CHF 10)			0.002**	0.001
Education (years)			-0.011	0.009
Swiss passport (yes = 1)			0.303**	0.083
Parent (yes = 1)			0.060	0.039
Residence duration (years)			0.005**	0.001
Environmental concern			-0.087*	0.038
Constant	8.005***	0.059	7.917***	0.237
Number of observations	3,005		3,005	
Number of clusters	54		54	
Adjusted R^2	-0.0003		0.049	

*Note*s: The table lists coefficient estimates and cluster-robust standard errors (***$p < 0.001$, **$p < 0.01$, *$p < 0.05$, for two-sided tests) of simple and multiple OLS regression models with multiple imputations of missing values. The outcome variable in models 20 and 21 is a global index of life satisfaction. The income variable represents individuals living either in RNPs or in the control group. The number of clusters corresponds to the number of municipalities.

Appendix B: OLS regression without multiple imputations

In the estimations used in our article, we applied multiple imputations due to a large number of missing values in one of the control variables. However, multiple imputations provide a level of uncertainty in regard to the imputed values. Therefore, we additionally tested here the most important hypotheses, 1a and 2a, without imputations, to see whether these models showed any significant differences compared to the models with imputations.

In order to test Hypothesis 1a – the relation of people's self-reported satisfaction with their resource use – we ran the same simple and multiple models (M22 and M23 in Table S6) as are described in the "Results" section of the article (M1 and M2 in Table 3), but without multiple imputations. The results with and without multiple imputations do not differ substantially. The models without imputations indicate a significant negative relation between resource use and life satisfaction, as do the models with multiple imputations (M1 in Table 3: $b = -0.032$, $p < 0.001$). The same applies to the coefficients of the multiple regression models (M2 in Table 3: $b = -0.032$, $p < 0.001$).

Table S6
OLS regression models for resource use and life satisfaction, clustered by municipalities

			Life satisfaction	
	M22		M23	
	Coef.	SE	Coef.	SE
Resource use (1–21)	-0.031***	0.008	-0.030**	0.009
Age (years)			-0.014	0.010
Age x age			0.000*	0.000
Gender (female = 1)			0.136**	0.048
Single household (no = 1)			0.263	0.134
Household income per month (in CHF 10)			0.001	0.001
Education (years)			-0.009	0.013
Swiss passport (yes = 1)			0.092	0.097
Parent (yes = 1)			0.084	0.076
Residence duration (years)			0.002	0.002
Environmental concern			-0.123	0.063
Constant	8.685***	0.073	8.355***	0.421
Number of observations	2,172		2,172	
Number of clusters	54		54	
R^2	0.007		0.041	

Notes: The table lists coefficient estimates and cluster-robust standard errors (***$p < 0.001$, **$p < 0.01$, *$p < 0.05$, for two-sided tests) of simple and multiple OLS regression models. The outcome variable of models 22 and 23 is the life satisfaction variable (general life satisfaction). The income variable is the resource use indicator. The number of clusters corresponds to the number of municipalities.

Table S7 reports the results of OLS regression models without multiple imputations to test Hypothesis 2a. The hypothesis postulates that people living in parks have lower resource use and higher self-reported satisfaction than people living in comparable, non-park regions. Like in the models with multiple imputations in the article (M5 and M7 in Table 4), the results of the models show insignificant relations between regions (park and non-park) and life satisfaction (see M24 in Table S7) and between regions and resource use (see M25 in Table S7). Thus, the models without multiple imputations show that the resource use of individuals living in parks is not lower, and their life satisfaction is not higher, than the resource use and life satisfaction of those in the control group – just like the models reported in the "Results" section of the article (see Table 4). Accordingly, it can be assumed that the estimations with multiple imputations presented in the article are reliable.

Table S7
OLS regression models for life satisfaction and park and non-park regions, as well as resource use and park and non-park regions, clustered by municipalities

	Life satisfaction		Resource use	
	M24		M25	
	Coef.	SE	Coef.	SE
Lives in park (yes = 1)	0.072	0.053	0.292	0.238
Age (years)	-0.011	0.010	-0.065	0.033
Age x age	0.000	0.000	0.001	0.000
Gender (female = 1)	0.149	0.050	-0.447**	0.157
Single household (no = 1)	0.260**	0.137	0.038	0.283
Household income per month (in CHF 10)	0.002	0.001	-0.008**	0.003
Education (years)	0.010	0.013	-0.062	0.042
Swiss passport (yes = 1)	0.118	0.097	-0.818**	0.281
Parent (yes = 1)	0.097**	0.075	-0.393	0.199
Residence duration (years)	0.002	0.002	0.004	0.005
Environmental concern	-0.082	0.061	-1.332**	0.171
Constant	7.746***	0.394	18.380***	0.911
Number of observations	2,172		2,172	
Number of clusters	54		54	
R^2	0.036		0.086	

Notes: The table lists coefficient estimates and cluster-robust standard errors (*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, for two-sided tests) of simple and multiple OLS regression models. The outcome variable of model 24 is satisfaction (life satisfaction in general). The outcome variable of model 25 is the resource use indicator. The income variable represents individuals living either in RNPs or in the control group. The number of clusters corresponds to the number of municipalities.

Article 4

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Improving quality of life for residents of biosphere reserves and nature parks: management recommendations from Switzerland

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Improving quality of life for residents of biosphere reserves and nature parks: management recommendations from Switzerland

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ABSTRACT

Biosphere reserves and nature parks are protected areas that aim to combine nature conservation with human-development goals. These areas provide ideal environments for promoting and testing sustainable ways of living. The goal of this study was to determine how park management can best contribute to the quality of life of residents. The article presents the results of a survey in Switzerland of 2,409 residents of a biosphere reserve and two regional nature parks on the provision of quality of life. The results indicate that the quality of life in the parks is generally high. The identified dimensions that constitute this quality of life, their perceived importance, and the needs expressed by residents suggest that park management can help to increase and safeguard extant conditions by offering activities that improve health, social relations, and sustainable mobility. Awareness of how park management can contribute to the quality of life of park residents sustainably enables the setting of new priorities that have joint outputs that can be positive for both nature and people.

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Quality of life; parks; satisfaction; well-being; protected area management; sustainability

Introduction

The objectives of most protected areas cover various aspects of sustainability which are not exclusively focused on nature conservation and tourism but include goals related to residents living within the sites, such as providing infrastructure for sports activities or co-working in the agriculture and tourism sectors (WCPA 2016). Protected areas with a wide array of sustainability goals are typically regional nature parks, biosphere reserves, and modern types of national parks. In this article, we subsume all three categories under the term "parks." These parks bring nature protection to human environments; promote activities in nature; attempt to create appreciation and awareness of nature; involve sectors like agriculture, business, tourism, culture, and leisure in their activities; and are perceived as an advantage from the standpoint of social sustainability (Humer-Gruber 2016; UNESCO 2019a, 2019b). Such parks can, therefore, also be seen as social-ecological systems (Cumming and Allen 2017; Hammer et al. 2016).

Moreover, aligning social and ecological goals synergistically is essential to ensure the human quality of life (QoL) over generations (Brundtland 1987; United Nations 2019). These considerations led us to the question of how park management, with the activities they initiate and implement, can best succeed in sustainably contributing to residents' QoL.

We refer to the term QoL as a construct that encompasses several dimensions of people's lives including their environment (e.g., infrastructure, basic services), preconditions (e.g., education, state economy), personal conditions (e.g., health, social relationships), and their subjective satisfaction with these dimensions (Wiesli et al. 2021). In this sense, QoL goes far beyond basic human needs and includes emotional and social factors, the right to participation, and capabilities to fulfill these factors (see, for example, Nussbaum 2011).

Many studies to date have investigated the effects of parks on certain aspects of QoL of visitors (Romagosa, Eagles, and Lemieux 2015; Terraube, Fernández-Llamazares, and Cabeza 2017). For example, researchers have observed positive effects on visitors' mental, physical, and social health (Puhakka, Pitkänen, and Siikamäki 2017; Wolf and Wohlfart 2014); life satisfaction and feelings (Cini, Kruger, and Ellis 2013); and children's physical and mental development (Lemieux et al. 2012). However, there is a general lack of literature on park residents and their QoL.

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An entry point for research on park residents is usually provided by studies on their acceptance of the region becoming a park (e.g., Stoll-Kleemann and O'Riordan 2017; von Lindern et al. 2019; Wallner, Bauer, and Hunziker 2007). The residents' acceptance of a park is influenced by the economic (dis)benefits and hence the jobs being created in the park region, as shown in several studies. For instance, Wallner, Bauer, and Hunziker (2007) reported that a few years after the creation of the UNESCO Biosphere Entlebuch (UBE), residents hoped mainly for the increased economic development of the region to enhance their QoL. A study by Knaus, Bonnelame, and Siegrist (2017) confirmed that products carrying a label initiated by the UBE generated considerable gross added value 13 years after its introduction. Further studies at the global level, indicate significant economic effects in protected areas largely due to nature tourism (Heagney et al. 2019; Job et al. 2005). Pantić, Čolić, and Milijić (2021) claim, that tourism in a Serbian biosphere led to lower outmigration of residents and attracted investors, which in turn contributed to the preservation of the local infrastructure and services. Vivanco's (2001) investigations in the Reserva Santa Elena in Costa Rica revealed positive effects on the economic power of women due to increased tourism which raised sales of women's handcrafts. The results of Sundberg (1998) showed how the Maya Biosphere Reserve in Guatemala contributed to changes in women's work roles and how this in turn led them to form alliances and networks.

Knaus and Backhaus (2014) claim that parks not only contribute to the region's economy, but also enhance their renewable energy-production facilities, landscape, and cultural life. Trivourea's Trivourea (2011) study indicated positive influences on the social life of residents in a Greek national marine park since the increase in tourism brought people to the region and lead to more social exchanges. The results of Humer-Gruber (2016) additionally demonstrated that farmers considered the biosphere reserve to have social advantages, such as strengthening the community and preventing the outmigration of young people. They regarded the pursuit of sustainable development throughout the biosphere reserve as an advantage for their grandchildren.

In sum, research to date has covered several social and economic impacts that have been traced back to park-management efforts. However, options for park management to sustainably and systematically improve residents' QoL have not been robustly investigated. Therefore, this study aimed to determine how park management could best contribute to the QoL of park residents. We investigated the following research questions in a UNESCO biosphere reserve and two regional nature parks:

1. What are nature park residents' perceptions of their QoL?
2. What dimensions of life contribute most strongly to QoL?
3. What management needs are there in nature parks with respect to QoL, and what are residents' wishes in this regard?

In the following section, we describe how we conducted the survey and the statistical analyses. In the results section, we present the overall life satisfaction of the residents, the main contributing dimensions to life satisfaction, the management needs, and residents' wishes to park management. Thereafter, we discuss these results together with international literature and provide recommendations for park management. Finally, we summarize the key actions of park management and other regional management bodies.

Methods

Study areas

The three study areas are the UNESCO Biosphere Reserve Entlebuch (UBE) and two regional nature parks – the Gantrisch Nature Park (GNP) and the Jurapark Aargau (JPA) (see Figure 1). The status of biosphere reserves is internationally recognized and UNESCO biosphere reserves are developed by local stakeholders in coordination with the national UNESCO committees of the Man and the Biosphere Programme (MaB). The nomination dossier is prepared with the involvement of local stakeholders, authorities, and municipalities and reviewed by UNESCO. Biosphere reserves are finally endorsed by the MaB International Coordination Council (UNESCO 2021) and divided into core, buffer, and transition zones.

Regional nature parks instead are specific labels for officially recognized protected areas in Switzerland. This label, awarded by the Swiss government, implies the objective to enhance both resident's well-being and sustainable development (FOEN 2019) and hence corresponds to International Union for the Conservation of Nature (IUCN) category VI sites (Dudley 2008). UNESCO biosphere reserves in Switzerland are subsumed in this type of regional nature park which in the country are large (at least 100 square kilometers (km^2)) (38.6 square miles, m^2) and typically consist of populated areas that contain several municipalities located within the boundaries of the park (FOEN 2019). The parks, thus, contain settlement areas, less

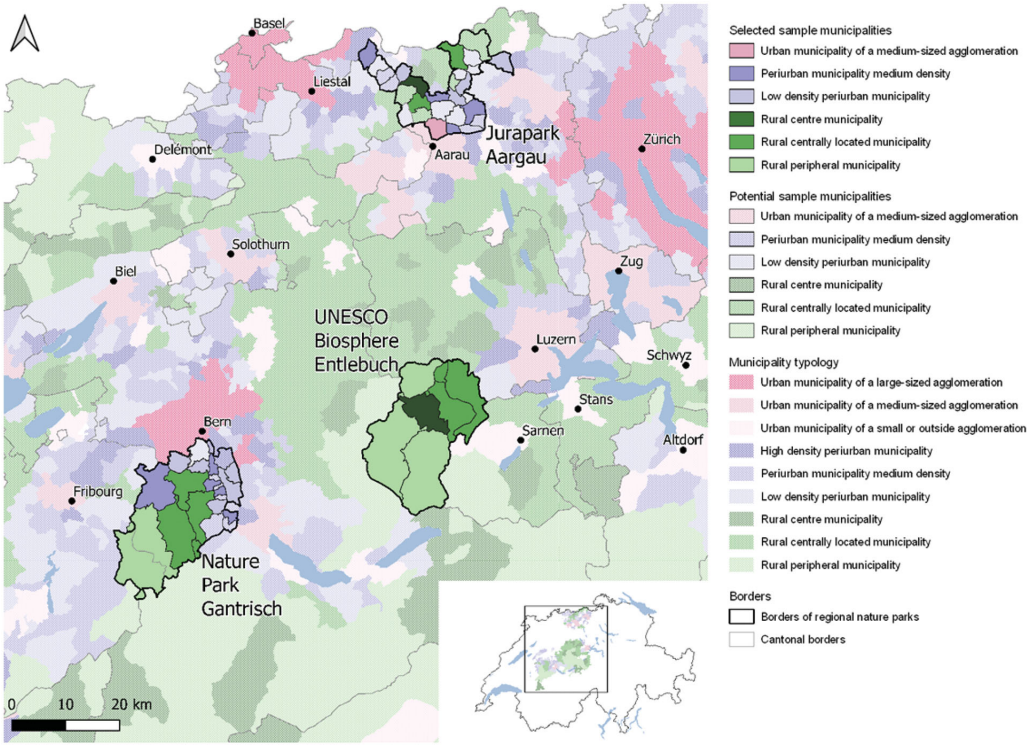

Figure 1. The three Swiss regional nature parks (UNESCO Biosphere Entlebuch, Jurapark Aargau, and Nature Park Gantrisch). Source: Open Street Map Contributors, Swisstopo, ESRI. Map: Roger Bär.

extensively protected areas, and highly protected areas. Each park's authority establishes a 10-year charter as a planning instrument with the participation of residents, interest groups, and the business community and implements the plan using funds pledged by the circumscribed municipalities, the cantonal administration, and the national government (FOEN 2019). Since the park label belongs to the park authority and the park management is responsible for the implementation of the goals, the municipalities and park management are strongly linked (FOEN 2019).

Our three selected parks encompass a total of 104,500 residents. First, UBE has the smallest population with 17,600 residents, covers an area of 394 km^2 (152.1 m^2) and ranks second of the three parks with respect to physical size. Second, GNP is the largest of the three parks and includes 46,500 residents on an area of 414 km^2 (159.8 m^2). Finally, JPA has a population of 40,400 people and extends over an area of 245 km^2 (94.6 m^2). These three parks are comparable in terms of population density (e.g., 168 residents per km^2 in JPA), language (Swiss German), and geographical location (at the edge of the Swiss Plateau, including both lowland and mountain areas). At the same time, they are relatively far apart and widely dispersed across Switzerland, and cover all types of Swiss rural municipalities with varying population densities (Federal Statistical Office 2012).

Data collection

We assessed QoL through an extensive questionnaire that was distributed to the residents of the three parks. We prepared the survey instrument in cooperation with park management and collected the mailing addresses of the targeted respondents from the relevant municipalities. Entitled "Quality of life in the UNESCO Biosphere Entlebuch/Jurapark Aargau/Gantrisch Nature Park," we sent the survey instrument to all households living within the boundaries of the parks (see supplementary material). We used self-reported life satisfaction as a proxy for QoL and included participants' satisfaction with their personal conditions and their environment and its infrastructure. Self-reported satisfaction is a widely used and validated concept (Diener and Suh 1999; Costanza et al. 2007; Wiesli et al. 2021). The questionnaire included 31 items with questions about several dimensions of satisfaction, the importance of these dimensions, residents' expectations about park management, and socio-economic information.

The dimensions of satisfaction represented in the survey were health, safety, social relations, mobility, basic services, housing and income, and employment-based on empirical studies that identified these criteria as relevant for life satisfaction (e.g., Frey and Stutzer 2018; Layard 2006). Furthermore, we included place attachment, quality of nature and landscape based on studies about identity, landscape and spatial planning, and protection of nature and biodiversity (e.g., Lemieux et al. 2012; (Lengen 2016; Terraube, Fernández-Llamazares, and Cabeza 2017; Wolf and Wohlfart 2014). In workshops together with the park management, we developed regional and park-relevant dimensions, such as sources of renewable energy, regional and seasonal food, and information on regional nature parks.

We tested a draft of the questionnaire using a three-step pre-test procedure. First, we recruited ten people to complete the survey instrument. Second, we carried out face-to-face pre-tests with ten respondents and, finally, we sent the questionnaire via postal mail to 150 people living in the parks in a standard pre-test process. Based on the feedback, we adjusted the questionnaire after each test.

When collecting the addresses of the park inhabitants, we controlled for the balance of municipalities in terms of the degree of urbanization and population density and categorized them according to the Swiss municipality typology from 2012 which differentiates between these two criteria (Federal Statistical Office 2012). We then deployed a two-stage random sampling procedure in the GNP and the JPA, first, by randomly choosing municipalities within the categories and, second, by selecting from the adult population of these municipalities. The GNP contains 20 peri-urban municipalities with medium (11% of the Swiss population) and low (5% of the Swiss population) population densities, as well as central rural and peripheral rural municipalities (Swiss Federal Statistical Office 2012). We then randomly identified 16 municipalities (see Figure 1). The JPA includes 28 peri-urban municipalities of medium density, central rural municipalities, and medium-sized urban municipalities (22% of the Swiss population), and selected 13 municipalities on a randomized basis. The UBE contains seven central rural (4% of the Swiss population) and peripheral rural municipalities (3% of the Swiss population). Due to the small number of municipalities, in this case, we included all of them in this study and only the respondents were randomly selected.

Finally, all the randomly selected inhabitants of the three parks ($n = 13{,}313$), were contacted via a postal letter in 2019 in which they were given the option of filling in the enclosed paper questionnaire or an online questionnaire. One reminder was issued after three weeks. The resulting response rate was 25% ($n = 2{,}409$).

Sample

All respondents lived within the park boundaries. The youngest persons in the sample were 16 years old and the oldest was 94 years (see Table 1). The mean age is 50.8 and, thus, slightly higher than the mean age of 49.6 for the parks' population. The sample included slightly more female (52.8%) than male participants (46.8%), just as the overall population of the parks includes more women (50.1%) than men (49.9%). Most of the individuals in our sample had completed an apprenticeship as their highest level of education, a majority were employed, and 6.5% were retired. We cannot directly compare these characteristics with the overall population of the parks as these data for all people living in the parks and their municipalities are not available. However, 40% of people living in Switzerland have an apprenticeship as their highest qualification and 68.1% are employed (Federal Statistical Office 2020, 2016). Thus, we can assume that the sample adequately resembles the Swiss population regarding education and employment.

Table 1. Socio-economic characteristics of the samples in the selected three Swiss regional nature parks.

	UBE sample	UBE population	GNP sample	GNP population	JPA sample	JPA population	Full sample	Population of parks
Mean age in years	48.8	48.3	51.7	50.6	52.1	50	50.8	49.6
SD	18.6	17.7	17	18.7	16	10.8	17.5	7.2
n	867	14,058	786	29,821	756	35,060	2,409	78,939
Male %	46.2	49.0	45.8	49.4	48.4	49.7	46.8	49.9
Female %	53.5	51.0	53.6	50.6	51.1	50.3	52.8	50.1
Other %	0.23	–	0.51	–	0.40	–	0.37	–
n	867	14,058	786	29,821	756	35,060	2,409	78,939
Apprenticeship as highest education %	47.9	–	42.6	–	38	–	43.1	–
n	859	–	776	–	750	–	2,385	–
Employed %	90.5	–	88.9	–	86.8	–	88.8	–
Not employed %	9.45	–	11	–	13.2	–	11.1	–
n	656	–	590	–	584	–	1,830	–

UBE: UNESCO Biosphere Entlebuch; GNP: Gantrisch Nature Park; JPA: Jurapark Aargau; *SD*: standard deviation; *n*: number of observations.
Notes: The samples and hence also the population include only individuals aged 16 and older. The number of individuals who are not employed includes retirees. Missing values are excluded in sample sizes (*n*).

A comparison of the three subsamples in the UBE, JPA, and the GNP reveals that the respondents of the UBE have a slightly different age than the other two parks (see Table 1). The young age groups up to 45 years are more strongly represented in the UBE (42%) than in the other two parks (37% in GNP and 35% in JPA). Respondents in the JPA sample had the highest income on average ($M = 5{,}170$ CHF per month) compared to the other parks (GNP: $M = 4{,}708$ CHF per month and UBE: $M = 4{,}265$ CHF per month). The highest education level, namely tertiary education, is also most widely represented in JPA (23.5%; GNP 14.6% and UBE 9.7%). As these differences between the park samples are small, we can assume that the parks are comparable with each other in terms of their socio-economic characteristics.

Overall, we can assume that the sample represents the park population adequately, not only due to its large observation number and its associated distribution ($n = 2{,}409$) (Daniels and Minot 2019; Field, Miles, and Field 2012) but also due to the similar socio-economic characteristics to the park population (see Table 1).

Data analysis

We scanned the paper questionnaires that respondents returned using the "Remark Office" software. After checking and cleaning, the data were analyzed in the statistics software "Stata." The questionnaire items that correspond to each research question and the analyses applied to the corresponding data are presented in Table 2. To identify the residents' overall satisfaction and to estimate its main contributing dimensions, we used a variable representing overall satisfaction (see A1 in Table 2 and Supplementary Appendix) and ran ordinary least squares (OLS) regressions with various dimensions relevant to people's life satisfaction (e.g., satisfaction with health) as independent variables (see A2–A22 in Table 2 and Supplementary Appendix). To compare the three parks, we ran three pooled OLS models, including the same dependent and independent variables but as an interaction term multiplying them with the park variable (dimensions of life satisfaction x UBE/JPA/GNP).

To check whether multicollinearity was present in the overall and pooled OLS models, we first carried out correlations with Spearman and computed the variance inflation factor (VIF) after the regressions ($M = 1.38$). According to Spearman's correlation, the two independent variables of satisfaction with cycle routes and satisfaction with footpaths have the highest correlation ($r = 0.535$). However, since all correlations are below 0.8 and VIF values below 10, we can assume that there is no danger of multicollinearity (Field, Miles, and Field 2012). We, moreover, tested for the normality of residuals by a kernel-density plot and a numerical test by Shapiro Wilkinson. Based on these tests, there is no violation of the normality of residuals.

To combine the individual's satisfaction with their opinion on the importance of the same dimensions, we developed an index using items C1 and A2–A22 (see Table 2). We multiplied a variable containing the individual's satisfaction with one of the 20 dimensions (A2–A22), and a variable containing the corresponding individual's opinion of the importance of the same 20 dimensions (C1). The index is based on the following equation:

$$Index_i = importance_i \times (10 - satisfaction_i)$$

We think that multiplication makes the most sense as it considers relative increments of

Table 2. Research questions, questionnaire items (see Supplementary Appendix), and statistical analysis tools that were applied.

Research question	Item in questionnaire	Item number	Statistical analysis
What are nature park residents' perceptions of their QoL?	"How satisfied are you in general with your life?" Answer scale from zero ("not at all satisfied") to ten ("completely satisfied")	A1	Mean value; Kruskal–Wallis test; Dunn-Bonferroni test; Multiple OLS regression (see Table 3)
What dimensions contribute most strongly to QoL?	For example, "How satisfied are you with the leisure facilities in your region?" Answer scale from zero ("not at all satisfied") to ten ("completely satisfied")	A2–A22	Spearman's correlation; Shapiro Wilkinson test, kernel- density plot; multiple OLS regression (see Table 3); pooled OLS regression (see Table 4)
What management needs are there in nature parks with respect to QoL?	"How important are these areas to you personally in your life?" e.g., "Availability of public transport"; Answer scale from zero ("not at all important") to ten ("very important")	C1	Index from zero ("completely satisfying but not at all important") to 100 ("very important but not at all satisfying") (see Figure 2)
	For example, "How satisfied are you with the leisure facilities in your region?" Answer scale from zero ("not at all satisfied") to ten ("completely satisfied")	A2–A22	Kruskal–Wallis test; effect size according to Cohen
What are residents' wishes to park management regarding their QoL?	"In which areas do you think management of the UNESCO Biosphere Entlebuch could improve?" e.g., "Leisure, recreational and cultural activities" Answer options: "… could be improved by the park," "… is satisfying," or "Don't know"	D2	Mean percentage (see Figure 3)

satisfaction and importance systematically equally. The higher the index value, the more important and the less satisfactory is the dimension. From this, we interpret a higher value means a greater need for management and call this index "management need" (see Figure 2).

A further result is based on a descriptive analysis of another item (D2), in which participants evaluated 20 dimensions of life satisfaction in the park area (see Table 2 and Supplementary Appendix). These results obtain insights into respondents' wishes and perceptions concerning whether a park is responsible and able to improve certain dimensions in the region (see Figure 3).

Results

Overall life satisfaction

On average, on a scale of 0 ("not at all satisfied") to 10 ("completely satisfied"), survey participants rated their overall life satisfaction at 8.37 (95% CI [8.11, 8.62]). Comparing the three parks, respondents in the UBE reported the highest level of satisfaction, with a mean of 8.48 (95% CI [8.22, 8.73]), followed by respondents in the GNP with a mean of 8.39 (95% CI [8.14, 8.73]) and in JPA with a mean of 8.25 (95% CI [7.92, 8.58]). A Kruskal–Wallis test ($\chi^2 = 17.67$, $p < 0.001$) and a Dunn-Bonferroni test ($z = -4.05$, $p < 0.001$) indicate a significant difference between the UBE and JPA. However, the effect size ($d = 0.13$) according to Cohen (1992) is small; accordingly, the difference between the parks in overall satisfaction can be considered small.

Estimation of the main contributing dimensions

The regression models for all three parks indicate that satisfaction with health, social relations (such as family and friends), leisure offers, housing situation, income, and financial situation, fulfilling employment, equality, and the quality of road infrastructure are significantly associated with the estimated overall satisfaction (see Table 3). The overall explanatory power of the models ranges from 0.38 to 0.39 (see adjusted R^2 in Tables 3 and 4). The eight significant variables show a range of correlation coefficients (see Table 3). By improving residents' satisfaction with their health, the parks can potentially have the greatest influence on the residents' overall satisfaction ($b = 0.22$). A similar effect is estimated if the parks manage to positively influence residents' satisfaction with their social relations ($b = 0.20$).[1] The other dimensions score substantially lower coefficients, which indicates a weaker influence on overall satisfaction.

There are differences between the three parks regarding the significance of the various dimensions'

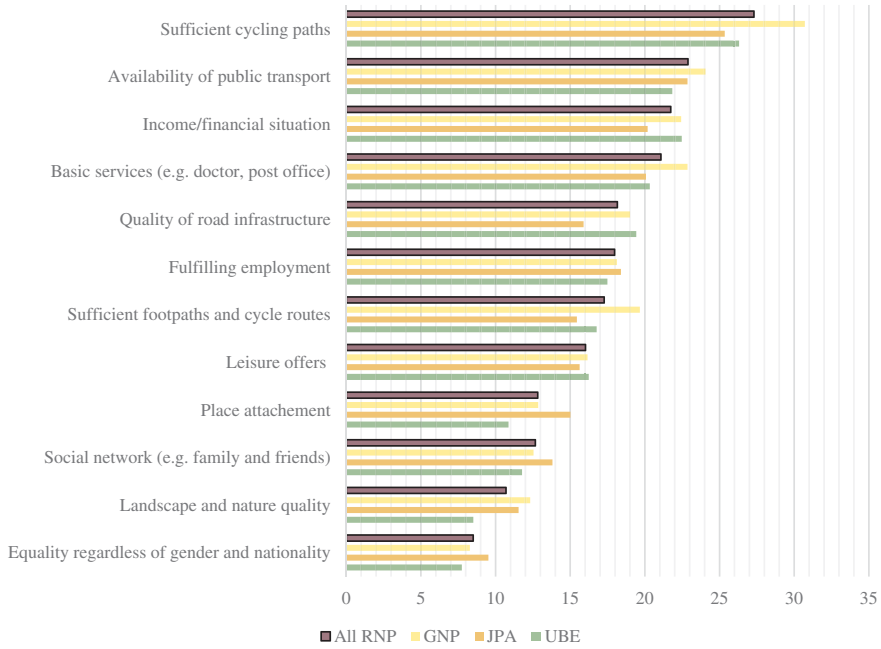

Figure 2. Management-needs indices for selected variables. *Notes:* Scale: zero = fully satisfactory but not important, 100 = very important but not at all satisfactory. Purple = all parks, yellow = GNP, orange = JPA, green = UBE. Number of observations = 2,223 (missing values excluded). The figure contains fewer variables than the regression models in Tables 3 and 4 because the variables concerning satisfaction and importance were not fully congruent in the survey.

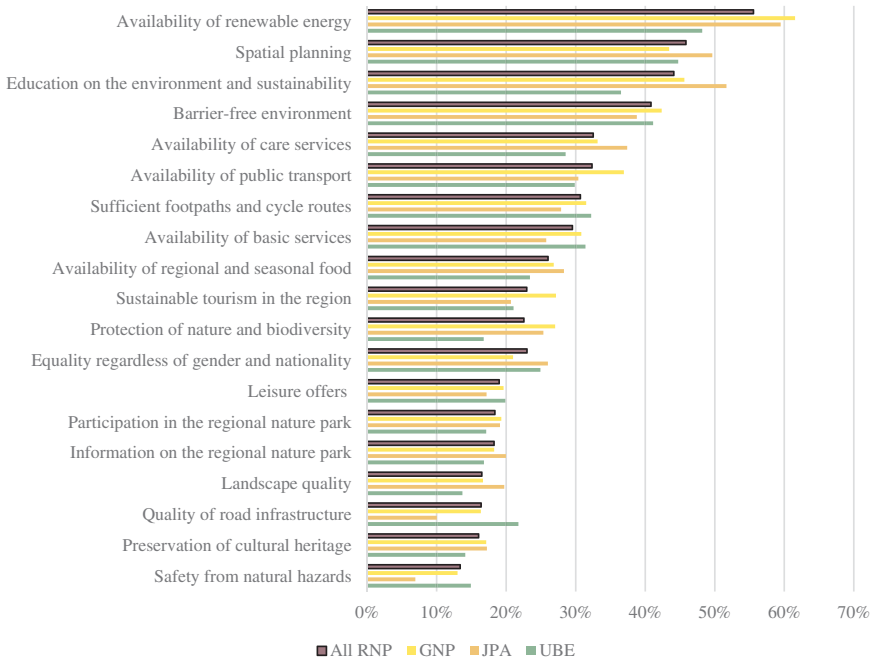

Figure 3. Areas that park management could improve in the park region according to residents, in percent of respondents. *Notes:* Purple = all parks, yellow = GNP, orange = JPA, green = UBE. Number of observations = 956 (missing values and "don't know" responses excluded).

Table 3. OLS regression models for overall satisfaction and specific dimensions of satisfaction in all three parks.

	Overall satisfaction
Health	0.220*** (9.85)
Social relations (e.g., family and friends)	0.201*** (9.42)
Leisure offers	0.100*** (5.24)
Housing situation	0.077*** (3.43)
Income/financial situation	0.070*** (4.02)
Fulfilling employment	0.058*** (3.43)
Equality regardless of gender and nationality	0.043** (2.88)
Quality of road infrastructure	0.33** (2.10)
Sufficient footpaths and cycle routes	0.022 (1.31)
Place attachment	0.012 (0.84)
Absence of noise from neighbors	0.004 (0.27)
Political participation	−0.025 (−2.01)
Housing costs	−0.033 (−1.95)
Safety from violence	0.004 (0.37)
Absence of traffic noise	0.019 (1.50)
Quality of nature and landscape	−0.008 (−0.39)
Availability of public transport	−0.004 (−0.34)
Absence of air traffic noise	−0.016 (−1.26)
Safety from traffic accidents	0.019 (1.50)
Constant = 1.902*** (10.80)	
Number of observations	1,345
Adjusted R^2	0.382

Notes: The table lists coefficient estimates of the relevant OLS regression models (***$p < 0.001$, **$p < 0.01$, *$p < 0.05$), with t values in brackets.

contributions to overall satisfaction, as the pooled OLS models show (see Table 4). In the UBE, the satisfaction dimensions of social environment, health, leisure offers, road infrastructure, and gainful employment are significantly associated with overall satisfaction, whereas in the GNP this association is made with dimensions of income and financial situation, equality regardless of gender and nationality, and housing situation. Road infrastructure and fulfilling employment are not significant dimensions in the GNP. In JPA, satisfaction with road infrastructure is also not significantly associated with overall satisfaction, whereas fulfilling employment is. Here, unlike in the other two parks, satisfaction with leisure offers is not significant; however, satisfaction with political participation and the absence of traffic noise is significant. The strength of the coefficients of the individual dimensions of life satisfaction also varies depending on the park. However, as in the model including all three parks (see Table 3), the dimensions of health and social relations have the strongest coefficients in all three parks, even though the values differ considerably: in the UBE, social relations contribute most to overall satisfaction ($b = 0.261$), more so than health ($b = 0.213$). In the GNP and JPA, health has the highest coefficients ($b = 0.230$ and 0.239, respectively), while social relations contribute substantially less to satisfaction ($b = 0.165$ and 0.137). There are other relatively important dimensions with coefficients between 0.1 and 0.15 for which values vary among the three parks (Table 4).

Management needs

Looking at the three parks overall, the most urgent needs expressed by the residents concern sustainable forms of mobility: cycle routes (by 27.3 scale points)

Table 4. Pooled OLS regression models for overall satisfaction and specific dimensions of satisfaction in each of the three parks.

	Overall satisfaction		
	UBE	GNP	JPA
Interaction of each satisfaction variable with parks variable			
Health × parks	0.213*** (6.22)	0.230*** (6.16)	0.239*** (5.59)
Social relations × parks	0.261*** (8.06)	0.165*** (4.26)	0.137*** (3.28)
Leisure offers × parks	0.153*** (4.98)	0.094** (2.67)	0.032 (0.93)
Income/financial situation × parks	−0.006 (−0.23)	0.131*** (4.14)	0.103*** (3.24)
Housing situation × parks	−0.004 (−0.15)	0.129*** (4.39)	0.1054*** (3.11)
Equality × parks	0.015 (0.58)	0.055* (1.99)	0.043 (1.63)
Fulfilling employment × parks	0.113*** (2.10)	−0.003 (−0.13)	0.076** (2.42)
Sufficient footpaths and cycle routes × parks	−0.045 (−1.88)	0.037 (1.33)	0.005 (0.17)
Quality of road infrastructure × parks	0 .054* (2.10)	0.008 (0.31)	0.021 (0.68)
Place attachment × parks	0.015 (0.54)	−0.008 (−0.30)	0.018 (0.82)
Absence of noise from neighbors × parks	0.019 (0.69)	−0.021 (−0.75)	0.026 (1.00)
Political participation × parks	0.013 (0.44)	0.035 (1.20)	−0.051* (−2.48)
Housing costs × parks	−0.029 (−0.94)	−0.017 (−0.57)	−0.048 (−1.67)
Safety from violence × parks	0.014 (0.65)	0.001 (0.08)	−0.004 (−0.21)
Absence of traffic noise × parks	−0.018 (−0.77)	0.012 (0.50)	0.047* (2.32)
Quality of nature and landscape × parks	−0.039 (−1.02)	0.024 (0.71)	−0.009 (−0.25)
Availability of public transport × parks	−0.004 (0.21)	−0.033 (−1.49)	0.012 (0.53)
Absence of air traffic noise × parks	−0.024 (−1.32)	−0.030 (−1.13)	−0.003 (−0.13)
Safety from traffic accidents × parks	0.007 (0.34)	−0.011 (−0.52)	−0.005 (−0.27)
Constant = 1.995*** (7.41)			
Number of observations = 1,345			
Adjusted R^2 = 0.394			

UBE: UNESCO Biosphere Entlebuch; GNP: Gantrisch Nature Park; JPA: Jurapark Aargau.
Notes: The table lists coefficient estimates of pooled OLS regression models (***$p < 0.001$, **$p < 0.01$, *$p < 0.05$), with t values in brackets. Each independent variable is a multiplied term, i.e., the variables of the satisfaction dimensions are multiplied with the variables of the respective park study regions (UBE, GNP, JPA).

and public transport (by 22.8 scale points) rank as the two highest management needs. Income and satisfactory financial situation (by 21.7 scale points) rank as the third-highest management need, followed by availability of basic services, such as doctors, grocery stores, post offices, and so forth. These dimensions are of high importance for the inhabitants but are also the least satisfying. Equality regardless of gender and nationality is the lowest management need (see Figure 2). The second-lowest management need is the beauty and integrity of the landscape.

A comparison of the management need indices between the three parks reveals several differences (see Figure 2). In the UBE, the results for equality regardless of gender and nationality indicate a lower management need (by 1.8 scale points) than in JPA ($\chi^2 = 5.83$, $p < 0.01$). In JPA, there is a significantly lower management need for income and financial situation (by 2.25 scale points) than in the other two parks ($\chi^2 = 6.24$, $p < 0.05$). In the GNP, there seems to be a much higher need (by 4.4 scale points) for cycle routes than in the other two parks ($\chi^2 = 13.52$, $p < 0.05$).

Residents' wishes with regard to park management

Most respondents (56%) across all three parks wanted the availability of renewable energy to be improved (see Figure 3). Almost half (46%) of the respondents wanted the park managers to tackle spatial planning and prevent the loss of green spaces, and 44% wanted more education on the environment and sustainability. At the other end of the scale, the least mentioned wishes, and therefore relatively satisfactory dimensions were safety from natural hazards (13%), preservation of cultural assets (16%), and quality of road infrastructure (16%).

Residents' wishes differed to some extent between the three parks (see Figure 3). These differences were substantial in the desire for more education on the environment and sustainability. In the UBE, which has a long history of park activities in this domain, only 37% of respondents stated this desire, while in JPA it was reported by 52% of respondents, and in the GNP by 46%. Spatial planning was the second most mentioned desire in the UBE (45%) but not in the other two parks (JPA 50%, GNP 43%). Also, given the dispersed settlements in the UBE, 22% of respondents wanted the quality of road infrastructure to be improved, but this was only mentioned by 10% of respondents in JPA and 17% in the GNP.

Looking at the least mentioned wishes, the share of respondents who wanted improvements in landscape quality was the lowest in the UBE (14%; JPA 20%, GNP 17%). In JPA and the GNP, the share of respondents who wanted improved safety from natural hazards was the smallest (JPA 7%, GNP 13%, UBE 15%).

Discussion

Overall, our results show that health and social relations are most strongly associated with QoL. Cycling paths, public transport, and road infrastructure are, in the opinion of the inhabitants, important yet not sufficiently developed in the investigated parks. Management needs thus relate to various kinds of sustainable mobility. Fulfilling employment, adequate income, and provision of basic services are further areas that require management efforts. At the same time, fulfilling work, adequate income, and road infrastructure influence QoL significantly. Finally, residents want to see improvements in renewable energy, spatial planning, and education on the environment and sustainability on the part of park management. The core of these main findings is in line with recommendations from the literature on sustainability challenges in rural areas. In particular, the state of infrastructure (e.g., Bosworth et al. 2020), social life aspects influenced by distance and remoteness (e.g., De Koning, Stathi, and Richards 2017), and structural changes (e.g., Junquera et al. 2022) are areas that pose challenges in rural areas internationally.

Going back to the overarching research question of how protected areas can improve inhabitants' QoL, current literature indicates that health and protected areas are brought together mainly through conservation measures (Terraube, Fernández-Llamazares, and Cabeza 2017): parks can influence mental and physical health by safeguarding and promoting the high quality of nature in the area, as studies in Canada (Lemieux et al. 2012), Finland (Puhakka, Pitkänen, and Siikamäki 2017), Australia (Wolf and Wohlfart 2014), and Poland, Austria, and Italy (Jiricka-Pürrer et al. 2019) indicate. The parks investigated in this study were chosen because they have particularly valuable landscapes and nature and are all required to implement conservation activities (FOEN 2019). In contrast to most of the literature, our results show that such conservation measures are not the main line of action in improving the QoL of residents. Park management could make more of their conservation measures by combining them synergistically with the encouragement of physical activity in nature, leading to positive health impacts. This could be done by offering volunteering programs for residents where specific habitats, such as alpine meadows, are maintained by physical work or by specific outdoor activities, such as hiking tours and sports competitions, leading to an appreciation of nature and landscape (Björk et al. 2008; Stolton et al. 2015). Another option is to improve infrastructure, for instance by identifying high-quality landscapes and furnishing them with an adequate quantity of footpaths, hiking and running trails, and cycle routes (Wolf and Wohlfart 2014). Guided excursions could also be used to integrate educational aspects, for example, nature and sustainability (Schultz et al. 2018). Furthermore, by promoting green spaces and high landscape quality, park management can improve and maintain the quality of residents' housing situation—a further important aspect of QoL.

Health challenges in rural areas mainly concern elderly age groups: due to their high share of the population, limited mobility, and typically remote places of residence with lower access to public transport and greater distance from utilities, such as medical care, they are at particular risk (Bosworth et al. 2020). Accordingly, it is crucial for park management to identify group-specific measures that support residents' health (Jiricka-Pürrer et al. 2019; Puhakka, Pitkänen, and Siikamäki 2017). In the case of elderly people, this includes the promotion of mobility offers (e.g., calling taxicabs, car-sharing) and infrastructure if possible (Bosworth et al. 2020). It will be key to implement such measures sustainably to fulfill conservation goals (e.g., no negative impacts on biodiversity). However, by addressing such issues, park management could increase acceptance among residents, which in turn would help in implementing other measures (e.g., conservation projects) that face stronger resistance.

Satisfaction with social relations was another key dimension influencing QoL in our study. Social relations in rural areas, including the investigated regional nature parks, have been shown to be at risk (see e.g., Besser, Jurt, and Mann 2017; Bjornestad, Brown, and Weidauer 2019; Skaalsveen, Ingram, and Urquhart 2020). Increased structural changes, for example, the rationalization and automation of agriculture, have led to a loss of social contact, and farmers on remote farms increasingly suffer from loneliness (Bosworth et al. 2020; Forney and Häberli 2017; Junquera et al. 2022). Elderly widowed people in remote rural areas are also at risk of loneliness (Bosworth et al. 2020; De Koning, Stathi, and Richards 2017; Kelly et al. 2011). These risks of loneliness could also apply in our investigated remote rural areas. Park management can influence social structures (Jones, McGinlay, and Dimitrakopoulos 2017; Pinheiro, Triest, and Lopes 2021) and aim to strengthen social relations by initiating or co-creating local spatial plans, advising local authorities to revise construction legislation, and implementing options for social interaction within their offers of leisure infrastructure (e.g., visitor centers, hiking trails). Appropriate and careful spatial planning and architecture provide ways of supporting social contact among residents, for example by designing welcoming leisure spaces in

the villages that can host social meetings and discussions (Abass and Tucker 2018; Afshar et al. 2017; Eslami et al. 2019; Zhang, Matsuoka, and Huang 2018). In addition, scenically beautiful places in nature encourage people to spend time there, enable groups to come together, and strengthen social exchanges and relationships (Pinheiro, Triest, and Lopes 2021). Thus, infrastructure that allows people to sit together by the water, in the forest, or at other special (view)points can be offered and maintained by park management. Our findings show that residents want improvements in spatial planning. Park management can also organize events for social exchanges, such as neighborhood, youth, and senior citizen get-togethers, as well as initiating associations and festivals in their municipalities. Support of rural social enterprises and tailored interventions at the local level are further opportunities to support social relations in rural areas (Kelly et al. 2011).

Our results revealed the management needs that are perceived by residents regarding their income and financial situation. Residents' economic situation is, to a large extent, dependent on the (inter)-national economy, global events (e.g., pandemics, conflicts), and socio-economic factors (e.g., out-migration, structural changes in agriculture). The contribution of parks to the regional economy is mainly driven by generating and promoting tourism offers (do Val Simardi Beraldo Souza et al. 2019; Job et al. 2016; Knaus and Backhaus 2014; Mayer 2014; Naidoo et al. 2019; Serenari et al. 2017). This income from tourism indirectly affects the economics of other sectors (Pham 2020), such as local infrastructure and services (Pantić, Čolić, and Milijić 2021), cultural and leisure offers and institutions (Hogg et al. 2019; Rees et al. 2013), and education and off-farm jobs (Dang et al. 2020). It is thus important for park management to be aware of both direct and indirect impacts on the local economy and to find potential pathways for improving the economic situation. In addition, parks can contribute to residents' financial situation by enabling better human health and lowering health costs (Buckley et al. 2019), achieving larger yields of products through healthier soil conditions (Coad et al. 2008; Hogg et al. 2019; Rees et al. 2013; Vivanco 2001), and marketing their own park labels (Knaus, Bonnelame, and Siegrist 2017).

In line with the literature on rural areas, our results indicate that sustainable forms of mobility require greater management efforts in parks (Berg and Ihlström 2019; Eckhardt et al. 2018; Wierenga 2021; Yu and Zhao 2021). More astonishingly, however, it turns out that footpaths and cycle routes are not considered satisfactory in the investigated parks. This echoes other studies in Europe, such as that of Bosworth et al. (2020), who found that residents in the UK wanted separate paths that provided safety from fast and large vehicles. The safety provided by these measures could enhance people's motivation to travel to public transport stations on foot or by bicycle (Bosworth et al. 2020), which also seems conceivable in our study areas. In addition, a wide range of digital and smart innovations, such as apps for car sharing and hiking routes (Shaker et al. 2021), self-driving small buses, collective taxis (Imhof, Vogel, and Ruiz 2009), electric mobility (such as e-scooters, electric bicycles, and electric rental cars) (Martín et al. 2019) can further promote rural mobility (Bosworth et al. 2020; Eckhardt et al. 2018; Porru et al. 2020; Sieber et al. 2020). Accordingly, we propose that park management advise municipalities with a view to introducing alternative, sustainable, and digital mobility options, and seek cooperation with providers of electric vehicles and digital solutions, for example. Members of park-management bodies could also use their political connections to lobby for expanding public transport. Moreover, sustainable mobility requires sustainable energy provision, and our results show that the availability of renewable energy in parks is a prominent desire of residents. Thus, it would be worthwhile for parks to follow this line of activity, either through their own projects or through collaborations with energy providers.

In summary, the dimensions that proved important in park residents' QoL are also essential for sustainable development and hence relate to the two main goals of parks (FOEN 2019; UNESCO, 2019b; WCPA 2016). The wishes expressed by residents regarding the various fields of activity also imply that, in their view, these goals have not yet been achieved in the investigated parks. Hence, we propose that park management evaluate their activities more closely against residents' wishes and benefits (McNeely 1994) and find synergies for simultaneously promoting sustainable development and QoL for residents. It is also essential that they communicate these activities and the direct and indirect impacts they have on residents' QoL (Shields, Moore, and Eagles 2016). Information and opportunities for participation helps to build acceptance and identification with the park and open up opportunities for a common trajectory and collaboration toward sustainable development and QoL (Mashizi and Sharafatmandrad 2020; Stoll-Kleemann and Welp 2008; von Lindern et al., 2019). To reach these goals, park management can take up various roles and activities, including the provision of information, consulting with companies and private individuals, networking between various actors, project

development and implementation, sourcing funding, and liaising with political actors and authorities.

The differences found between the three parks point to the importance of considering the regional contexts of parks when tackling issues of QoL: while we found that health and social relations are generally the main components in shaping QoL, there are still important differences in the strength of the signals. Furthermore, there are also differences between the needs of management and the wishes expressed by residents regarding the various dimensions of QoL. For example, while noise reduction could lead to a significantly higher QoL in JPA, these measures would have no effect in the other two parks. We assume that the traffic situation in JPA is different from the other two parks and leads to more noise. However, to confirm this further investigation would be required. More importantly, the differences in the parks show that if parks aim to improve their residents' QoL, it is imperative that they first investigate which components of QoL are important and require improvement in their specific region.

Despite these specificities, we believe that our analyses and suggestions can be broadly extended to other parks facing similar challenges typical of rural regions, and where similar effects and issues have been identified, such as health impacts (e.g., Bonet-García et al. 2015; Lemieux et al. 2012; Puhakka, Pitkänen, and Siikamäki 2017; Romagosa, Eagles, and Lemieux 2015), sustainable mobility (e.g., Buongiorno and Intini 2021; Imhof, Vogel, and Ruiz 2009; Mounce, Beecroft, and Nelson 2020), availability of basic services and infrastructure (e.g., Hogg et al. 2019; Oikonomou and Dikou 2008), structural changes in agriculture (e.g., Nguyen et al. 2019; Sroka et al. 2019; Trachsel et al. 2021), and QoL in general (e.g., Dahlberg and McKee 2018; Oguzturk 2008; Shucksmith et al. 2009).

At the same time, it is important to state that our study has its limitations. It does not make use of objective indicators that also describe dimensions of QoL, such as life expectancy, distance from public transport or schools, and the number of leisure facilities. We measured QoL based on the self-reported satisfaction of individuals, which is subjective by nature. It would be interesting to contrast perceived QoL with other existing data. This would also be interesting for park-monitoring schemes and should therefore be addressed in future research. Furthermore, our results are based on cross-sectional data and provide a snapshot of present satisfaction and management needs. We cannot prove the extent to which the QoL of park residents is affected by influences other than park-management activities. Moreover, we cannot predict or infer the causality of the effects of park management on residents' QoL. In future studies, it would be interesting to use longitudinal data and survey measures with direct and indirect impacts on QoL to investigate how resident satisfaction changes when park management focus their efforts on areas shown to be important in this study. This would be a crucial component in elucidating the role that park management can play in improving QoL for residents and finding out which measures prove efficient. Overall, we believe that parks adopting such measures would benefit strongly with regard to achieving their sustainability goals.

Conclusion

In this study, we addressed the question of how park management can best contribute to park residents' QoL. We identified the most promising approaches by addressing the personal, social, and infrastructural dimensions of QoL. When they take the QoL of human populations in parks seriously, park management has various options for directly and indirectly improving the QoL of residents. Our results show that there are four lines of action through which park managements can synergistically tackle the improvement of park inhabitants' QoL and make use of efficient pathways to make a difference for local people. These are: (1) offers that directly or indirectly improve residents' health, for example encouraging them to be active outdoors and safeguarding a healthy, inspiring, and beautiful environment; (2) measures that improve social relations for residents, for example organizing events or supporting municipal spatial planning; (3) activities that create meaningful jobs in the region, for example certifying local products and fostering nature-based tourism; and (4) promotion of sustainable mobility, infrastructure, and renewable energy, for example by collaborating with energy providers and political lobbying. By providing places in nature and planning landscapes with the aim of improving inhabitants' QoL, park management can contribute to both inhabitants' health and social life. Sustainable mobility, infrastructure, and renewable energy are prerequisites for enabling many other essential dimensions of high QoL in the long term. These lines of action overlap in many ways and offer great synergistic potential. Thus, defining goals and adopting measures to improve QoL for residents can generate multiple positive outcomes in parks, for both nature and people. This opens up pathways for achieving sustainable development.

Note

1. The coefficient of the independent variable of political participation is negative. In the bivariate model, however, the correlation is positive [$b = 0.117$,

$p < .001$, $F(1, 2344)$, $R^2 = 0.41$]. This indicates that the negative effect in the multivariate model results from the influence of the other independent variables. We, therefore, consider the effect as an artefact of the multivariate regression and refrain from any further interpretations.

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Ethical approval

All required ethical standards were respected. Informed consent was obtained from all subjects involved in the study.

Disclosure statement

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Appendix of Article 4

b
UNIVERSITÄT
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AND ENVIRONMENT

Quality of Life in the UNESCO Biosphere Entlebuch

You can also fill in the questionnaire online at the following link:

https://umfrage.cde.unibe.ch/entlebuch

Please only answer this questionnaire if the enclosed letter was addressed to you personally.

If not, please pass the questionnaire on to the right person.

If you have ticked something incorrectly, please colour in the box completely and place the new cross in the correct place. Please fill in the text fields legibly in block letters.

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Your quality of life

A1 **How satisfied are you with your life <u>in general</u>?**

Not at all satisfied	0	1	2	3	4	5	6	7	8	9	10	Completely satisfied
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

A2 **How satisfied are you with the <u>leisure facilities</u> in your area? (Sports, recreation, culture, etc.)**

Not at all satisfied	0	1	2	3	4	5	6	7	8	9	10	Completely satisfied
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

A3 **How satisfied are you with the <u>public footpaths</u>? (Sidewalks, forest paths, etc.)**

Not at all satisfied	0	1	2	3	4	5	6	7	8	9	10	Completely satisfied	Does not concern me
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐

A4 **How satisfied are you with the transportation infrastructure for <u>bicycles</u>? (Bicycle paths, bicycle lanes, parking spaces, etc.)**

Not at all satisfied	0	1	2	3	4	5	6	7	8	9	10	Completely satisfied	Does not concern me
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐

A5 **How satisfied are you with the <u>public transportation services</u>?**

Not at all satisfied	0	1	2	3	4	5	6	7	8	9	10	Completely satisfied	Does not concern me
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐

A6 **How satisfied are you with the <u>road infrastructure</u>?**

Not at all satisfied	0	1	2	3	4	5	6	7	8	9	10	Completely satisfied	Does not concern me
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐

A7 **How do you perceive your <u>health status</u> in general?**

Very bad	0	1	2	3	4	5	6	7	8	9	10	Very good
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

A8 **How high do you perceive the risk of being involved in a traffic accident in your everyday life?**

Very high	0	1	2	3	4	5	6	7	8	9	10	Very low
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

A9 **How high do you perceive the risk of becoming a victim of physical <u>violence</u> or <u>crime</u> in your everyday life?**

Very high	0	1	2	3	4	5	6	7	8	9	10	Very low
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

A10 **How satisfied are you with your political participation?**

Not at all satisfied	0	1	2	3	4	5	6	7	8	9	10	Completely satisfied
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

A11 **How satisfied are you with your personal financial situation?**

Not at all satisfied	0	1	2	3	4	5	6	7	8	9	10	Completely satisfied
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

A12 **How satisfied are you with your gainful employment? (Regardless of salary or level of employment)**

Not at all satisfied	0	1	2	3	4	5	6	7	8	9	10	Completely satisfied	No employment
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐

A13 **How satisfied are you in general with the relationships you have in your social environment? (Family, friends, etc.)**

Not at all satisfied	0	1	2	3	4	5	6	7	8	9	10	Completely satisfied
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

A14 **How much do you feel <u>discriminated against</u> in your everyday life because of your gender, background, sexual orientation, or otherwise?**

Strongly discriminated	0	1	2	3	4	5	6	7	8	9	10	Not at all discriminated
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

A15 **How satisfied are you with the <u>basic services</u> in your area? (Shopping facilities, doctor's office/hospital, internet, post office, etc.)**

Not at all satisfied	0	1	2	3	4	5	6	7	8	9	10	Completely satisfied
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

A16 **How satisfied are you with the size, location, and quality of your house/apartment?**

Not at all satisfied	0	1	2	3	4	5	6	7	8	9	10	Completely satisfied
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

A17 **How satisfied are you with the <u>cost</u> of your housing?**

Not at all satisfied	0	1	2	3	4	5	6	7	8	9	10	Completely satisfied	I cannot asses
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐

A18 **To what extent do you feel a sense of belonging to your place of residence?**

Not at all belonging	0	1	2	3	4	5	6	7	8	9	10	Completely belonging
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

A19 **How satisfied are you with the quality of nature and landscapes in your area?**

Not at all satisfied	0	1	2	3	4	5	6	7	8	9	10	Completely satisfied
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

A20 **How much do you feel burdened by noise from road or rail traffic?**

Strongly burdened	0	1	2	3	4	5	6	7	8	9	10	Not at all burdened
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

A21 **How much do you feel burdened by <u>air traffic</u> noise?**

Strongly burdened	0	1	2	3	4	5	6	7	8	9	10	Not at all burdened
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

A22 **How much do you feel burdened by noise from your <u>neighbours</u> or <u>people</u> on the street?**

Strongly burdened	0	1	2	3	4	5	6	7	8	9	10	Not at all burdened
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

Your opinion on different lifestyles

Below are descriptions of three different people with different lifestyles. It is possible that none of these descriptions matches you exactly. Nevertheless, we ask you to imagine, if possible, what matches you most and to put appropriate tick marks in each of the lifestyle categories.

B1 How well do the following descriptions of different lifestyles apply to you?

Lifestyle A:

Person A lives in the country in a medium-sized house. The person uses solar energy for electricity and has gas heating. In summer, Person A likes to go to a river or lake and meet friends there. On holiday, Person A prefers to go to the Mediterranean by car. About every other year, she/he also flies to a country that is further away, for example in Asia or South America.

Person A sometimes goes to work by car alone or together with a neighbour.

When shopping, Person A travels by bike or car to a big grocery store and buys mainly food that she/he considers good quality. For example, she/he buys high-quality meat, fresh bread, and good cheese. From time to time, Person A also buys products with organic or other sustainability labels.

	Does not apply										Applies
	0	1	2	3	4	5	6	7	8	9	10
Lifestyle A is similar to my lifestyle.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lifestyle A is what I want.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lifestyle A would be easy for me to implement.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Lifestyle B:

Person B has made a conscious decision to live close to nature. She/he lives in a small house and uses renewable energy for electricity and heating. In her/his leisure time, Person B prefers to meet friends, play outdoor sports, and appreciate the beautiful landscape. Sometimes Person B does volunteer work for different organizations.

On holiday, Person B goes hiking in the Swiss mountains or swimming in Ticino. Sometimes this person goes on a city trip to Italy or France by train. Person B commutes to work by train.

Person B usually buys seasonal vegetables and eggs from the farmer next door who she/he knows cares about the environment and animal welfare. For products she/he can't get from the farmer, she/he takes the bus or the bike to the nearest bigger shop and usually buys food there with a label like organic, Demeter, or similar. Person B rarely buys meat.

	Does not apply										Applies
	0	1	2	3	4	5	6	7	8	9	10
Lifestyle B is similar to my lifestyle.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lifestyle B is what I want.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lifestyle B would be easy for me to implement.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Lifestyle C:

Person C lives in the countryside in a spacious house and particularly appreciates having a lot of space. In terms of household energy, Person C mainly uses mixed-source electricity and gas for heating.

In her/his free time, Person C prefers to meet friends and go to a sports club. On holiday, she/he particularly likes to travel to warm countries and flies to the Maldives or South Africa once a year. The goal of Person C is to see New Zealand or Australia soon.

Person C commutes to work by car and listens to music. When shopping, she/he usually takes the car to a big grocery store where she/he gets everything she/he needs each day. For example, pasta, meat, cheese, and vegetables. The price of products is important to Person C, so she/he thus pays close attention to sales.

	Does not apply 0	1	2	3	4	5	6	7	8	9	Applies 10
Lifestyle C is similar to my lifestyle.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lifestyle C is what I want.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lifestyle C would be easy for me to implement.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

B2 Perhaps you consider one or more of the above lifestyles to be less easily achievable for you. If so, what are the reasons?

Your opinion on different areas of life

C1 How important are the following areas to you personally?

	Not at all important 0	1	2	3	4	5	6	7	8	9	Very important 10
Protection and conservation of nature and biodiversity	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Beauty and integrity of the landscape	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Safety from floods, storms, landslides, avalanches, or similar	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Spatial planning: preventing the overbuilding of green spaces	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Availability of public transport	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Sufficient and good footpaths (sidewalks) and cycle paths	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

(continued) How <u>important</u> are these areas to you personally?

	Not at all important 0	1	2	3	4	5	6	7	8	9	Very important 10
Good quality road infrastructure	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Obstacle-free environment for persons with disabilities	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Gender equality	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Equality of all people from different backgrounds	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Individual self-determination	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Education and awareness-raising for the environment and sustainability	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Care services for children, the elderly, and other persons with care needs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Volunteering (in associations, non-profit organizations, politics, etc.)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Friends, family, partner	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Sense of belonging to place of residence	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Opportunities to participate in activities related to biosphere	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ongoing information on biosphere management activities	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Leisure, recreational, and cultural activities	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Air travel	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Preservation of cultural heritage (buildings/ruins, traditions, crafts, etc.)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Renewable energy (solar, wind, bioenergy, etc.)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Adequate income	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Sustainable tourism in the region	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Satisfaction with employment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Basic services (shopping facilities, doctor/hospital, internet, post office, etc.)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Regional and seasonal food	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Meat and fish to eat	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Milk and eggs to eat	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Your opinion about your surroundings and region

You live in the UNESCO Biosphere Entlebuch. Below are questions about your surroundings as well as the biosphere's potential for improvement in various areas.

D1 Which statement best applies to you?

- ☐ I didn't know I live in a biosphere.
- ☐ I know that I live in a biosphere, but I am not very interested in it.
- ☐ I wasn't sure if I was living in a biosphere and I don't consider it relevant.
- ☐ I know that I live in a biosphere, and I am very interested in it.

D2 In which areas do you think management of the UNESCO Biosphere Entlebuch could be improved?

The area...	...could be improved.	...is satisfactory.	Don't know
Protection and conservation of nature and biodiversity	☐	☐	☐
Beauty and integrity of the landscape	☐	☐	☐
Safety from floods, storms, landslides, avalanches, or similar	☐	☐	☐
Spatial planning: preventing the overbuilding of green spaces	☐	☐	☐
Availability of public transport	☐	☐	☐
Sufficient and good footpaths (sidewalks) and cycle paths	☐	☐	☐
Quality of road infrastructure	☐	☐	☐
Obstacle-free environment for persons with disabilities	☐	☐	☐
Gender equality	☐	☐	☐
Equality of all people from different backgrounds	☐	☐	☐
Education and awareness-raising about the environment and sustainability	☐	☐	☐
Care services for children, the elderly, and other persons with care needs	☐	☐	☐
Opportunities to participate in activities related to biosphere	☐	☐	☐
Ongoing information on biosphere management activities	☐	☐	☐
Leisure, recreational, and cultural activities	☐	☐	☐
Preservation of cultural heritage (buildings/ruins, traditions, customs, crafts)	☐	☐	☐
Sustainable tourism in the region	☐	☐	☐
Provision of renewable energy (solar, wind, bioenergy, etc.)	☐	☐	☐
Availability of regional and seasonal food	☐	☐	☐
Availability of basic services (shopping facilities, doctor/hospital, internet, post office, ...)	☐	☐	☐

D3 Other areas in which biosphere management should make improvements:

Information about your everyday life

E1 How big is your apartment/house? *(Please indicate approximate measure.)*

|__|__|__|__| square meters

E2 What is your apartment/house mainly heated with? *(Multiple selections possible.)*

☐ Oil	☐ Biogas	☐ District heating
☐ Gas	☐ Wood, woodchips, pellets	☐ Other
☐ Electrical resistance heating	☐ Heat pump	☐ Don't know

E3 How many garbage bags are filled in your private household each month?

|__|__|__| garbage bags with a volume of |__|__|__| litres

E4 How much of the food you consume comes from Switzerland and neighbouring countries? *(Please indicate approximate percentage)*

|__|__|__| % ☐ Don't know

E5 Which of these statements best describes your diet? *(Please tick only one.)*

☐ Meat or fish daily

☐ Meat or fish a few times a week

☐ Meat or fish a few times a month

☐ Eggs/dairy products, but no meat or fish

☐ No eggs, no dairy products, no meat, no fish

E6 Do you use a car or motorbike privately (for commuting, shopping, leisure, etc.)?

☐ Yes ➔ Continue with question E7 ☐ No ➔ Continue with question E9

E7 **What kind of fuel(s) does the car or motorbike you use require, and what is its consumption level?** *(Please tick only one option and indicate consumption level, where applicable.)*

☐ Petrol/diesel with a consumption of ⌊_⌊_⌊_⌋ litres per 100 kilometres

☐ Hybrid (i.e. petrol/diesel) consumption of ⌊_⌊_⌊_⌋ litres per 100 kilometres

☐ Electro

E8 **What cumulative distance do you travel privately by car or motorbike (for commuting, shopping, leisure, ...) in a normal working week, including weekends?** *(Please give approximate figure.)*

	Distance per week		Distance per week
Commute	⌊_⌊_⌊_⌊_⌊_⌋ km	Purchasing / Household	⌊_⌊_⌊_⌊_⌊_⌋ km
Leisure	⌊_⌊_⌊_⌊_⌊_⌋ km	Other	⌊_⌊_⌊_⌊_⌊_⌋ km

E9 **Do you use public transportation privately (for commuting, shopping, leisure, etc.)?**

☐ Yes ➔ Continue with question E10 ☐ No ➔ Continue with question E11

E10 **What distance do you travel privately by public transport (commuting, shopping, leisure, etc.) in a normal working week, including weekends?** *(Please provide approximate figure.)*

	Distance per week		Distance per week
Commute	⌊_⌊_⌊_⌊_⌊_⌋ km	Purchasing / Household	⌊_⌊_⌊_⌊_⌊_⌋ km
Leisure	⌊_⌊_⌊_⌊_⌊_⌋ km	Others	⌊_⌊_⌊_⌊_⌊_⌋ km

E11 **How many hours did you fly for private purposes (holidays, travel, etc.) last year?** *(Please provide approximate number or 0.)*

⌊_⌊_⌊_⌊_⌋ hours

E12 **Did you donate money to a non-governmental organization (NGO) or charity last year?**

☐ Yes ☐ No

E13 **How important are environmental and social sustainability criteria to you when investing money (choice of bank, account, fund, etc.) compared to other criteria (return, services, etc.)?**

Not at all important	0	1	2	3	4	5	6	7	8	9	10	Very important
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

E14 How well do the following statements apply to you?

	Totally disagree	Somewhat disagree	Somewhat agree	Totally agree
The thought of what environmental conditions our children and grandchildren will likely face worries me.	☐	☐	☐	☐
If we continue as we have so far, we are heading for an environmental catastrophe.	☐	☐	☐	☐
The majority of the population in our country is not sufficiently environmentally aware.	☐	☐	☐	☐
Environmental problems are greatly exaggerated by many environmentalists.	☐	☐	☐	☐
Politics in our country does far too little for environmental protection.	☐	☐	☐	☐
For the sake of the environment, we should all be prepared to reduce our standard of living.	☐	☐	☐	☐

Information about you personally

F1 In what year were you born?

Year of birth: ⌊_⌊_⌊_⌊_⌋

F2 What is your gender?

☐ Female ☐ Male ☐ Other

F3 In what municipality do you live?

Municipality: ⌊_⌋

F4 How many years have you lived in this municipality or in the wider region (i.e. also including surrounding municipalities)? *(Please provide approximate number.)*

⌊_⌊_⌊_⌊_⌋ Years

F5 Do you have children?

☐ Yes ☐ No

F6 How many people permanently reside in your household (including you)?

⌊_⌊_⌋ Persons, thereof ⌊_⌊_⌋ Child(ren) under 18

F7 Do you have a Swiss passport?

☐ Yes ➔ Continue with question F10 ☐ No ➔ Continue with question F8

F8 Are you a citizen of an EU/EFTA state?

☐ Yes ☐ No

F9 What residence status do you have?

- ☐ Permit B (residence permit)
- ☐ Permit C (settlement permit)
- ☐ Permit Ci (resident with employment)
- ☐ Permit G (cross-border commuter permit)
- ☐ Permit L (short-stay permit)
- ☐ Permit F (provisionally admitted)
- ☐ Permit N (for asylum seekers)
- ☐ Permit S (for the vulnerable)

F10 What is your highest educational qualification? (Please tick only one box.)

☐ Compulsory schooling	(Primary/Real/Secondary/District School, Lower Secondary School)
☐ Basic vocational training	(Federal Certificate of Proficiency EFZ, Federal Vocational Certificate EBA, Vocational Baccalaureate, etc.)
☐ General education school	(*Gymnasiale Matura*, *Fachmatura*, *Fachmittelschulausweis*, etc.)
☐ Higher vocational education	(*Höhere Fachprüfung* HFP, *Berufsprüfung* BP, *Diplom* HF, etc.)
☐ Bachelor	(university, post-secondary school, etc.)
☐ Master	(university, post-secondary school, etc.)
☐ PhD	
☐ Other degree	*(Please specify:)* _____

F11 Many people use the terms "left" and "right" in order to describe political values. If you reflect on your own politics, how would you classify yourself in such a spectrum?

Left ☐ ☐ ☐ ☐ ☐ Centre ☐ ☐ ☐ ☐ ☐ Right Don't know ☐

F12 How high is your <u>gross household income</u> per month?
(Total of all persons in the household in CHF incl. earned income, wage supplements, AHV, pensions and social benefits, income from assets and rent, etc.)

☐ Below CHF 2,000	☐ CHF 6,001 to 8,000	☐ CHF 12,001 to 14,000
☐ CHF 2,001 to 4,000	☐ CHF 8,001 to 10,000	☐ More than CHF 14,000
☐ CHF 4,001 to 6,000	☐ CHF 10,001 to 12,000	☐ No answer

F13 How many hours do you use on average in a usual workweek in the following areas? *(Please indicate the approximate number of hours.)*

	Effort per area of activity
Employment and education (side jobs, school, study, etc.)	____ hours per week
Household (shopping, cleaning, cooking, gardening, etc.)	____ hours pro week
Care and nursing (relatives, acquaintances, children, etc.)	____ hours per week
Civic engagement	____ hours per week

(voluntary activities in associations, public institutions, politics, ...)

F14 In which of the following areas are, or were, you mainly active? *(Please tick only one box.)*

- ☐ Housewife or househusband
- ☐ Trade and commerce
- ☐ Banking and insurance
- ☐ Science and research
- ☐ Agriculture and forestry
- ☐ Art and culture
- ☐ Education and social sector
- ☐ Skilled trades, business, or industry
- ☐ Tourism
- ☐ Healthcare, care, or nursing
- ☐ Administration (municipality, canton, federal government)
- ☐ In training/school/university
- ☐ None
- ☐ Other area (please specify:)

|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|

F15 Are you gainfully employed? *(Please tick only one.)*

- ☐ Yes, and I am satisfied with my workload.
- ☐ Yes, and I would like to increase my workload.
- ☐ Yes, and I would like to reduce my workload.
- ☐ No, and I am actively looking.
- ☐ No, and I am not actively looking.
- ☐ No, I am retired.

F16 In which municipality do you mainly work?

Municipality: |_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_| ☐ I am not employed.

Conclusion

Do you have any suggestions or comments on the topics of our survey or on the questionnaire itself? If so, please make a note of it here.
(Praise, criticism, and suggestions are all welcome.)

Please return the questionnaire in the enclosed prepaid envelope.

Thank you very much for your valuable time and cooperation!

Selbständigkeitserklärung

Ich erkläre hiermit, dass ich diese Arbeit selbstständig verfasst und keine anderen als die angegebenen Quellen benutzt habe. Alle Koautorenschaften sowie alle Stellen, die wörtlich oder sinngemäss aus Quellen entnommen wurden, habe ich als solche gekennzeichnet. Mir ist bekannt, dass andernfalls der Senat gemäss Artikel 36 Absatz 1 Buchstabe o des Gesetzes vom 5. September 1996 über die Universität zum Entzug des aufgrund dieser Arbeit verliehenen Titels berechtigt ist.

Zürich, 03.12.2021

Thea Xenia Wiesli