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World Tourism Organization
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of Sustainable Tourism
Observatories



The Sustainable Tourism Observatory of South Tyrol (STOST)

First Annual Progress Report

IMPRESSUM

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Foreword

What you can’t measure, you can’t manage.

(Peter Drucker)

Tourism is one of the most important economic and social phenomena at a global level, undoubtedly a strategic driver of regional development. However, the growing awareness about tourism-related impacts and the acceptance of sustainable development principles entail a new form of destination management: a data-driven, long-term approach for tourism regions.

For several years, the Italian Autonomous Province of Bolzano/Bozen – Alto Adige/Südtirol, located in the Italian Alpine area, has aimed to become a green region. Regional efforts include investments in renewable energies, sustainable transport, e-mobility, and a strong will to shape tourism in harmony with the natural and human territorial entities. Tourism constitutes a very strong pillar of South Tyrol’s overall economy, accounting for 33 million overnight stays and 7.5 million arrivals in 2018 – in an area with only 531 thousand inhabitants. Along with its high potential for generating added value, tourism might also represent a source of pressure for local inhabitants and fragile Alpine environments.

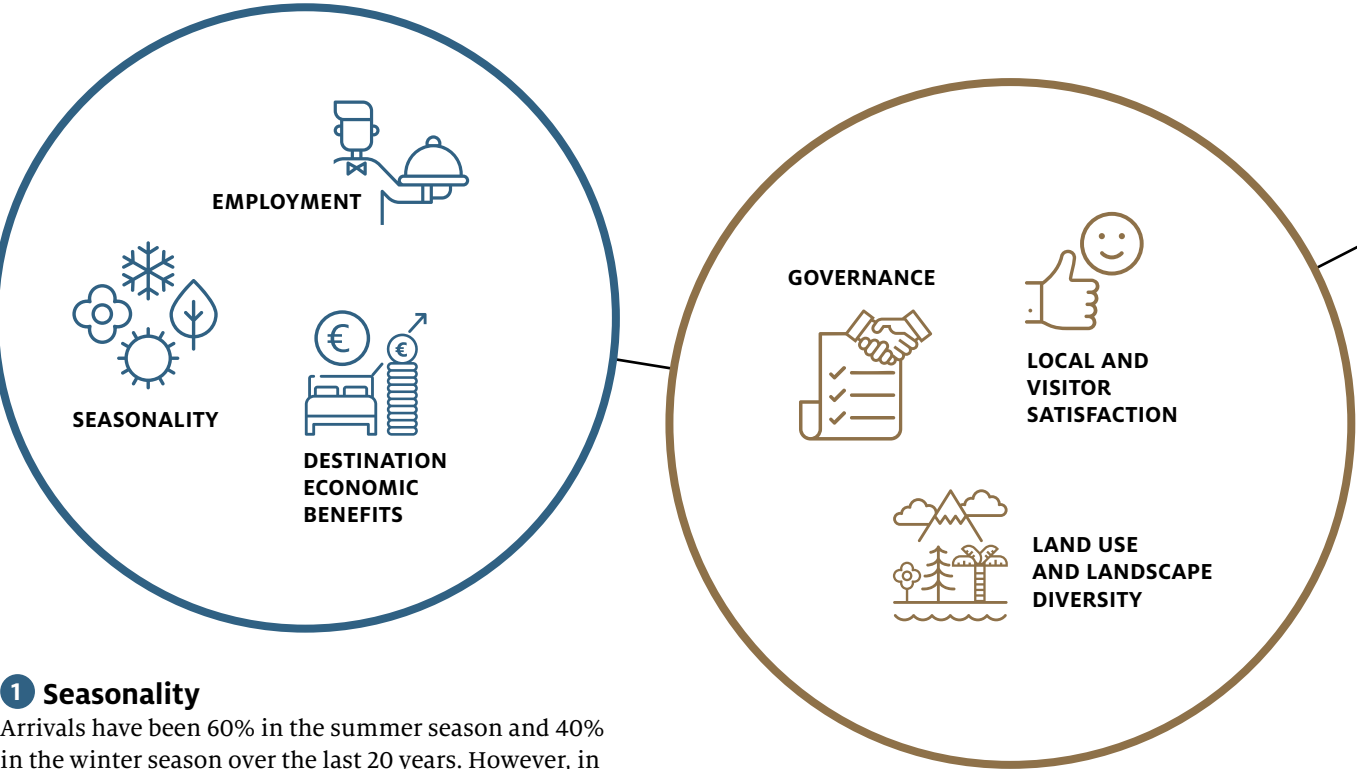
The admission of the Autonomous Province of South Tyrol to the International Network of Sustainable Tourism Observatories is a major step in shaping the balance between the environment, society and the tourism economy. STOST (The Sustainable Tourism Observatory of South Tyrol) also provides a chance to understand tourism from a broad perspective, both in practice and in research. It will enable knowledge transfer, networking and best practice exchange, both worldwide and between disciplines, in turn enriching and putting the concept of sustainability into effect which is a primary goal for South Tyrol.

Arno Kompatscher – Governor of the Autonomous Province of Bozen/Bolzano - South Tyrol
Erwin Hinteregger – Director general of IDM Südtirol - Alto Adige
Harald Pechlaner – Head, Center for Advanced Studies, Eurac Research

Executive Summary

Sustainable tourism “takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities” (UNEP & UNWTO, 2005).

STOST monitors, evaluates, and communicates tourism developments in South Tyrol (Italy). It examines benefits and costs of tourism for South Tyrol and provides recommendations and guidelines for policy makers to support sustainable tourism management. In 2018, tourism in South Tyrol produced over 7.5 million arrivals and 33.3 million overnight stays (ASTAT, 2019a).



1 Seasonality

Arrivals have been 60% in the summer season and 40% in the winter season over the last 20 years. However, in some municipalities, up to 40% of yearly arrivals were hosted in August. The Italian guests have been those mostly subject to summer seasonality.

2 Employment

14% of total employees in South Tyrol work in the accommodation or food and service sector. Around 64.6% are Italian citizens. 35.2 % of enterprises in this sector are female.

3 Destination Economic benefits

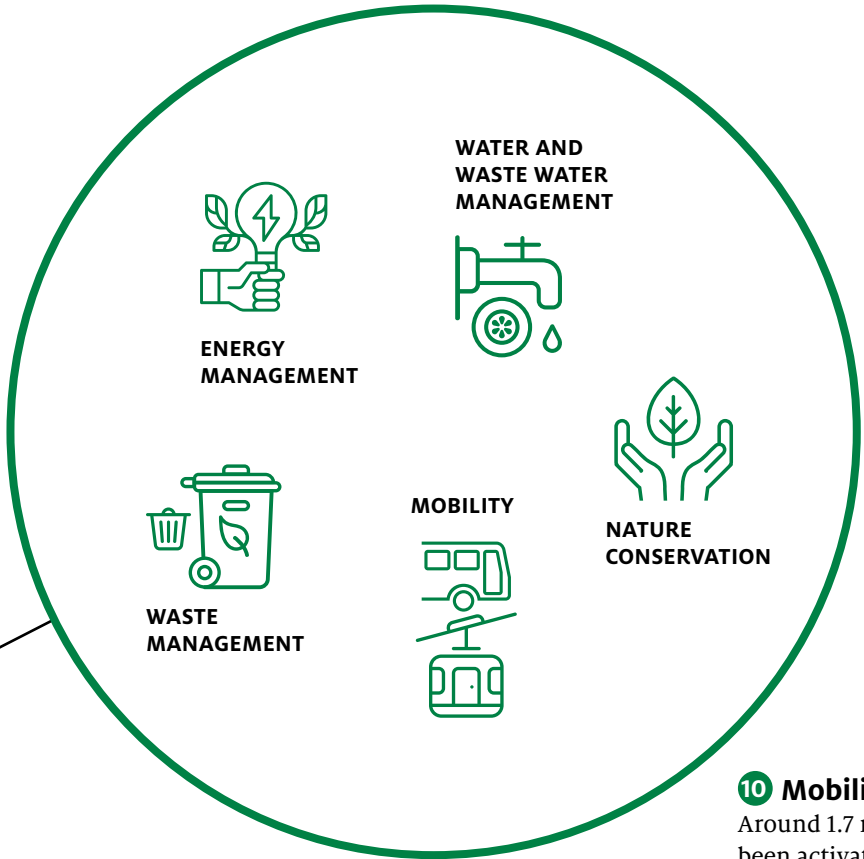
11.1% of total GDP is generated in 2017 by the accommodation or food and service sector. There is an increasingly positive business climate and the gross occupancy rates in the accommodation sector have steadily grown and reached 39.9% in 2017.

4 Governance

17 municipalities, 62 events and 22 accommodation facilities adopted voluntary certification schemes with sustainability purposes or strategies for sustainable development. The provision of regional agricultural products to enterprises of the hospitality and food sector increased over the last years, and so did the commerce of organic milk.

5 Local and visitor satisfaction

On average, there are 17 tourists out of 10 inhabitants, but some municipalities show a much higher share, up to 200. Prices for goods and services are significantly higher in touristic than non-touristic municipalities. However, tourists show high degrees of satisfaction with prices.



6 Energy management

Electricity consumption attributable to the accommodation sector is increasing over time and amounts to 8.7% of total electricity consumed in South Tyrol in 2018. Ski-lifts have also increased their demand for electricity. However, renewable resources are used to produce electricity and also e-mobility charging stations are spreading. Of the 300 active stations, 2/3 are located in accommodation facilities.

7 & 8 Water and waste water management

8% of total water consumed is attributable to the accommodation sector. There is an increasing trend of water use for snowmaking. A maximum share of 23.6% of waste water treated can be attributed to tourism.

9 Waste management

9% of waste produced in South Tyrol can be attributed to the tourism sector.

10 Mobility

Around 1.7 million of guest tickets and mobilcards have been activated in 2018, with an exponential growth in comparison with the 222,000 activated in 2012. The use of cable cars boomed during the summer, showing a +38.7% over the last decade (2006-2016).

11 Land use and landscape diversity

0.6% of total buildings in 2018 are hotels and similar establishments and this share has slightly decreased over time. There is a higher landscape diversity in remote areas of the region, a sign that stands for a potentially more beautiful scenery in remote valleys that attracts visitors.

12 Nature conservation

1/4 of the surface of South Tyrol is protected and many tourism-intense areas show a low level of human influence on the natural environment (hemeroby).

Overall, the growing quantity of tourists in South Tyrol is linked with an increased quality of tourism, not only from the user perspective, but also from that of the environment. Environmental certification schemes are promoted and increasingly welcomed, sustainable transport is supported, and land use is carefully managed to preserve the landscape diversity. We can interpret these farsighted reactions to an increased tourism pressure and resource use as first signs of a sustainable development process at its very beginning.



South Tyrol in brief

South Tyrol is an Italian Autonomous Province and constitutes, together with the other Autonomous Province of Trento, the region Trentino-South Tyrol, located in the northern part of the Italian Alps and bordering with Austria and Switzerland. The Province has an area of 7,400 square kilometers and a total population of over 530,000 inhabitants. Its capital is the city of Bolzano, with about 100,000 inhabitants, but it also has a few other small towns with more than 20,000 inhabitants (Meran/Merano, Brixen/Bressanone, and Bruneck/Brunico). South Tyrol is officially a trilingual region, with German, Italian and Ladin speakers. The statute of autonomy came into force in 1972 and contains concrete measures to protect the German- and Ladin-speaking minorities, such as German and Ladin schools, minority-language radio and television broadcasts and administrative and law-making rights. The territorial morphology is characterized by mountains and valleys. South Tyrol is known for its mountain areas and natural landscapes covering approximately 90% of the territory. One fourth of the South Tyrolean surface (25%) is protected area (Morello, Oggiano, 2015). This includes those protected areas that form part of the core of the renowned Dolomites natural heritage site, which was declared a UNESCO World Natural Heritage site in 2009 for its value in landscape aesthetics and its geologic and geomorphologic importance in science.

The role of tourism in South Tyrol's economy

Tourism plays a major role in South Tyrol's economy, contributing over 8.2% to the local GDP with direct effects only, according to the result of the most recent assessment of the tourism satellite account (TSA), referring to the year 2005 (ASTAT, 2019a). In 2018, tourism in South Tyrol produced over 7.5 million arrivals and 33.3 million overnight stays (ASTAT, 2019a). The main tourist markets are the DACHI markets, named after an abbreviation standing for Germany, Austria, Switzerland, and Italy. Germany accounts for nearly 50% of total visitors, followed by Italy (31.4%), Switzerland (5.1%), and Austria (3.1%). The average length of stay amounts to 4.4 days, a number that has steadily decreased over the last few decades.

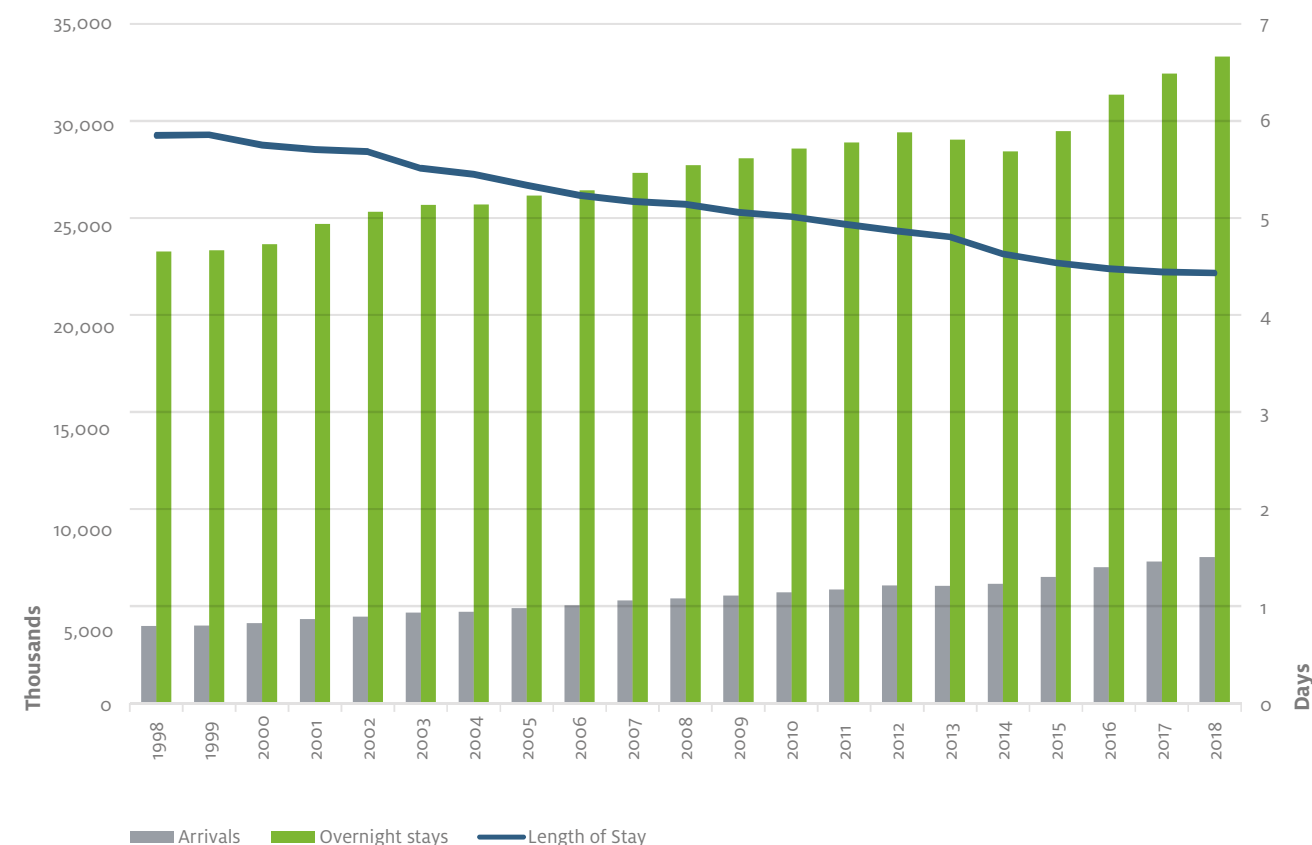


Figure 1: Arrivals and overnight stays (left axis) and average length of stay in days (right axis) in all accommodation facilities, South Tyrol – 1998 - 2018. Yearly data in thousands. Source: ASTAT, 2019a, own elaboration.

Accommodation facilities have experienced dynamics of concentration and an increase in quality. The number of hotels and similar establishments has decreased over the last two decades by 10.5% (4,542 facilities in 1998 vs. 4,065 in 2017), while the number of beds decreased a little less, by 2.9% (229,443 in 1998 vs. 222,703 in 2017). On the other hand, the quality of accommodation facilities has increased, with a rise in 3, 4, and 5-star hotels and a reduction of 1- and 2-star hotels (see [Figure 2](#)). Other accommodation services, such as campsites, private accommodations and agritourisms, when compared to hotels and similar establishments have experienced an almost opposite trend, increasing by 9.9% (5,533 in 1998 vs. 6,080 in 2017). The number of beds in other accommodation services increased proportionally by 8% (65,651 in 1998 vs. 70,952 in 2017), but remain considerably lower than those offered by hotels and similar establishments.

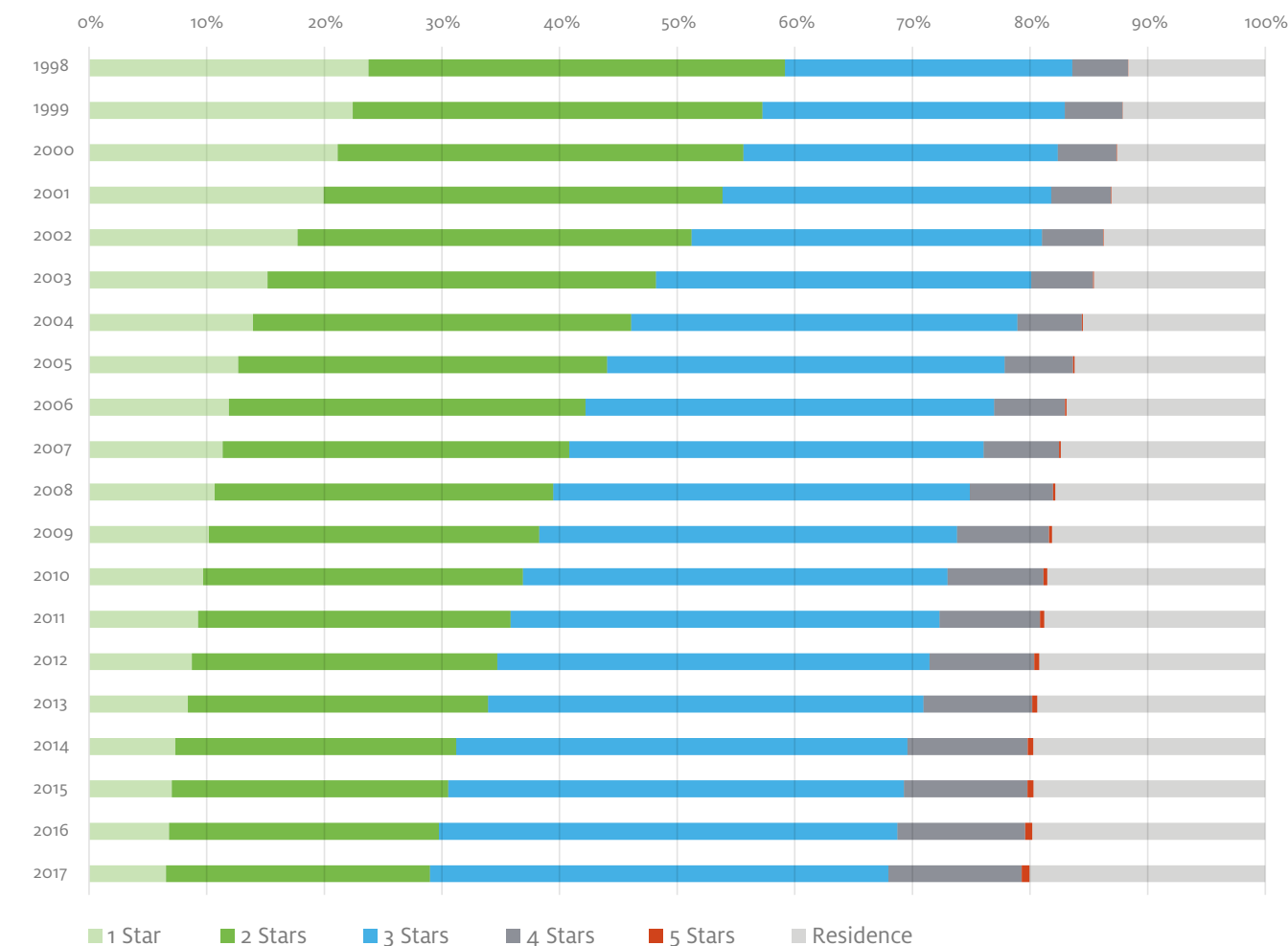


Figure 2: Hotel and similar establishments by accommodation category, South Tyrol – 1998-2017. Percentage values. Source: ASTAT, 2019a, own elaboration.

The tourism hospitality sector is spread over all South Tyrolean valleys, with a higher concentration of beds in the South-Eastern part of the province (see [Figure 3](#)). The number of “Red Rooster” branded agritourism ventures is spread over almost all touristic areas, with only few exceptions mostly related to ski areas located in higher altitudes, which usually cannot be used for farming activities.

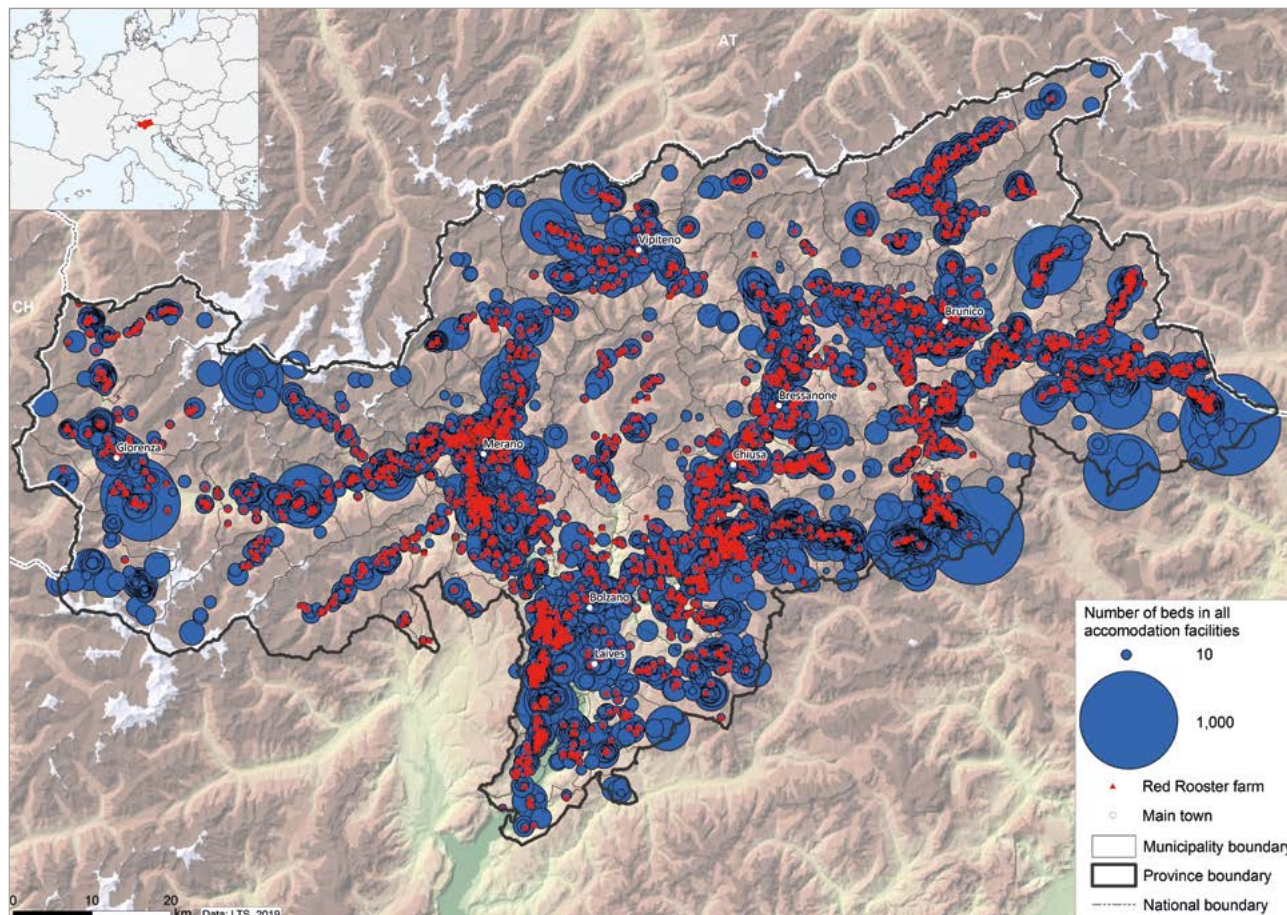


Figure 3: Geolocation and bed capacity of all accommodation facilities (in blue) and location of “Red Rooster” branded agritourism ventures (in red). Source: Open Data Hub South Tyrol Online database, 2019.

Concerning tourism markets, as shown in **Figure 4**, proximity markets prevail over long-distance markets. The region is an attractive destination for tourists mostly originating from the DACH markets. They visit South Tyrol to practice outdoor sport activities, but also just to enjoy the landscapes and protected areas. German and Italian tourists have made up more than 80% of the overnight stays in South Tyrol for over twenty years. The Swiss market has recently been developing, while the Austrian market is small but stable. Additional international markets have increased up to the year 2000, e.g. Poland, the Czech Republic, and the United Kingdom.

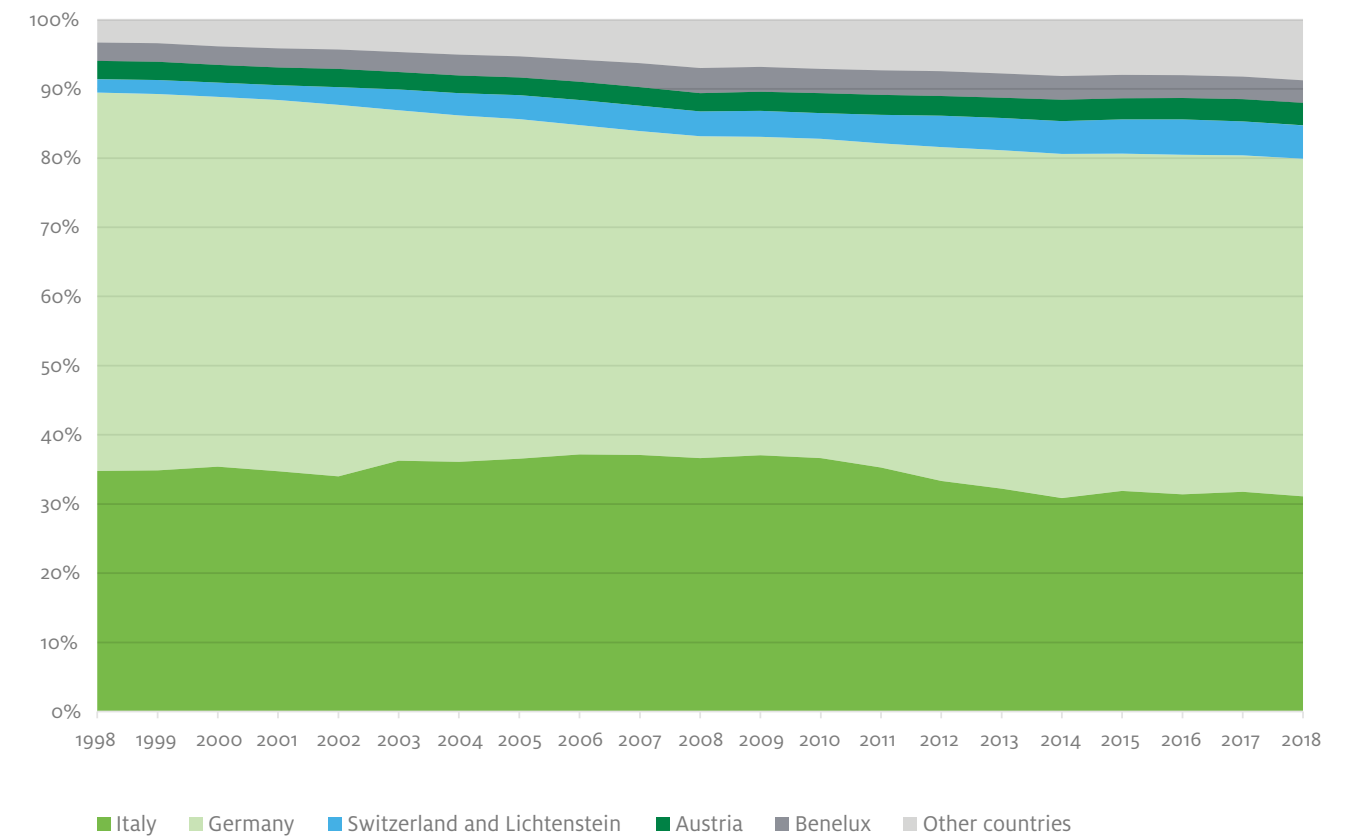


Figure 4: Overnight stays in all accommodation facilities by market of origin, South Tyrol – 1998-2018. Percentage values. Source: ASTAT, 2019a.

In 2017 South Tyrol issued a strategy for 2030 that contains several trends and measures relevant for tourism development. The strategy, #ZTS 2030 (2017), consisted of 20 deployment plans: almost half of them relates to sustainability issues (see **Figure 5**, highlighted topics). These covers both environmental sustainability issues (e.g. transport, cross-sectoral relationships to enhance the consumption of regional products, de-seasonalization) and social issues (e.g. quality of employment in tourism, quality of life for local communities). They also cover the ability to use marketing techniques to encourage sustainable and discourage unsustainable behaviors (e.g. marketing campaigns, sustainable experience design).



Figure 5: The 20 deployment plans of #ZTS 2030. Source: #ZTS 2030 (2017).

In this context, establishing a monitoring system for sustainable tourism in the region (#20 Tourism-Intelligence-Act) was considered essential to foster the implementation of such a strategy, while at the same time motivating and informing the destination’s stakeholders on how to proceed on the ongoing path towards improved sustainability in tourism.





Figure 6: Acceptance of South Tyrol within the network of tourism observatories of the United Nations World Tourism Organization (UNWTO) in October 2018.

STOST: a Tourism Intelligence tool

The Sustainable Tourism Observatory of South Tyrol (hereafter STOST) belongs to the United Nations World Tourism Organization (UNWTO) International Network of Sustainable Tourism Observatories (INSTO), a network of organizations monitoring the economic, environmental, and social impact of tourism at the regional level. The initiative is based on UNWTO's long-standing commitment to the sustainable and resilient growth of the sector through measurement and monitoring, supporting an evidence-based management of tourism (see <http://insto.unwto.org>).

STOST began its activities in early 2018, when a preliminary report was submitted to the INSTO network. On October 22nd, 2018, during the Global INSTO Meeting, South Tyrol officially became part of the UNWTO-INSTO network initiative¹: the inclusion of STOST into this global network plays an important role in fostering the management and monitoring of sustainable tourism development in the region. Moreover, by piloting the membership of an Italian destination in the INSTO Network, the engagement of South Tyrol also aims to contribute to improving sustainability monitoring on a national scale.

The observatory strives to achieve a series of objectives in line with the following vision and mission:

Vision

Through intersectoral and destination-wide cooperation as well as new monitoring and communication models, STOST seeks to contribute to the creation of a livable socio-environmental habitat for South Tyrol's future generations and their guests.

Mission

STOST monitors, evaluates, and communicates tourism developments in South Tyrol. STOST examines benefits and costs of tourism for South Tyrol and provides

recommendations and guidelines for policy makers to support sustainable tourism management. The enabling of awareness, learning, and evidence-based decision-making for different target groups of South Tyrol's society shall lie at its very core.

Objectives

Striving towards the achievement of the vision and the implementation of the mission, the following table shows the short-, medium-, and long-term objectives for the observatory that were elaborated based on a synthesis of the perceptions of experts interviewed during the preliminary phase of the STOST settlement.

¹ <http://insto.unwto.org/event/2018-global-insto-meeting/>

OBJECTIVES	Short term	Medium term	Long term
Be in the loop of developments and regularly informed about them:			
✓ Deliver a clear and regular picture of the resources used and the impact tourism has on South Tyrol's society, economy, and environment.		✓	✓
✓ Identify and communicate good developments, potentials, and opportunities.		✓	✓
✓ Warn about extreme developments, risks, and dangers.		✓	✓
Serve as a think-tank:			
✓ ... which enables sustainable tourism planning and practices through the provision of ideas, possible measures, recommendations and solutions for politicians and other decision makers (e.g. private sector) as well as for other target groups - including young locals and guests.		✓	✓
✓ ... which provides ideas on how to sustainably tackle the challenges of continuous tourism growth and its impacts and which proposes possibilities for a balanced development.		✓	✓
✓ ... which can impact on politics - at provincial level, national level and at global level (by being a member of the UNWTO-INSTO network).		✓	✓
Raise awareness and enable learning:			
✓ Create a better public understanding of what sustainable tourism is, raise awareness amongst different target groups, including the private sector, the population in general, schools and students, visitors etc.		✓	✓
✓ Explore the possibility of creating a short training scheme for destination managers and other tourism stakeholders, based on findings gathered by the monitoring.		✓	✓
✓ Compare and identify best practices of the individual places and communities in South Tyrol. Bring community actors together so they can learn from each other.		✓	✓
✓ Network and exchange sustainable tourism knowledge and experience with other tourism destinations worldwide, compare practices, discuss problems and learn from each other.	✓	✓	✓
Provide evidence for decision makers:			
✓ Provide reliable data and facts as a solid basis for decision-makers from the private and public sector, from which they can derive strategic orientations, objectives, and modalities.		✓	✓
✓ The monitoring results can also support tourism marketers in communicating more credibly about sustainable tourism.		✓	✓
✓ Create evidence to enable decision-makers to perceive the impacts and results of their decisions.		✓	✓
Enable communication, cooperation, and networking - build trust:			
✓ Foster trust, mutual understanding and engagement through regular communication and networking between the private sector, research sector, public and civil sector and between nature conservation, economy, society, and culture.		✓	✓

Governance

The governance of STOST is shaped by many different actors within and outside the destination. The observatory has been installed by the Center for Advanced Studies at Eurac Research in cooperation with the local destination management organization IDM (abbreviation for Innovation, Development, Marketing) (see [Figure 7](#)) and the provincial government of South Tyrol. The stakeholder working group actively contributes to the development of the observatory by supporting Eurac Research and IDM in the design of monitoring issues, in data management and feedback processes, as well as in the validation of results. The stakeholder working group reflects:

a) data providers, among which are, e.g., the Provincial Statistical Office, the Chamber of Commerce and Industry, the local Environmental Agencies; b) support and advice providers, such as, e.g., Institutes for Sustainable Development, the University of Bolzano, other local research

institutions and local trade associations. A complete list of the organizations participating in the Working Group Workshops is listed in the Annex of this report. Finally, additional organizations such as the National Ministry for Agriculture and Tourism, the provincial administration, and international treaties such as the Alpine Convention support the advancement of the observatory by sharing their expertise and bringing in best practices. These entities are crucial because they offer benchmarking opportunities and access to a supra-regional knowledge network. While providing support to policy makers and tourism businesses to make evidence-based decisions, STOST also aims to build a local culture for sustainable development among local communities. Therefore, the main target groups of the observatory are policy makers, the private sector, and the general public.

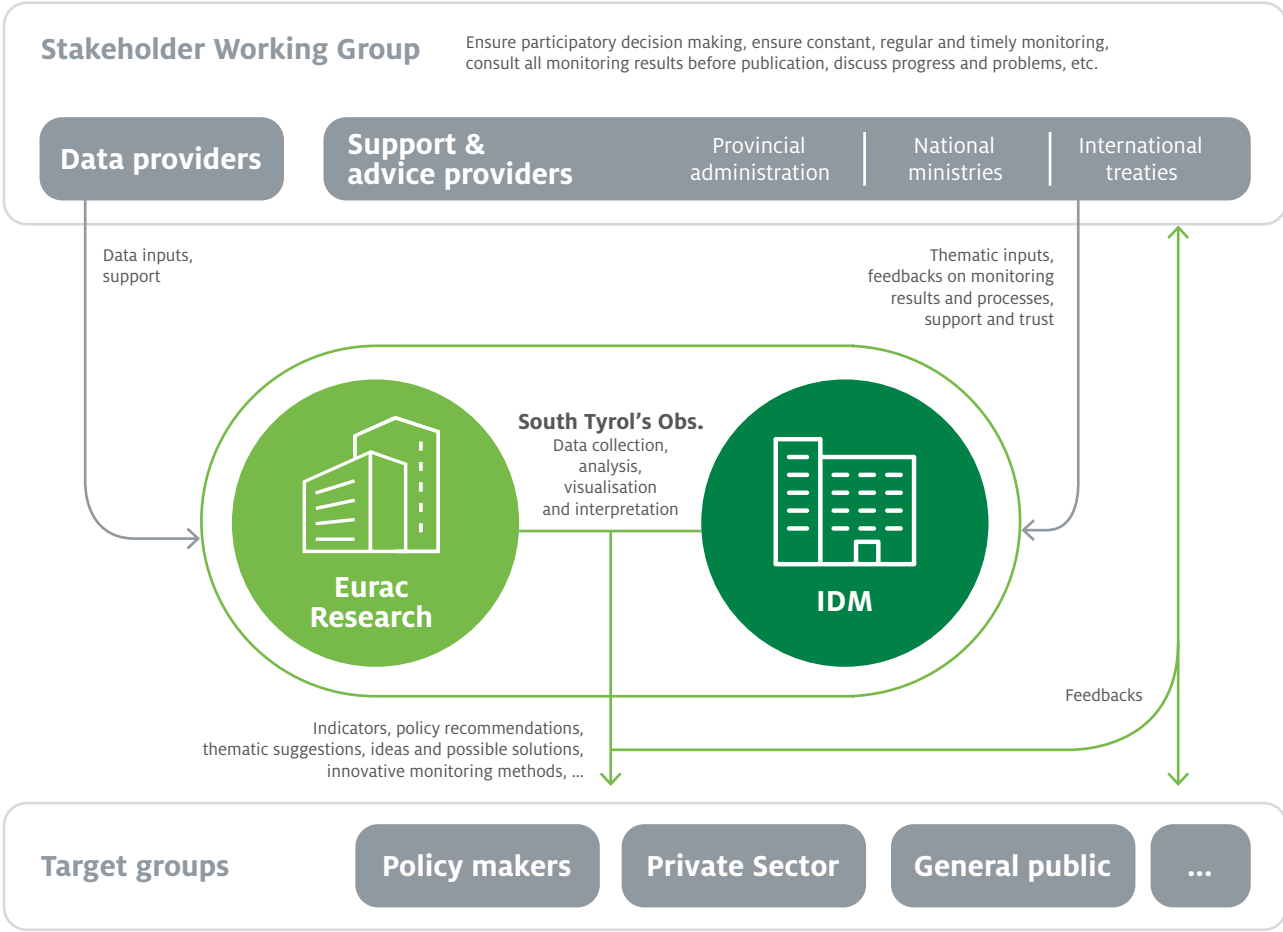


Figure 7: Governance of the STOST observatory. Source: own elaboration.



Research strategy

The observatory is rooted in a deep reflection on the meaning of sustainability in tourism, as well as an applied approach to measure it in the South Tyrolean region. The combination of a conceptual and territorial knowledge has given birth to the monitoring operations and results. This document represents the first STOST annual report in compliance with the regulations and recommendations of the UNWTO-INSTO initiative.

Preliminary analyses were discussed with local stakeholders during face to face interviews and workshops. During these meetings, STOST presented the UNWTO mandatory issue, i.e. the issue areas that UNWTO obligates its members to monitor, and discussed their relevance for South Tyrol. In order to meet the additional needs of the region, STOST decided to augment the UNWTO mandatory issue areas with additional topics that were considered important for a complete analysis of sustainable tourism in South Tyrol.

Definition of Sustainable tourism

In this report we refer to sustainable tourism according to the UNWTO definition, as a form of tourism that **“takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities”** (UNEP & UNWTO, 2005). Following this definition, UNWTO’s and UNEP’s (2005: 11-12) “sustainable tourism development guidelines and management practices are applicable to all forms of tourism in all types of destinations, including mass tourism and the various niche tourism segments. Sustainability principles refer to the environmental, economic, and socio-cultural aspects of tourism development, and a suitable balance must be established between these three dimensions to guarantee its long-term sustainability. Thus, sustainable tourism should:

1) Make optimal use of environmental resources that constitute a key element in tourism development, maintaining essential ecological processes and helping to conserve natural resources and biodiversity.

2) Respect the socio-cultural authenticity of host communities, conserve their built and living cultural heritage and traditional values, and contribute to inter-cultural understanding and tolerance.

3) Ensure viable, long-term economic operations, providing equal socio-economic benefits to all stakeholders, including stable employment and income-earning opportunities and social services to host communities, and contributing to poverty alleviation.

Sustainable tourism development requires the informed participation of all relevant stakeholders, as well as political leadership to ensure wide participation and consensus building. Achieving sustainable tourism is a continuous process and it requires constant monitoring of impacts, introducing the necessary preventive and/or corrective measures whenever necessary. Sustainable tourism should also maintain a high level of tourist satisfaction and ensure a meaningful experience to the tourists, raising their awareness about sustainability issues and promoting sustainable tourism practices amongst them.”

BOX 1 :

A SHORT NOTE ON THE EVOLUTION OF THE SUSTAINABILITY PARADIGM

The concept of sustainable development has undergone many phases and has changed over time. The report *The Limits to Growth* (Meadows, Meadows, Randers and Behrens, 1972), published by the Club of Rome in 1972, counts as one of the most significant and decisive documents in addressing social, economic and especially ecological sustainability and in calling attention to the limits of our planet, continuously striving for growth (Meadows et al., 1972). Thereupon, in 1987 the World Commission on Environment and Development (WCED), took over the ideas of this report and defined sustainable development as “a development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. (Hauff, 1987, p. 46). Following that definition, sustainable development can be interpreted as “an attempt to combine growing concerns about a range of environmental issues with socio-economic issues” (Hopwood, Mellor & O’Brien, 2005: 38). Hence, the quality of the environment must be balanced with the quality of life of people, which in turn is related to the preservation of cultural identity, respect for cultural diversity, and good standards for income and living (Tomislav, 2018).

Since the concept of sustainability was taken up by international organizations such as the United Nations (UN), the World Trade Organization (WTO), the Organization for Economic Co-operation and Development (OECD) and other actors, a variety of different steps were made to enforce and implement sustainability as a core principle for development, among which the most relevant are the Earth Summits of 1992, 2002 and 2012 and the Resolution 70/1 of the United Nations General Assembly, the Global Agenda for Sustainable Development. The reference points for this report, apart from the official UNWTO definition cited in the text, are the 17 Sustainable Development Goals (SDGs) of the 2030 Global Agenda for Sustainable Development, and more specifically those explicitly related to tourism (Goals 8, 12 and 14 on inclusive and sustainable economic growth, sustainable consumption and production (SCP) and the sustainable use of ocean and marine resources - in the specific case of South Tyrol lakes and rivers – respectively).

Notwithstanding these well-known definitory frameworks for sustainable development and tourism, we also acknowledge critical positions, namely those arguing that “no agreement exists regarding what exactly is to be sustained.” (Redclift, 1987: 44). In other words, we understand that different views and different attitudes towards sustainable development co-exist, depending on the prevalence of ecocentric or technocentric environmental views, and different viewpoints about socio-economic equality and human well-being. O’Riordan (1989) and later Hopwood et al. (2015) tried to map the different approaches to sustainable development based on two (essential, but sometimes diverging) dimensions of analysis: the equality concerns vs. the environmental concerns. Depending on the attitudes towards societal change, three typologies of sustainable development supporters stand out: the supporters of the status quo, the reformists and the supporters of the transformation approach. Similarly, when reviewing 30 years of sustainable tourism research, Lane (2009, 2017) argues that there has been a shift in academic thought from a normative approach focused on carrying capacities and limits of acceptable change towards a more sophisticated and pro-active approach, related to system change in societies and transition management. This second approach, holistic and multi-disciplinary, is prominent in current analyses and is often focused on socio-economic transitions. Against that background, STOST acknowledges different approaches to sustainable development and tourism and deliberately helps in the process of evolution from more conservative approaches of adjusting growth models by imposing limits, towards more transformative ones that require system and behavioral change. As argued by Miller (2001: 361), “Although it seems paradoxical to develop indicators for sustainable tourism when no satisfactory definition of the concept exists, the process of developing the indicators does help in determining the important tenets of the concept”. Therefore, place-specific knowledge and data-driven evidence outstanding from STOST will not only suggest adjustments and reforms in the tourism policy system but will also have the more ambitious aim of transforming the destination system and sustainability itself.

Methodological strategy: how to measure and understand?

The UNWTO guidelines for INSTO observatories propose nine mandatory issue areas to monitor sustainability in tourism. These are: tourism seasonality, employment, destination economic benefits, governance, local satisfaction, energy management, water management, waste water management, and solid waste management. However, further monitoring topics are welcomed to assess place-specific issues. Therefore, based on 29 qualitative interviews undertaken with local and international tourism experts during the preliminary phase, the STOST research team defined three additional issue areas: mobility, nature conservation, land use and landscape diversity (see Figure 8). Therefore, the monitoring activities have developed considering 12 issue areas in total.

It is planned that each of the 12 issue areas will include three indicators, selected with reference to international standards (i.e. European Tourism Indicators System for sustainable destination management - ETIS, Global Sustainable Council Tourism Criteria for Destinations - GSTC-D), and one think tank, related to innovative or emerging (but not yet measurable) issues in each field (see Figure 9). The selected indicators were chosen thanks to the collaboration and support of different

administrative and private stakeholders, during 22 bilateral meetings. Not all indicators and think tanks were implemented in this first year of activity, since several knowledge and data gaps emerged during these meetings and further efforts in data generation will be required in the upcoming years. Among the 36 planned indicators, 29 are included in this report. One indicator per each issue area is always general, and the further two illustrate specific phenomena of interest. The think tank is interpreted as an occasion – usually during a working group workshop – to discuss innovative and groundbreaking innovations in the respective issue area by inviting experts in the respective field. For instance, in the issue area “Employment”, the general indicator refers to employees in the hospitality and food service sector, whereas the more specific indicators assess the percentage of female enterprises and the citizenships of tourism employees. Finally, the think tank addresses artificial intelligence (AI) and robotics in the hospitality sector, a major driver of change for the future with potentially disruptive social impacts. Think tanks work as a source of monitoring new concerns but are qualitative in their structure because they cannot (yet) rely on existing data.

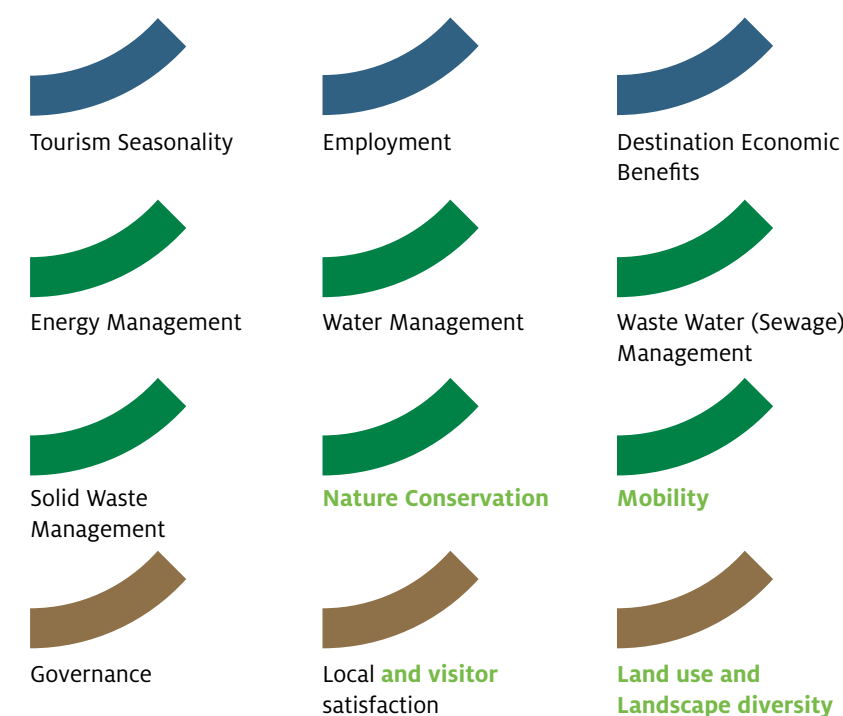


Figure 8: Mandatory (in black) and additional (in green) issue areas. Source: own elaboration.

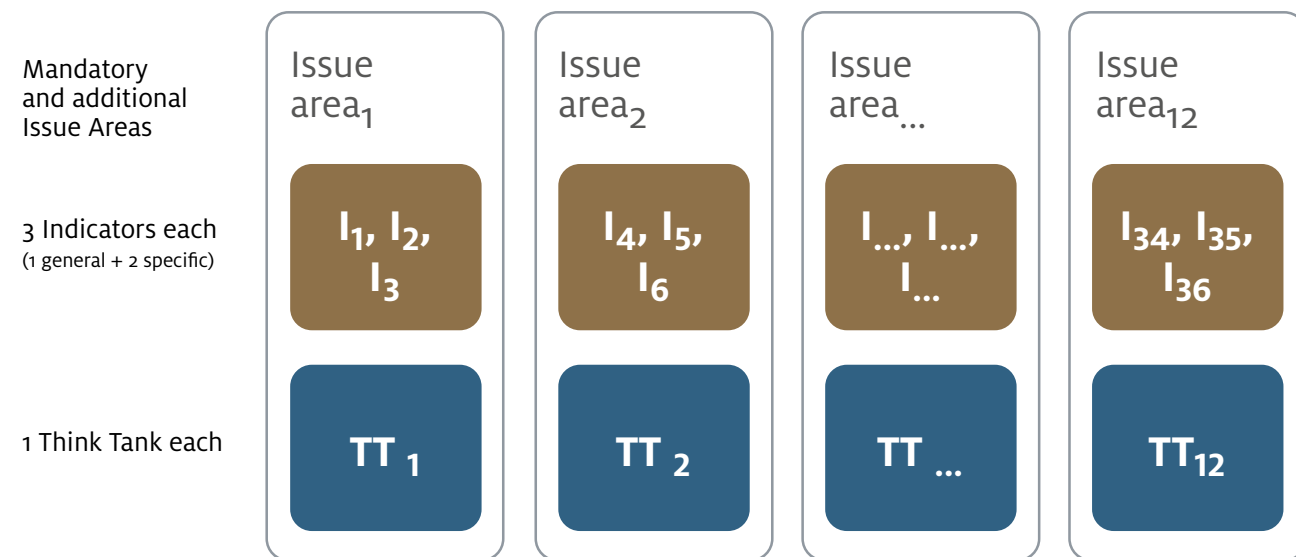























Figure 9: Structure of the observatory. Source: own elaboration.

With a view to the subsequent creation of a general indicator for sustainability (e.g. using the standard by Pulido Fernández, Sánchez Rivero, 2009), indicators were classified according to the DPSIR framework (an acronym that stands for Driving forces, Pressures, States, Impacts, Responses) (Burkhard, Müller, 2008). This framework enables the classification of indicators based on their typology as: a) driving forces of an impact (DF); b) indicators of pressure on the environment (P); c) indicators of the state of the environment (S); d) indicators of impact measured on the environment (I) and finally d) indicators of response (R), typically undertaken by civil society to minimize impacts. Below is a table illustrating the indicators and their classification. Beside each indicator, a circular symbol helps the reader to identify the DPSIR typology, as well as the pillar it refers to: a blue circle indicates the economic, a brown one the social and a green one the environmental pillar.

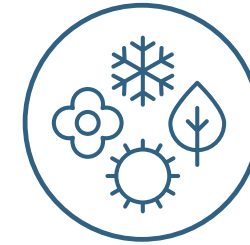
Concerning data granularity, for mandatory issue areas we tried to collect municipal (LAU2) data and address a 10-year time span (2008-2018 was set as a common standard). For additional issue areas (10-12) several efforts were made to create new data from scratch. Municipal data are not always presented in this report, but they are stored and available for interested stakeholders. Data frequency might be daily, monthly, yearly, or one-off. Further details on the procedures of data management, storing and processing are provided in Annex 1. Several collaborations were crucial in calculating specific indicators. For instance, the Eurac Research Institute for Alpine Environment updated the indicators for landscape diversity (SHEI) and hemeroby (human activity impact on the ecosystem) (see indicator 11.1 and 12.2); the Institute for Earth Observation supported in geolocalizing accommodation facilities and protected areas (see indicator 11.2); the collaboration of the Center for Advanced Studies with ESRI Spain produced new knowledge about the accessibility of trails using public means of transport (see indicator 10.2). Further efforts need to be made concerning energy, water, and waste management, since estimates were produced by a linear combination of overnight stays and standard coefficients available in literature (see Annex 2). However, more precise evaluations could only be made after a tailored data collection phase in local accommodation facilities. Primary data about resource consumption could also be useful to calculate the overall amount of greenhouse gas (GHG) emission related to tourism, a figure that strictly depends on transport, heating, and cooling services in the hospitality sector.

ISSUE AREA	INDICATOR	DESCRIPTION	PILLAR	TYPOLOGY (DPSIR)
1 Seasonality 	1.1	Tourist arrivals by month and market	Economic	Driving forces DF
	1.2	% of annual tourist arrivals occurring in peak months by municipality	Economic	Pressure P
	1.3	% of annual tourist arrivals occurring in peak weeks by municipality	Economic	Pressure P
2 Employment 	2.1	% of employees in the accommodation and food service sector	Economic/Social	Driving forces DF
	2.2	% of female enterprises in the accommodation and food service sector	Economic/Social	State S
	2.3	Employees in the accommodation and food service sector by citizenship	Economic/Social	State S
3 Economic benefits 	3.1	Value added by industry	Economic	Driving forces DF
	3.2	Profit situation for the accommodation and food service sector (business climate index)	Economic	State
	3.3	Gross occupancy rates of bed places	Economic	Driving forces DF
4 Governance 	4.1	Number of municipalities, accommodation facilities and events involved in voluntary certification schemes for sustainability	Environmental/Social	Responses R
	4.2	Number of "Red Rooster" branded agritourism ventures producing and selling regional products	Environmental/Social	Responses R
	4.3	Organic milk sold to members of the main local buying syndicate	Environmental/Social	Responses R
5 Local and visitor satisfaction 	5.1	Tourism intensity index	Environmental/Social	Pressure P
	5.2	Prices of rents in the destination	Social	State S
	5.3	Tourist satisfaction with prices	Social	State S

ISSUE AREA	INDICATOR	DESCRIPTION	PILLAR	TYPOLOGY (DPSIR)
6 Energy management 	6.1	Estimated minimum electricity consumption in accommodation facilities	Environmental	Pressure 
	6.2	Electricity consumption by ski-lifts and snow cannons	Environmental	Pressure 
	6.3	Charging stations offered for e-mobility in hotels and public spaces	Environmental	Responses 
7 Water management 	7.1	Estimated minimum water consumption in accommodation facilities	Environmental	Pressure 
	7.2	Water use by snow guns	Environmental	Pressure 
8 Waste water management 	8.1	Discharge of sewage water attributable to tourism	Environmental	Pressure 
9 Waste management 	9.1	Estimated waste production in accommodation facilities	Environmental	Pressure 
10 Mobility 	10.1	Mobilcards, bikemobil cards, museumobil cards and guest tickets	Environmental	Responses 
	10.2	Number of ski-lift and cable car users by season	Environmental/ Economic	Driving forces 
	10.3	Kilometers travelled using car sharing services by non-local users	Environmental	Responses 
11 Land use and landscape diversity 	11.1	Number of hotels and similar establishments over total number of buildings	Environmental/ Social	Driving forces 
	11.2	Shannon's Diversity Index	Environmental/ Social	State 
12 Nature conservation 	12.1	Hemeroby (human activity impact on the ecosystem)	Environmental/ Social	State 
	12.2	Natural parks and protected areas	Environmental	Responses 

Issue areas and indicators

For further details on the indicators and on the studies presented in the boxes (definitions, formulas, data availability), please refer to Annex 2.



1 Tourism seasonality

Notwithstanding the attempt to expand tourism offers and products in shoulder seasons, tourism peaks are inevitable in most destinations. Destinations characterized by high fluctuations in seasonality often suffer from various issues, such as overcrowding, high prices, inadequate infrastructure in peak seasons and a lack of services and job opportunities in shoulder seasons. South Tyrol is not an exception and it experiences its peak seasons in summer and winter, when the weather is ideal for the practice of outdoor activities such as hiking, mountain biking, and skiing. High peak periods may be linked not only with seasons/months, but also with specific events/festivals or festivities, such as Christmas (and the Christmas Markets) and Easter. Each tourism market has its own seasonality. This has remained almost stable over the past twenty years, although absolute numbers have increased. Monitoring the percentage of tourist arrivals per market, months and weeks helps to identify high and low peaks and to foresee and tackle the issues linked with both periods in a timely manner. It further suggests when and how to concentrate efforts aimed at managing tourist flows. How to efficiently manage visitor flows is in fact the main topic that a selected group of stakeholders was addressing within a dedicated think tank.

1.1 TOURIST ARRIVALS BY MONTH AND MARKET

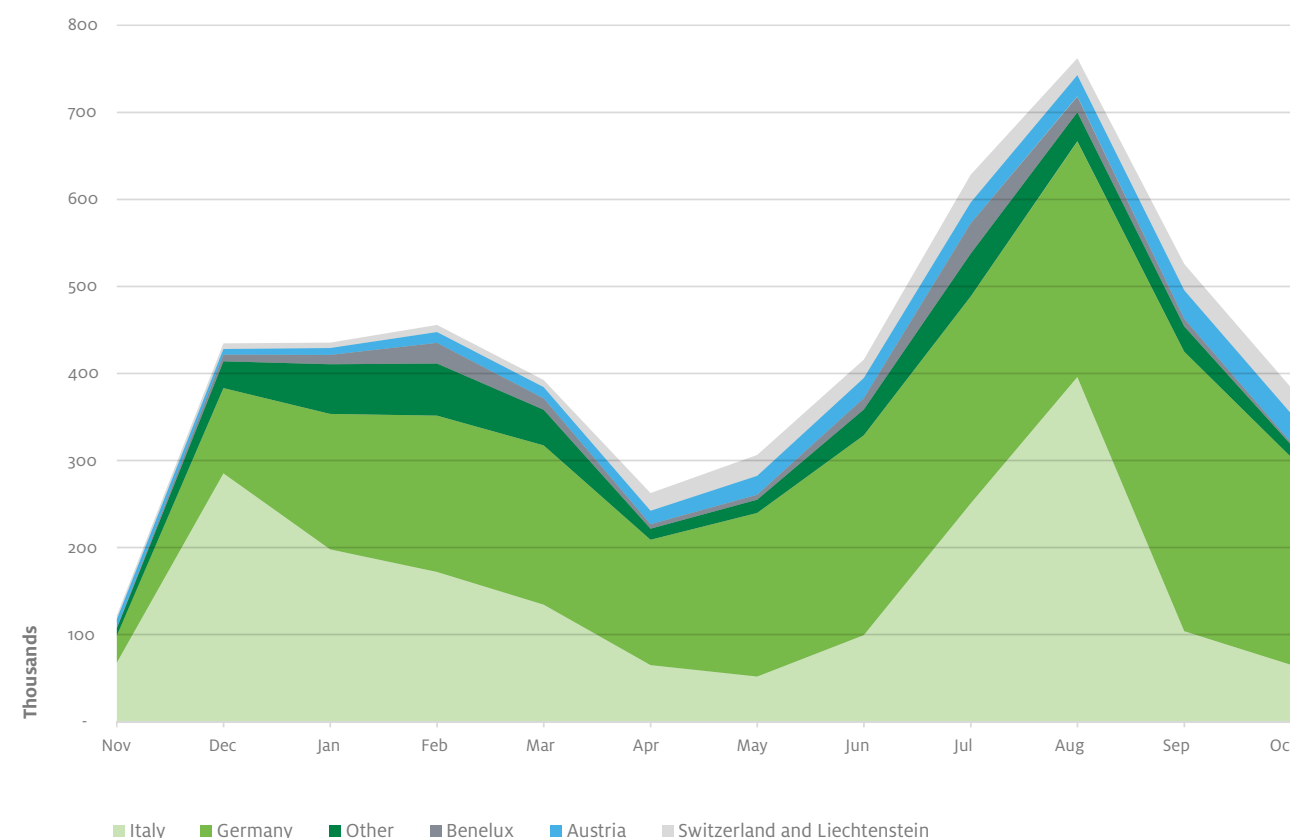


Figure 10: Total tourist arrivals by month and market, South Tyrol 2008-2018. Monthly average values in thousands. Source: ASTAT, data available on demand.

Figure 10 shows the mean values per month of tourism arrivals in South Tyrol between 2008 and 2018, distinguished by market. One can clearly identify the seasonal pattern, i.e. tourism in South Tyrol has a winter and a summer season. This pattern has remained constant over the last 20 years, although absolute numbers of arrivals have changed. Regarding the countries of origin, proximity markets (Italy and Germany) clearly prevail over long-distance markets. The various markets display different seasonal patterns. Italian tourists arrive predominantly in December and August, while the arrivals of German tourists are more evenly distributed. Other type of guests, often referring to long-distance markets, tend to concentrate more in the wintertime. The calculation of the Gini index, normally used to measure the degree of inequality of a distribution, helps

in classifying the different tourist markets according to their high or low degree of seasonality. The index takes the value 0 when tourist arrivals from a country are uniformly distributed over the whole year and assumes a value of 1 in the case that all tourists of one nationality arrive in the same month. Comparing the Gini index for the most important markets of origin gives the following picture: German tourists are the most uniformly distributed across the year, with a Gini value of 0.236. Tourists from Switzerland and Liechtenstein, other countries and Italy follow with values equal to 0.323, 0.324 and 0.362 respectively. Italian tourists are more likely to arrive in South Tyrol in August (20.7%) and in December (15.3%). Finally, with a Gini index of 0.436, tourists from Benelux, few in absolute numbers, display a particularly high concentration in July (25%).

1.2. % OF ANNUAL TOURIST ARRIVALS OCCURRING IN PEAK MONTHS BY MUNICIPALITY

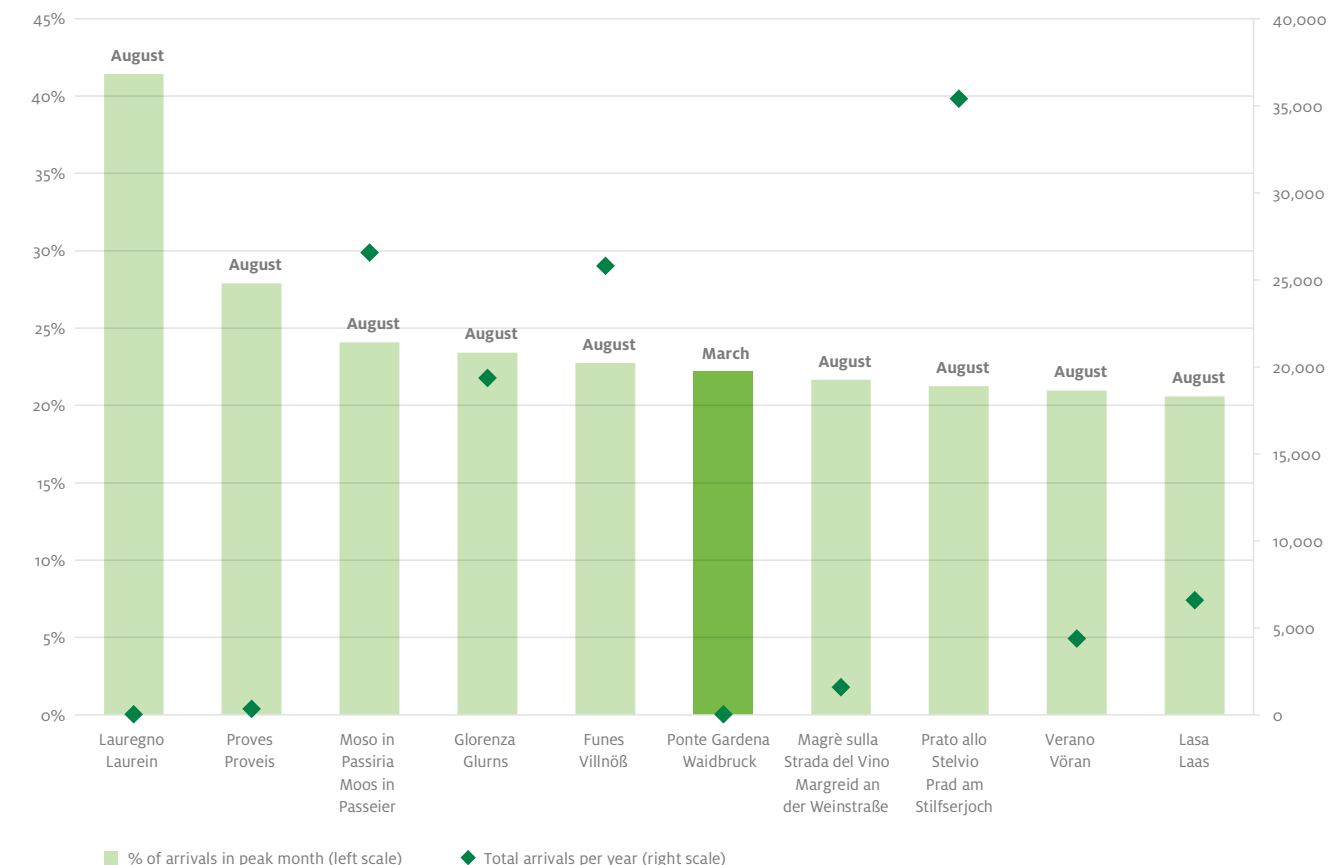


Figure 11: Total tourist arrivals occurring in peak months by municipality (top 10 municipalities with the highest share), 2008-2018. Monthly average percentage values (left scale) and total arrivals per year (right scale). Source: ASTAT, data available on demand, own elaboration.

Figure 11 illustrates the municipalities of South Tyrol with higher seasonal peaks in the time span 2008-2018. The figure confirms the concentration of arrivals during the month of August in almost all selected municipalities, but it also shows that less touristic areas tend to suffer from higher seasonal peaks. In fact, nine out of the 10 highest values refer to August, when most of the Italian tourists are more likely to go on holidays. However, some municipalities (e.g. Laurein/Lauregno, Margreid an der Weinstraße/ Magrè sulla strada del vino, Proveis/ Proves, and Waidbruck/ Ponte Gardena) are not highly touristic; some others

(e.g. Prad am Stilfserjoch/ Prato allo Stelvio, Villnöß/ Funes, Moos in Passeier/ Moso in Passiria) are more well-known but host a moderate number of tourist flows. The highest concentration of tourists within one month is reached by the municipality of Laurein/ Lauregno, a remote village in the western part of the province (where on average, 41.4% of arrivals occurred in August between 2008 and 2018). The only municipality registering a seasonal peak in March instead of August is Waidbruck/Ponte Gardena, situated on the outskirts of Val Gardena Valley, a place well-known for winter tourism.

1.3 % OF ANNUAL TOURIST ARRIVALS OCCURRING IN PEAK WEEKS BY MUNICIPALITY

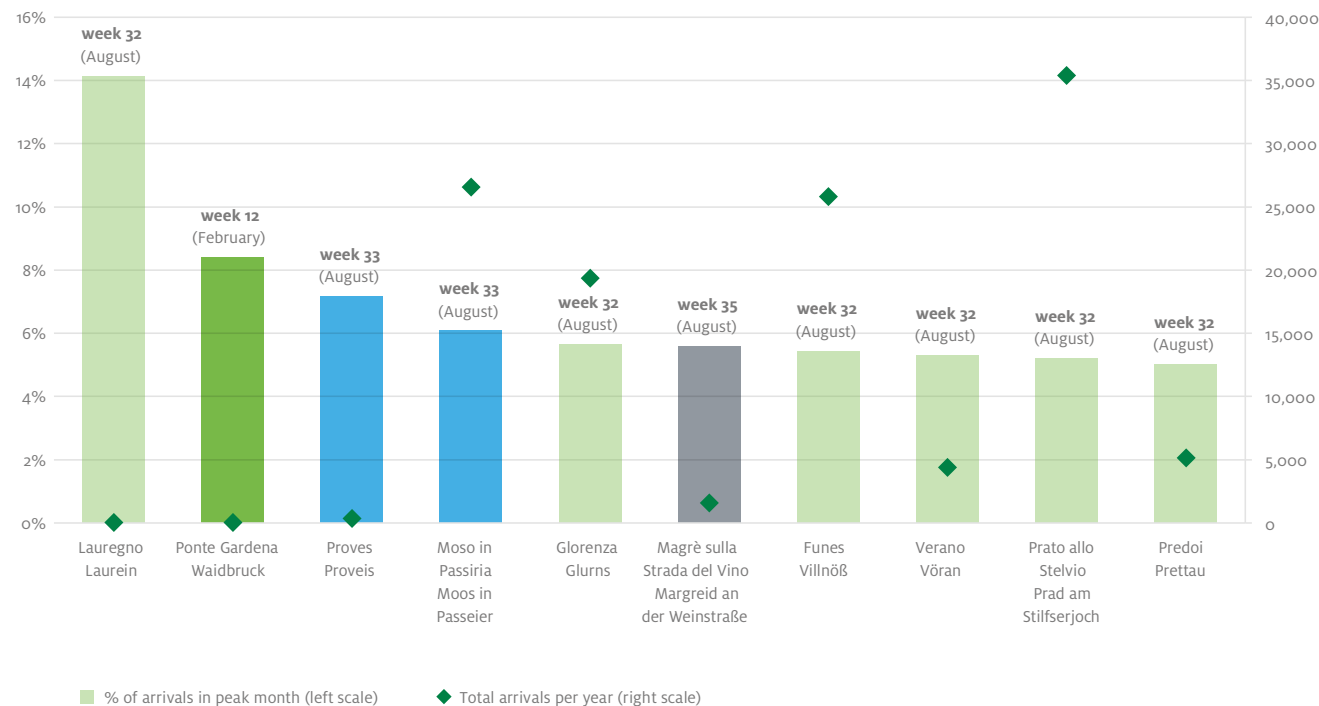


Figure 12: Total tourist arrivals occurring in peak weeks by municipality (top 10 municipalities with the highest share), 2008-2018. Weekly average percentage values (left scale) and total arrivals per year (right scale). Source: ASTAT, data available on demand, own elaboration.

Like Figure 11, **Figure 12** highlights the predominance in arrivals concentration in weeks 32 and 33 (weeks 32, 33 and 35 are all in August). As before, Laurein/Lauregno is by far the municipality with the highest concentration, with more than 14% of the total tourists reaching the destination in the 32nd week, and Waidbruck/Ponte Gardena is the only municipality registering the highest number of arrivals in March. Again, the effects of seasonality seem to be harsher in less touristic areas.

BOX 2 :

EASTER EFFECT ON OVERNIGHT STAYS

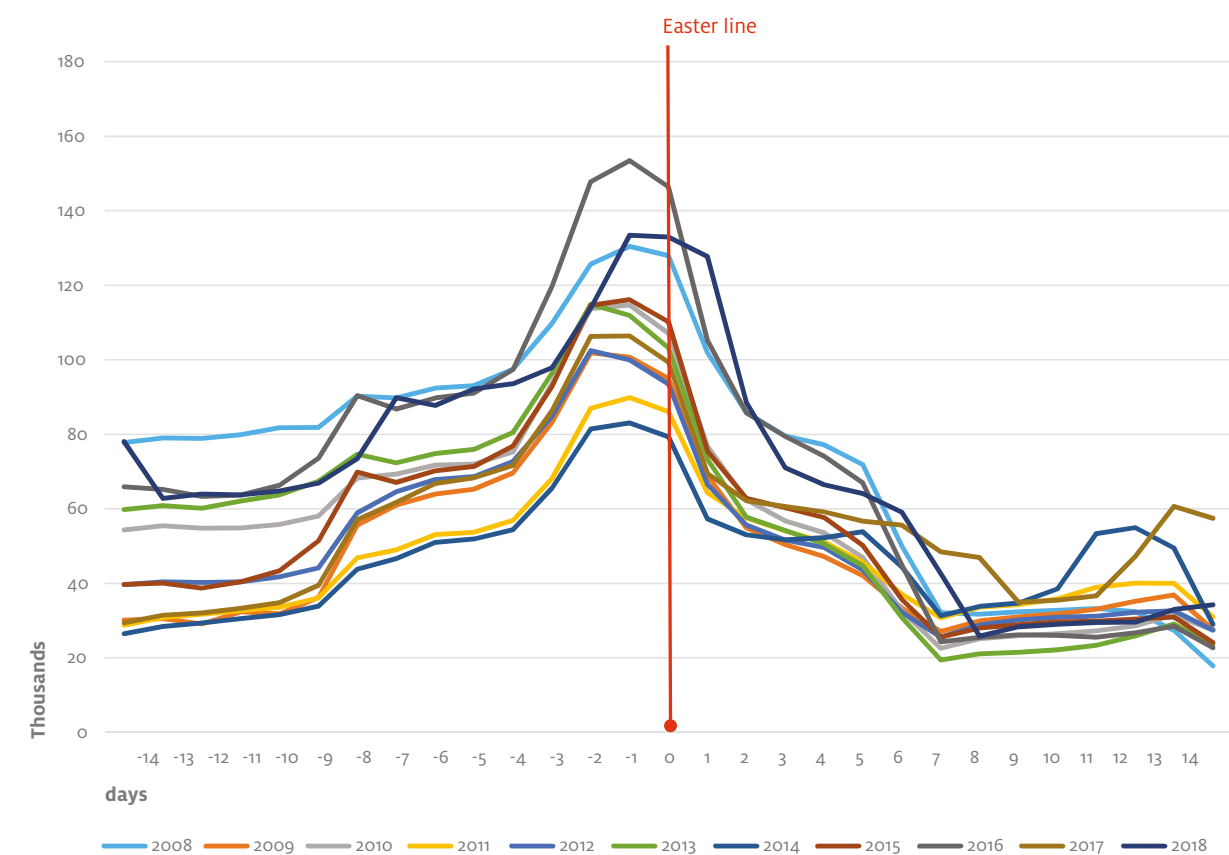


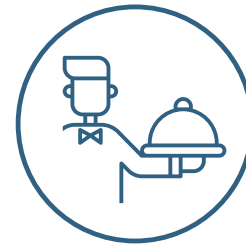
Figure 13: Overnight stays in South Tyrol 14 days before and after Easter in thousands, 2008-2018. Daily average values. Source: ASTAT, data available on demand, own elaboration.

The so-called Easter effect captures how the touristic presence changes due to the fluctuating dates of Easter, a festivity that occurs exactly between the summer and winter season, in a period of low tourism intensity. In **Figure 13**, overnight stays usually reach the peak on the Saturday before Easter (day -1), probably because tourists spend Easter day in South Tyrol and then go back home

in the next few days, starting to leave from Sunday itself. The Easter effect is pronounced in South Tyrol. In fact, overnight stays increase on average (years 2008 to 2018) by 36% from one week before Easter (day -7) to Easter Sunday. In the subsequent seven days (day +7), overnight stays fall, on average, by 72%. Thus, the tourist peak due to the Easter holiday is considerable.



2



2 Employment

Employment within the tourism sector is a crucial area, as it impacts both the quality of life of the local population as well as tourists' experience and therefore satisfaction. Monitoring the percentage of people employed within the tourism sector in respect to other sectors is a good proxy of the importance of tourism within the local overall economy, while indicators related, for example, to gender equality help to understand the quality of such employment. The gender composition of the workforce is a relevant aspect in this context, as it is widely recognized (see for instance Baum, 2013) that the labor market within the tourism sector is characterized by horizontal and vertical gender segregation. Women and men typically perform different jobs (horizontal segregation), with women working mostly as waitresses and cleaners and men as maintenance and construction workers, gardeners etc. Moreover, occupations at the lower level with few career developments are usually dominated by women, while men are more likely to hold managerial positions (vertical segregation) (see Campos-Soria et al., 2011). Finally, the last aspect that we explore in this section concerns the composition of the labor force with respect to nationality. According to a study by Amt für Arbeitsmarktbeobachtung (Department of Labour Market Observation, hereinafter AMB) (2008), up to 2007, employment growth in the tourism sector was driven mostly by an increase of foreign workers. The aim was therefore to understand the extent to which the local economy can benefit from the steady growth of the sector, at least as far as the supply of workers is concerned. Within this specific issue area, a think tank was established to discuss within a selected group of stakeholders, topics such as artificial intelligence (AI) and robotics in the hospitality sector and its potential impacts on the social and economic pillars.

2.1 % OF EMPLOYEES IN THE ACCOMMODATION AND FOOD SERVICE SECTOR

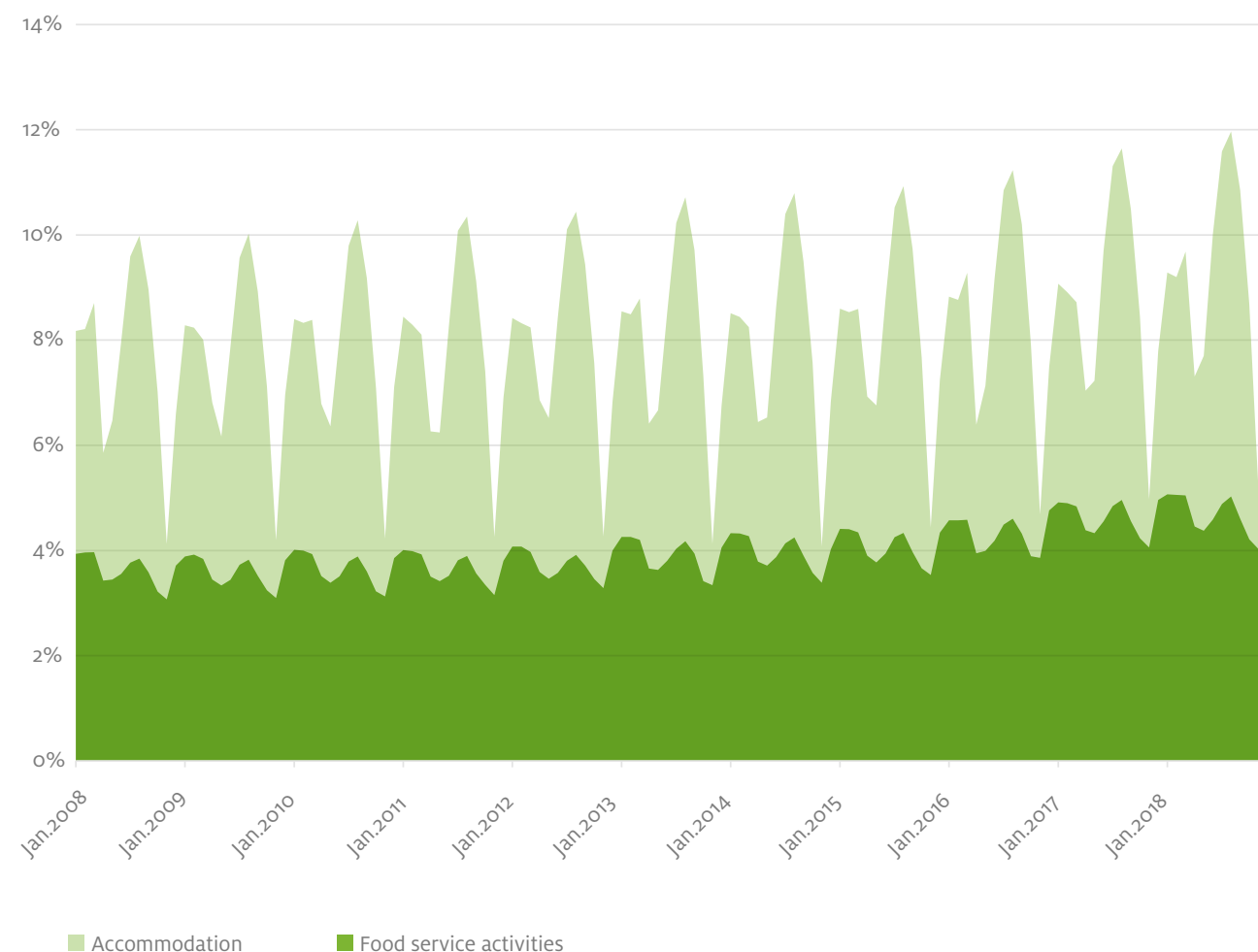


Figure 14: Employees in the accommodation and food service sector by sector and month, South Tyrol 2008-2018. Percentage values over total employment. Source: AMB, data available on demand.

Employees in the accommodation and food service sector make up about 14% of total employment in South Tyrol. In 2018, the absolute number of employees working in these sectors in South Tyrol was, on average, 29,233. Out of the 14%, about 9% work in the accommodation sector and the remaining 5% in food service activities (cafes and restaurants). Note that the numbers displayed in **Figure 14** refer to employees and do not include the self-employed. They also exclude all other tourism-related economic activities (e.g. museums, natural parks, commercial activities). Thus, the share of

workers (employees and self-employed) in the tourism sector compared to the total number of workers in South Tyrol might be higher. Employment in the tourism sector is highly seasonal with notable differences between the two sub-sectors. That is, employment in food service activities fluctuates less than employment in the accommodation sector. The reason is that, compared to the accommodation sector, the food service industry depends much less on tourists, i.e. in the food service industry, the share of demand that stems from residents is more important.

2.2 % OF FEMALE ENTERPRISES IN THE ACCOMMODATION AND FOOD SERVICE SECTOR

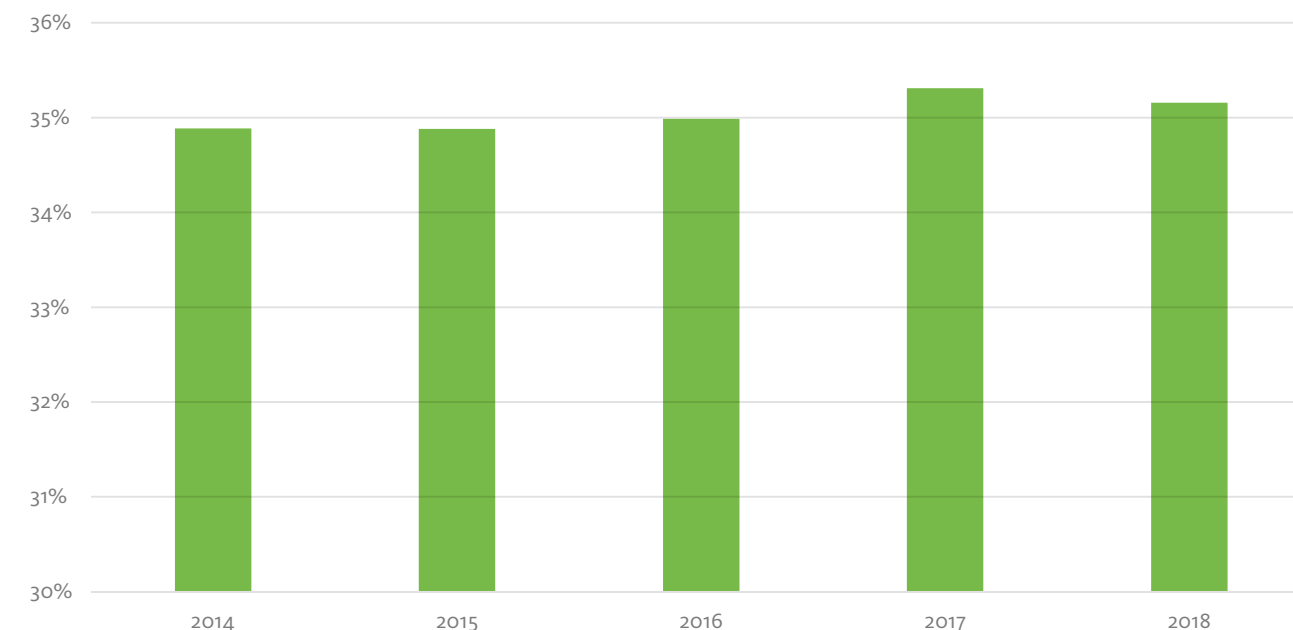


Figure 15: Female enterprises in the accommodation and food service sector, South Tyrol 2014 – 2018. Percentage values over total number of tourist enterprises. Source: WIFO, data available on demand, own elaboration.

Among the 7,165 enterprises active in the tourism sector in 2018, 2,519 were defined as female enterprises according to the definition provided by the Institut für Wirtschaftsforschung (Institute of Economic Research, hereinafter WIFO) (source: Unioncamere), leading to a share of 35.2%. Throughout the observed period, this percentage was relatively stable, ranging from a

minimum of 34.9% to a maximum of 35.3%. According to data provided by the Women's Entrepreneurship Observatory of Unioncamere ², in 2015, at the Italian level, 22% of enterprises (in all sectors) were owned by women. This relatively high share of women entrepreneurs in tourism in South Tyrol demonstrates that vertical segregation turns out to be not a major issue in the tourism sector.

² <http://www.imprenditoriafemminile.camcom.it/P42A0C0S806/Osservatorio-imprend%20%20itoria-femminile.htm>

2.3 EMPLOYEES IN THE ACCOMMODATION AND FOOD SERVICE SECTOR BY CITIZENSHIP

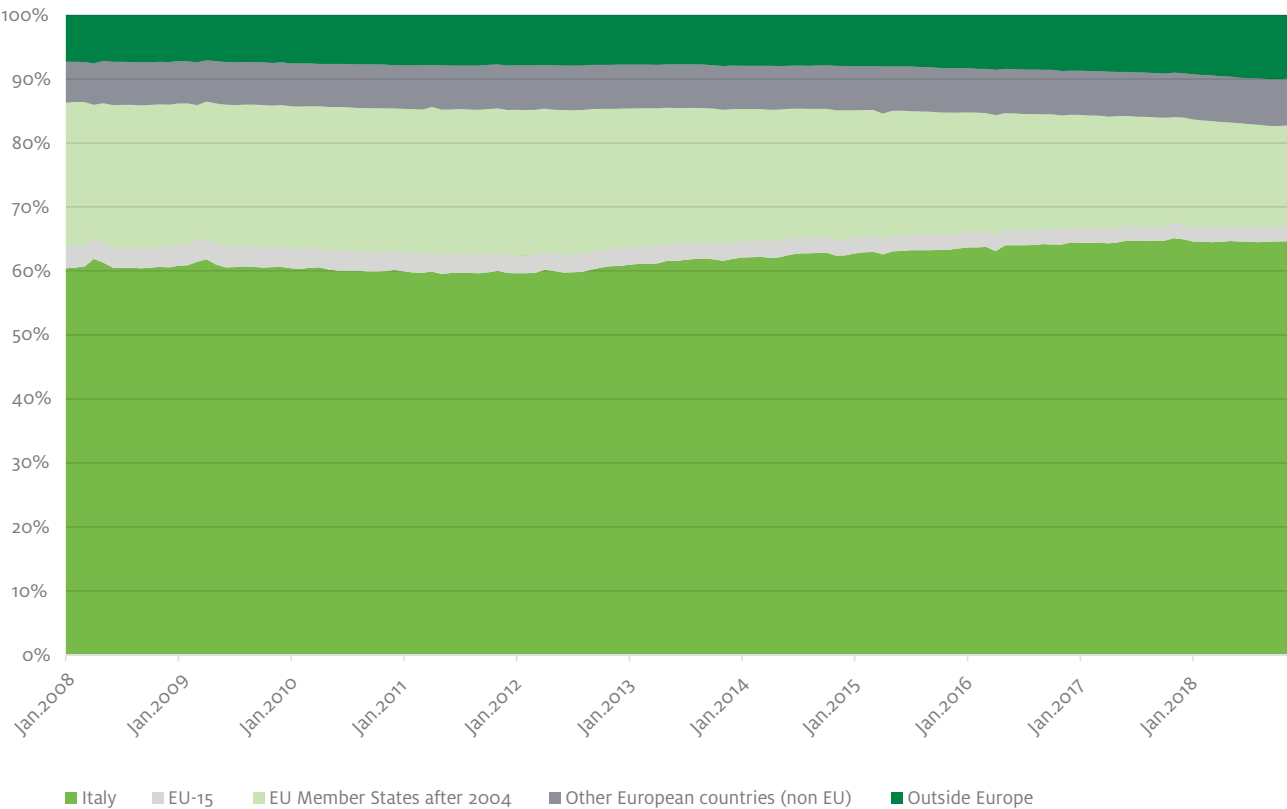


Figure 16: Employees in the accommodation and food service sector by month and citizenship, South Tyrol 2008 – 2018. Seasonally adjusted data, percentage values. Source: AMB, data available on demand, own elaboration.

Do the local inhabitants of South Tyrol benefit from employment growth in the tourism sector? **Figure 16** shows that the share of employees in the tourism sector with Italian nationality increased within the last decade, from 12 thousand workers in 2008 to 19 thousand in 2018. However, these data do not allow differentiation between employees coming from South Tyrol and from other Italian regions. While the share of employees coming from Eastern Europe (the main countries here are Poland,

Hungary, Czech Republic, Slovakia, Romania, Bulgaria) remained constant in absolute terms and decreased in relative terms between 2008 and 2018, South Tyrol experienced a sharp increase of employees coming from countries outside the European Union. While in 2008, 1,500 employees came from non-European countries, in 2018 this number was doubled (3,000). Note that the naturalization procedure (the acquisition of Italian citizenship) may play a role in explaining these trends.



3



3 Economic benefits at the destination level

Tourism brings economic growth and prosperity to regions (Brida & Risso, 2009). Tourism creates jobs, fosters private investment, and increases public spending in infrastructure. In South Tyrol, tourism plays a central role for the local economy. Besides employing almost 30,000 people, the tourism industry also contributes a significant share to the local gross domestic product. The monitoring of the value added by the hotel and food service industry over time is a good proxy of the relative contribution of tourism to total GDP, since the last tourism satellite account of South Tyrol refers to 2007/2008. Further indicators to assess the economic benefit of tourism at local level are reports by entrepreneurs on their profit situation, and the occupancy rate of accommodation facilities. Combining objective indicators (value added and occupancy rate) with a subjective assessment of the climate index (profit situation) and the issue area 2 on employment provides a well-structured image of the local benefits related to tourism. Within this issue area, a think tank has been established in order to reflect, with local and international stakeholder, on the concept of post-growth society, i.e., how tourism can be measured according to new criteria, that do not necessarily take into consideration the mere economic growth.

3.1 VALUE ADDED BY INDUSTRY

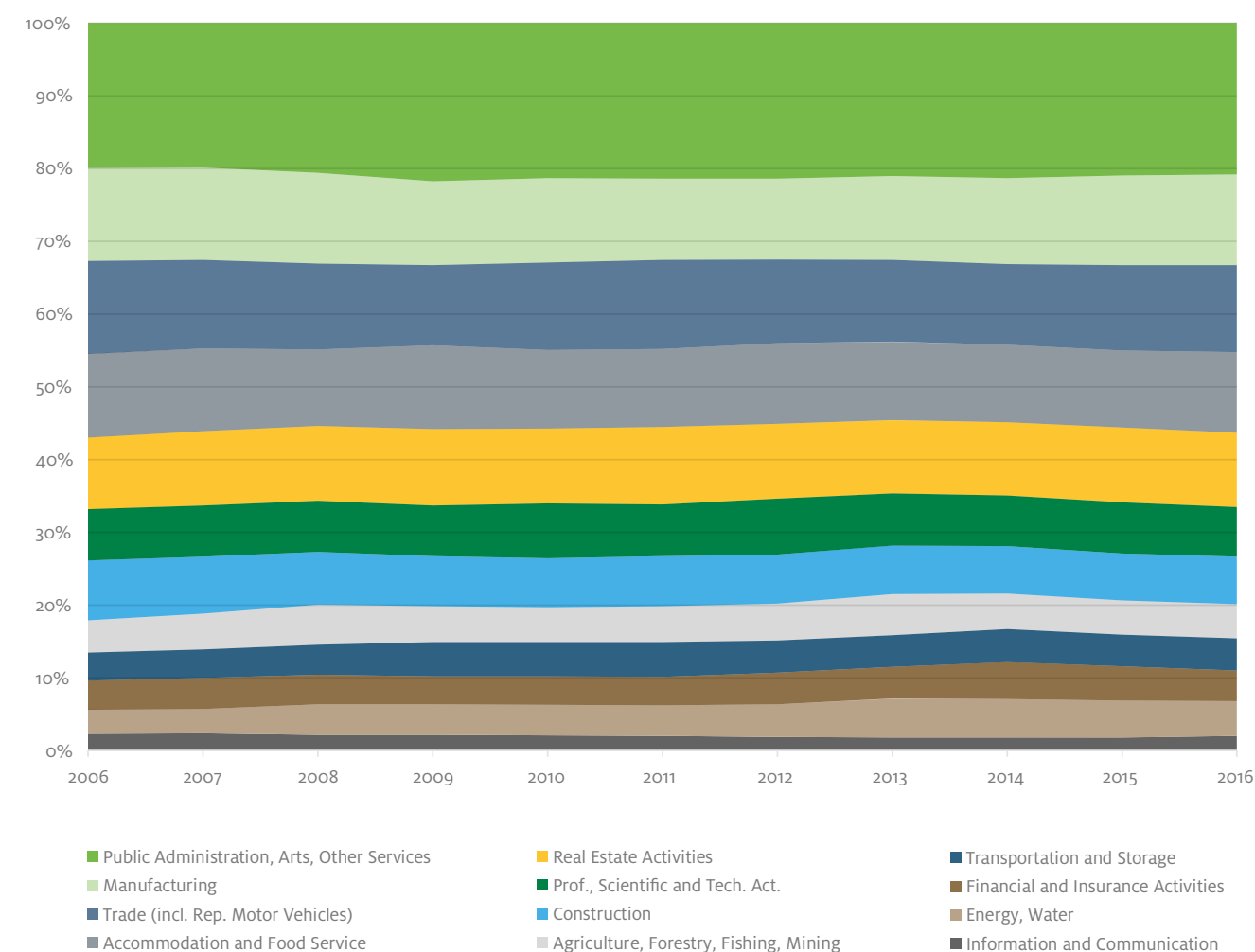


Figure 17: Value added by industry, South Tyrol 2006 – 2016. Percentage values. Source: ISTAT, online database (I.Stat database), own elaboration.

Figure 17 depicts the relative contribution of single industries to total GDP. The dark grey shade represents the share of the tourism industry. In 1995, the tourism industry produced goods and services corresponding to a nominal worth of 1,769 million EUR. In 2016, the sum of all goods and services produced by the tourism sector amounted to almost 2,200 million EUR. Despite an average nominal growth rate of 2.4%, the tourism sector did not outperform the overall economy.

In fact, the relative importance of the tourism sector for the total economy decreased slightly between 1995 and 2016. While the tourism industry accounted for 13.1% of total value added in 1995, in 2016 the sector only contributed 11.1% of total GDP. Between 2006 and 2016, data are almost stable: in 2006 tourism accounted for 11.5% of total GDP. Despite this trend, the tourism industry remains an important industry for South Tyrol.

3.2 PROFIT SITUATION FOR THE ACCOMMODATION AND FOOD SERVICE SECTOR (BUSINESS CLIMATE INDEX)



Figure 18: Business climate in the accommodation and food service sector, South Tyrol 2008 – 2018. Index, baseline year = 2015. Source: WIFO, data available on demand, own elaboration.

Figure 18 illustrates the business climate of hotels and restaurants in South Tyrol. The indicator is based on business tendency surveys conducted by WIFO among a large panel of firms. At the beginning of each year, WIFO asks firms to assess their profit situation of the past year. In the same questionnaire, firms are asked to state their expectations about the current year. The business climate indicator represents the geometric mean of both aggregated variables, i.e. the geometric

mean between the average assessment of the past year's profit situation and the average expectation about the future profit situation. In 2013 and 2014, both hotels and restaurants experienced a dip in their business climate. This dip is consistent with the dynamics observed in tourist arrivals and overnight stays, which declined during both years (see **Figure 1**). Recently, the business climate indicator rose again and reached all-time highs.

3.3 GROSS OCCUPANCY RATES OF BED PLACES

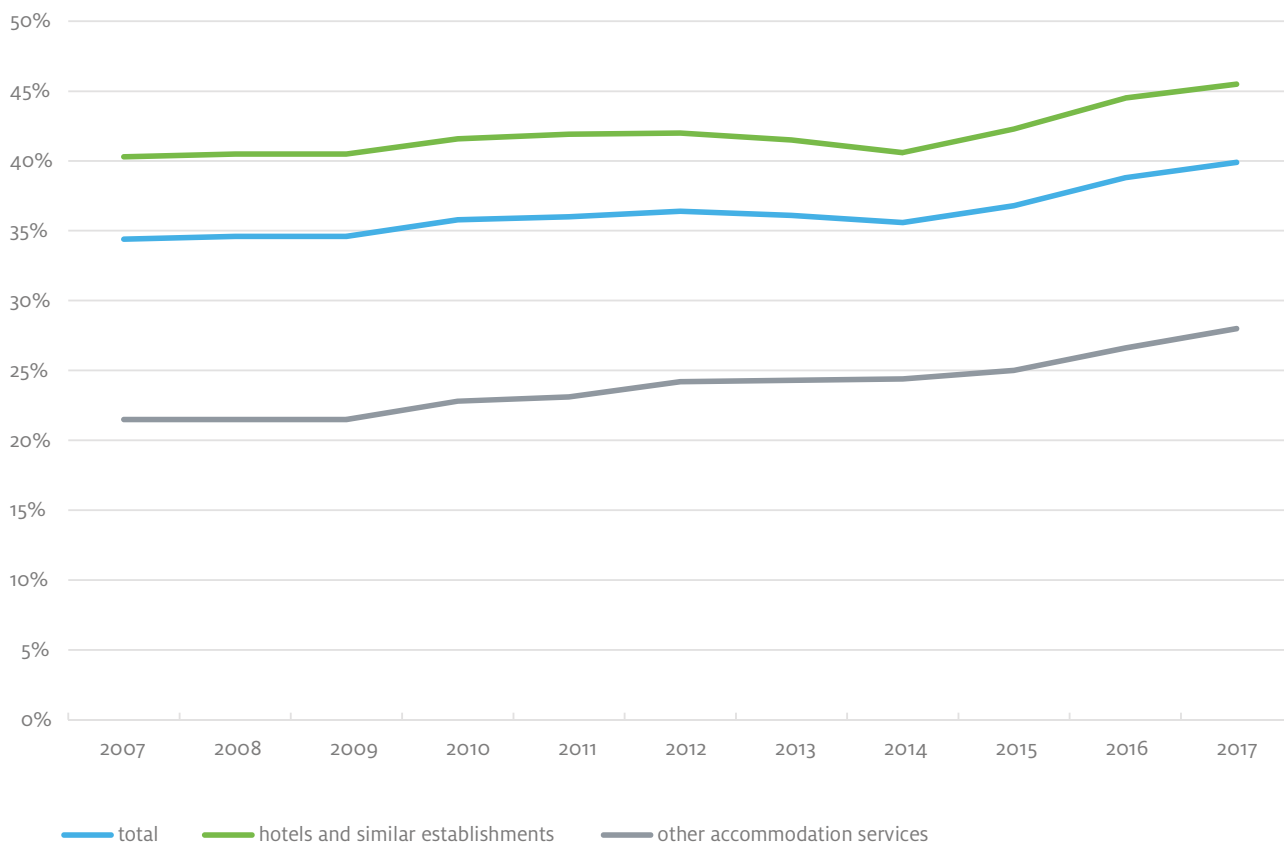


Figure 19: Gross occupancy rates of bed places by type of accommodation, South Tyrol 2007-2017. Percentage values. Source: ASTAT, online database.

Figure 19 shows gross occupancy rates of South Tyrolean accommodation facilities. Besides the indicator on firms' business climates, the indicator on occupancy rates represents an additional indicator of the economic benefits of tourism. A higher occupancy rate implies a higher capacity utilization that is associated with increasing prices, higher margins, and an increasing pressure for investment. Over the last ten years, the overall occupancy rates increased by more than 5 percentage points, from an average occupancy rate of 34.4% in 2007 to 39.9% in 2017.



4 Governance

The concept of governance refers to a myriad of steering approaches that include means such as trust, money, formal power, and knowledge (Pechlaner, Volgger & Herntrei, 2012; Raich, 2006). These work as an alternative to hierarchical steering in today's complex environment and are essential for linking many different stakeholders at destination scale. In fact, the participation of government, businesses and the community in a sustainable development path is crucial to achieve a successful implementation of the concept (Bramwell and Lane, 2011). Monitoring governance and the different steering approaches on site are of great importance to understand the formal and informal mechanisms that develop locally to increase decision-making capacities, shape more balanced policies and turn them into actions.

South Tyrol's tourism system includes a wide range of different actors, networked through corporations, informal agreements, and agencies (e.g. the South Tyrolean Hotels and Restaurants Association - HGV, the South Tyrolean Non-commercial Accommodation Providers Association – VPS, the South Tyrolean Farmers' Association – SBB, the Clima House agency and the Provincial Agency for the Environment). They all support many of the strategies and voluntary regulatory mechanisms aimed at increasing the level of quality and sustainability of the entire tourism system.

One possible way to understand the steering mechanisms active in a destination is to monitor these voluntary certification schemes.

In the following section, we present three examples of certification schemes that appear relevant for the tourism sector. They refer to municipal strategies (Climate Municipalities and Alpine Pearls) and to certification schemes (Green Events, Biohotels, Klimahotels and Ecolabel certified hotels). In the following years, a think tank could be dedicated to exploring and further fostering cross-sectoral relationships and synergies.

4.1 NUMBER OF MUNICIPALITIES, ACCOMMODATION FACILITIES AND EVENTS INVOLVED IN VOLUNTARY CERTIFICATION SCHEMES FOR SUSTAINABILITY

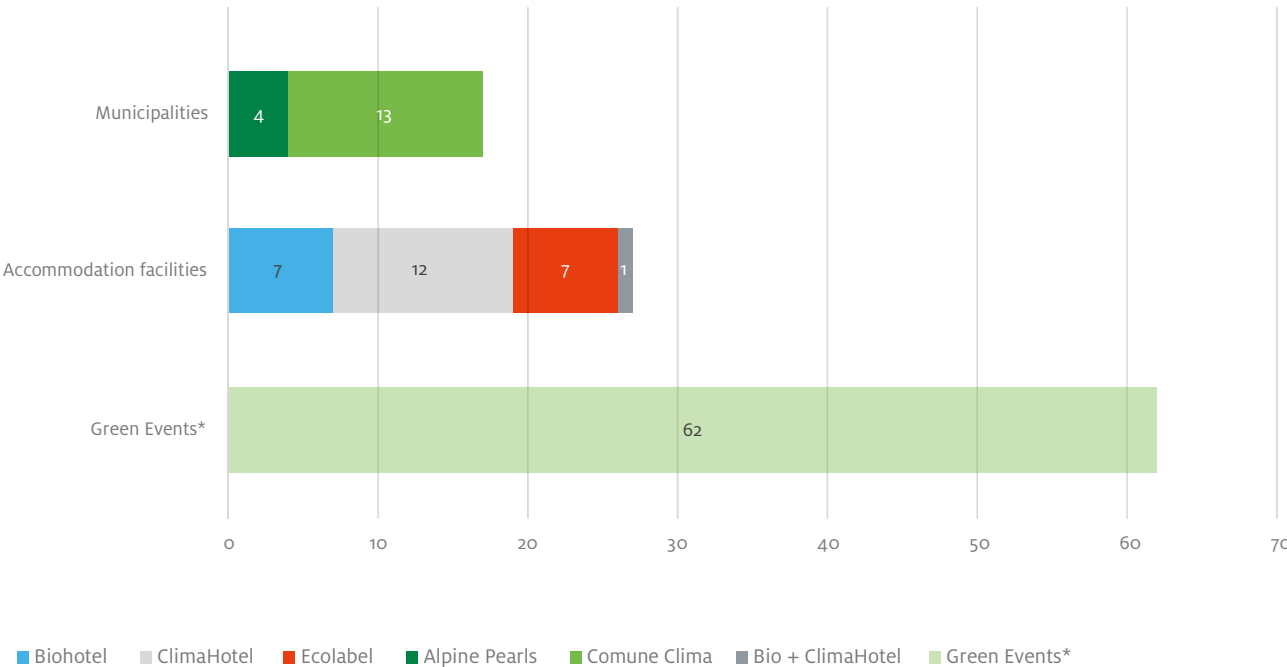


Figure 20: Number of events, accommodation facilities and municipalities involved in sustainability schemes by certification categories, South Tyrol 2019. Source: Casa Clima, ISPRA, Biohotel, Alpine Pearls, APPA, data available on demand, own elaboration.
*The number of Green Events refers to the year 2018.

The illustration shows the number of different voluntary schemes adopted to increase the sustainability level of tourism at a local scale. In the region of South Tyrol, there is a possibility – provided by the Provincial Agency for Environment – to certify different types of events as “Green Events”. Sports events, cultural events, festivals/culinary events, and conferences/congresses can be certified as “Green Events” if they are planned, organized and implemented according to sustainability criteria corresponding to the long-term climate strategy of the South Tyrolean government. In order to receive the certification, organizers must provide evidence that they have managed resources, waste, mobility, catering, energy, communication, noise, and other issues (e.g. alcohol and accessibility) following these sustainability criteria. In 2018, 62 events received this certification. Further, 17 certifications have been awarded to municipalities. Four municipalities are members of “Alpine Pearls”, a network of villages offering green mobility services and complying with some standards in terms

of traffic regulation and reduction, whereas 13 municipalities are members of the “Comune Clima”, a program which supports municipalities step by step in the preparation and implementation of a sustainable energy and environmental management plan and awards exemplary municipalities the “Comune Clima” certification. The program analyses, evaluates and improves the energy and water consumption of municipal buildings and facilities, the sustainable mobility concept, the local production of renewable energy and waste management according to sustainability aspects. In this way, municipalities minimize their consumption of resources and the emission of climate-damaging greenhouse gases. **Figure 20** shows sustainability schemes for accommodation facilities, including hotels and similar establishments. Overall, 27 facilities are certified with different labels such as Biohotel, ClimaHotel and Eco-label. Although 27 certified facilities out of a total of 4,000 hotels and similar establishments corresponds to quite a low percentage share (0.6%), it is interesting

to note that some accommodation facilities seem to work as pioneers in the voluntary certification schemes and have collected more than one certification. This might be because of a decreasing marginal effort to accomplish an additional sustainability certification when they already have one, but also

because of a strong will to position the accommodation facility in the field of sustainability, as is the case of Vitalpina Hotels, a group of hotels coordinated by the South Tyrolean Hotels and Restaurants Association – HGTV, that recommends Ecolabel certifications for their members.

4.2 NUMBER OF “RED ROOSTER” BRANDED AGRITOURISM VENTURES PRODUCING AND SELLING REGIONAL PRODUCTS

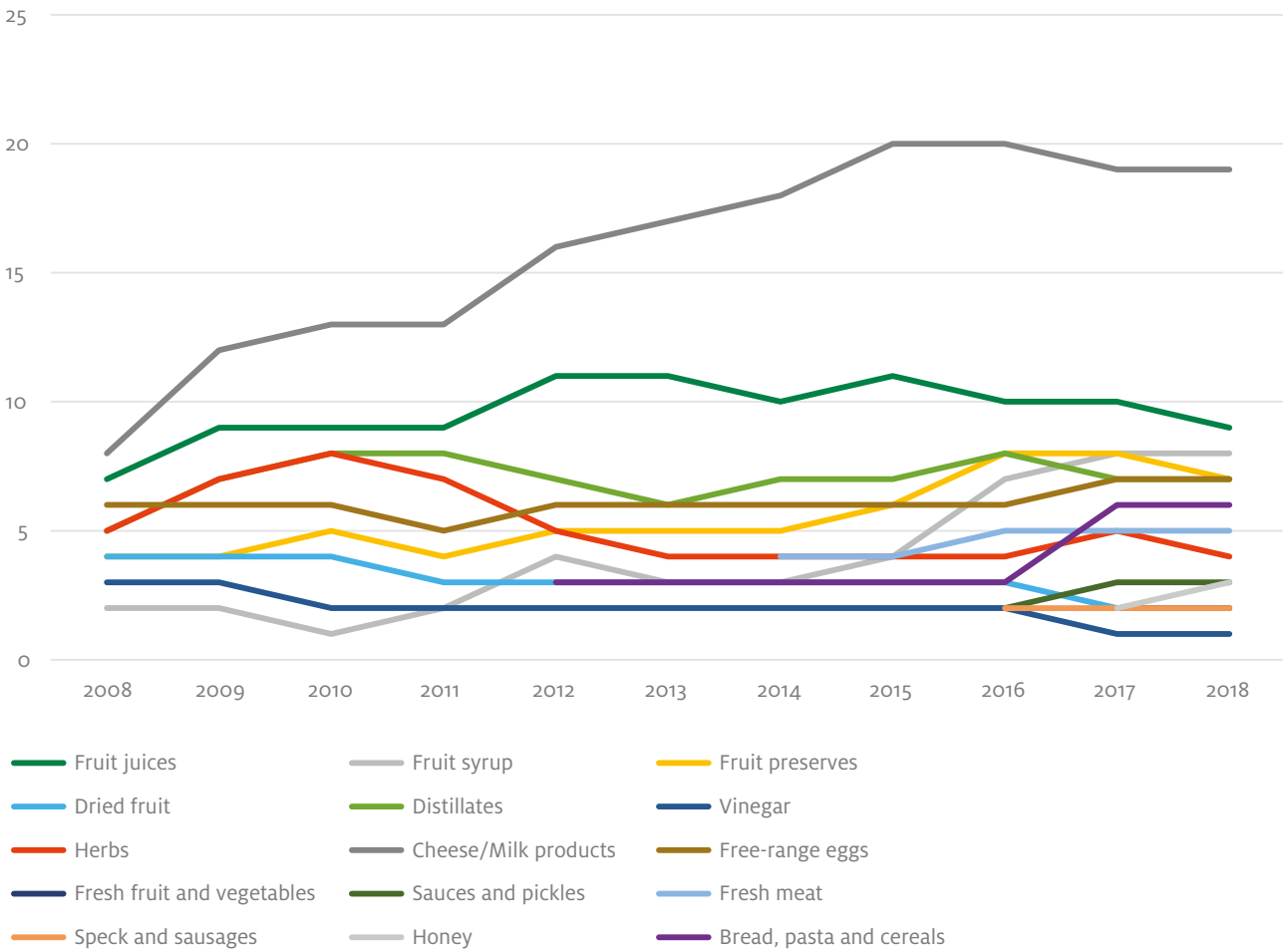


Figure 21: Number of “Red Rooster” branded agritourism ventures producing and selling regional products by type of product and year, South Tyrol 2008-2018. Absolute numbers. Source: Red Rooster, data available on demand, own elaboration.

“Roter Hahn” (German for “Red Rooster”) is a South Tyrolean quality label for agritourism. **Figure 21** shows the number of “Red Rooster” branded agritourism ventures that offer certified regional products. The label “Red Rooster (Roter Hahn/Gallo Rosso)” includes a wide range of products, such as fresh fruit and vegetables, fruit juices, fruit syrups, jams, dried fruit, sauces and pickles, spirits, vinegar, herbs, dairy products, fresh meat, bacon and sausages, bread, pasta, and cereals as well as free range eggs and honey. “Roter-Hahn” products are only produced in

farms that fulfill strict quality standards. For instance, at least 75% of raw ingredients must originate from the family farm. The remaining ingredients can be purchased from other South Tyrolean farms. To date, 66 South Tyrolean farms commit themselves to fulfill the rigorous “Red Rooster” requirements and sell their own products in their agritourism ventures and elsewhere. In addition, constant quality controls such as regular blind tastings by an independent expert commission guarantee consistently high-quality products (Red Rooster, 2019).

4.3 ORGANIC MILK SOLD TO MEMBERS OF THE MAIN LOCAL BUYING SYNDICATE

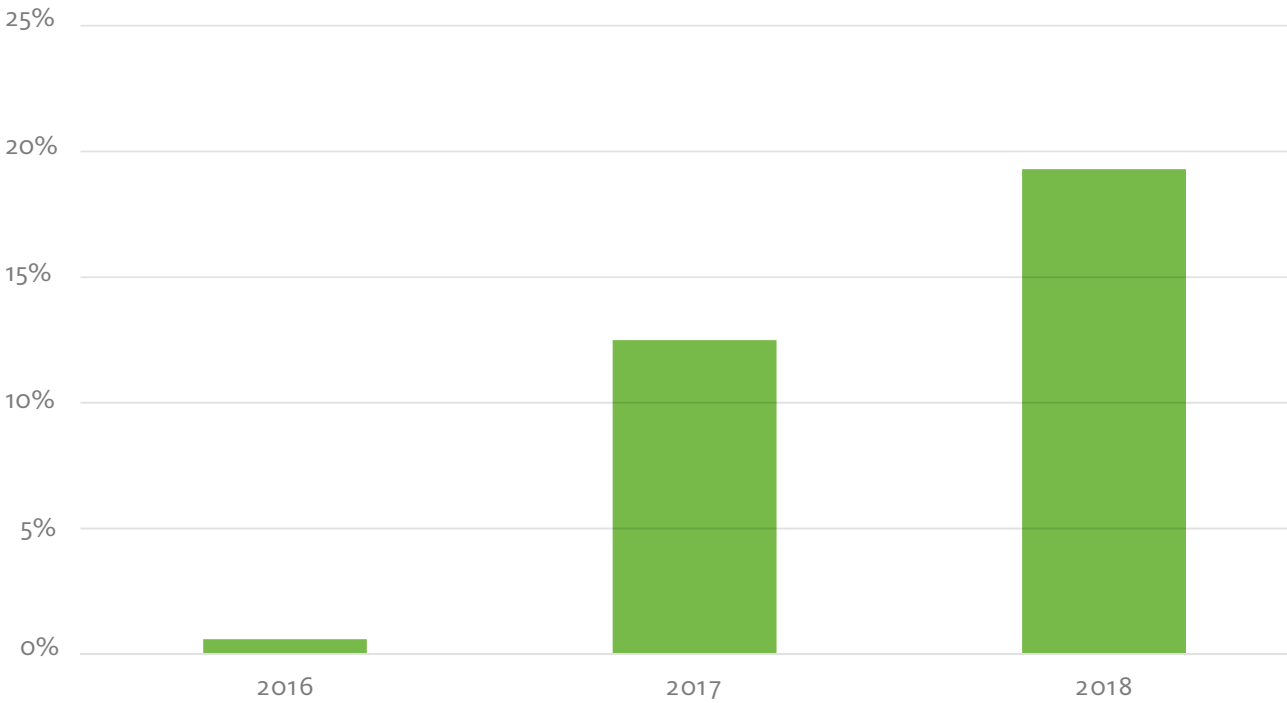


Figure 22: Sales of organic milk to members of the main local buying syndicate by year, South Tyrol 2016-2018. Percentage values over total sold milk. Source: Hogast, data available on demand.

Figure 22 shows the increasing demand for organic products – and particularly organic milk – in the food and accommodation service sectors. Data on the percentage of organic milk over total milk sold were provided by the main local buying syndicate HOGAST, the major purchasing organization of the hotel and food service sector in South Tyrol, consisting of 657 members (status quo

December 31st, 2018). After its introduction in 2016, the demand for organic milk has increased from 0.6 % (2016) of the total provision of milk to 12.5 % (2017) and 19.3 % (2018). This steady increase shows the interest and awareness of local stakeholders towards products of quality, local production, and certified regional products, which also seems to be appreciated by tourists themselves.





5 Local and visitor satisfaction

Satisfaction of both local inhabitants and visitors plays a crucial role in destination development. The local community can be impacted both positively and negatively by tourism. Related positive aspects are the creation of jobs, economic activity, and improved social services. However, tourism can cause stress or damage to local resources and cultural values. According to UNWTO, one needs to properly consider these negative effects in order to get a complete picture of sustainability (UNWTO, 2004). Continuously measuring the level of satisfaction of locals and tourists can help to detect potential problems, such as stress, noise, and other forms of disutility from tourism, even before these problems unfold a severe negative impact on the host-guest relationship. For the moment, no official data are available on local satisfaction, although STOST is planning a collaboration with ASTAT and ISTAT to survey this aspect. At the same time, a think tank has been planned to focus on the topic of subjective well-being within the local population, considering also happiness and life satisfaction. For the moment, only indirect measures of local satisfaction measurement have been addressed, such as the prices of rents and goods, and the tourism intensity index.

5.1 TOURISM INTENSITY INDEX

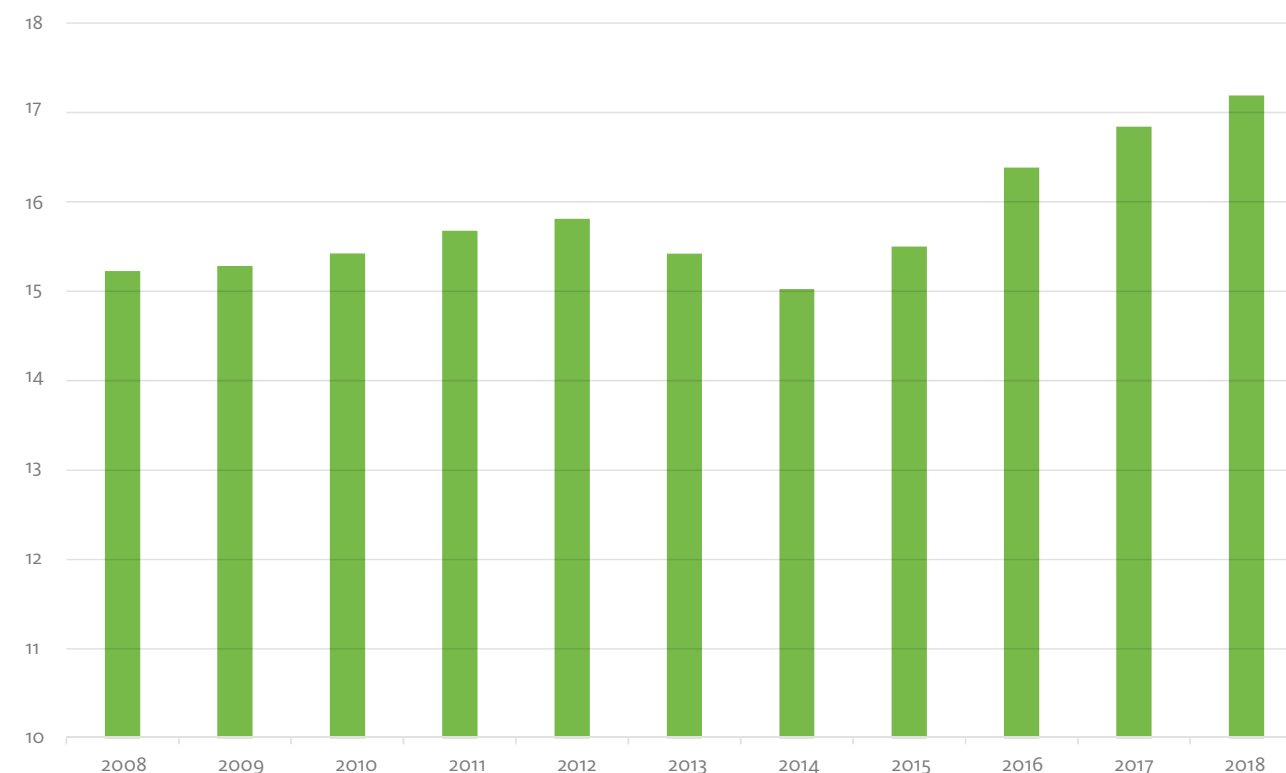


Figure 23: Tourism intensity index by year, South Tyrol 2008-2018. Source: ASTAT, own elaboration.

Tourism intensity indicates how much an area is exposed to tourism. The tourism intensity index is obtained by dividing the number of overnight stays in all types of accommodation facilities by 365 days and then by the resident population. A tourism intensity of 17.2% therefore indicates that for every 100 inhabitants, 17 overnight stays are registered. Starting from 2014, tourism intensity has continually increased in South Tyrol, meaning a greater presence of tourists compared to inhabitants, with tourism intensity exceeding 17% in 2018. This trend is driven by the steady increase in overnight stays (see [Figure 1](#)). Although not

all municipalities undergo the same pressure and face the same seasonal peaks, this indicator shows the relative proportion of stable and non-stable populations at the provincial scale and gives an idea of the overall tourism intensity. However, it should be noted that the variance of this indicator is high along the provincial territories and the scores of single touristic municipalities might be much higher than average: e.g. the two tourism-intense municipalities of Corvara/Corvara in Badia and Wolkenstein/ Selva di Val Gardena show tourism intensities of respectively 203.4% and 136.5% in 2018 (see [Figure 24](#)).

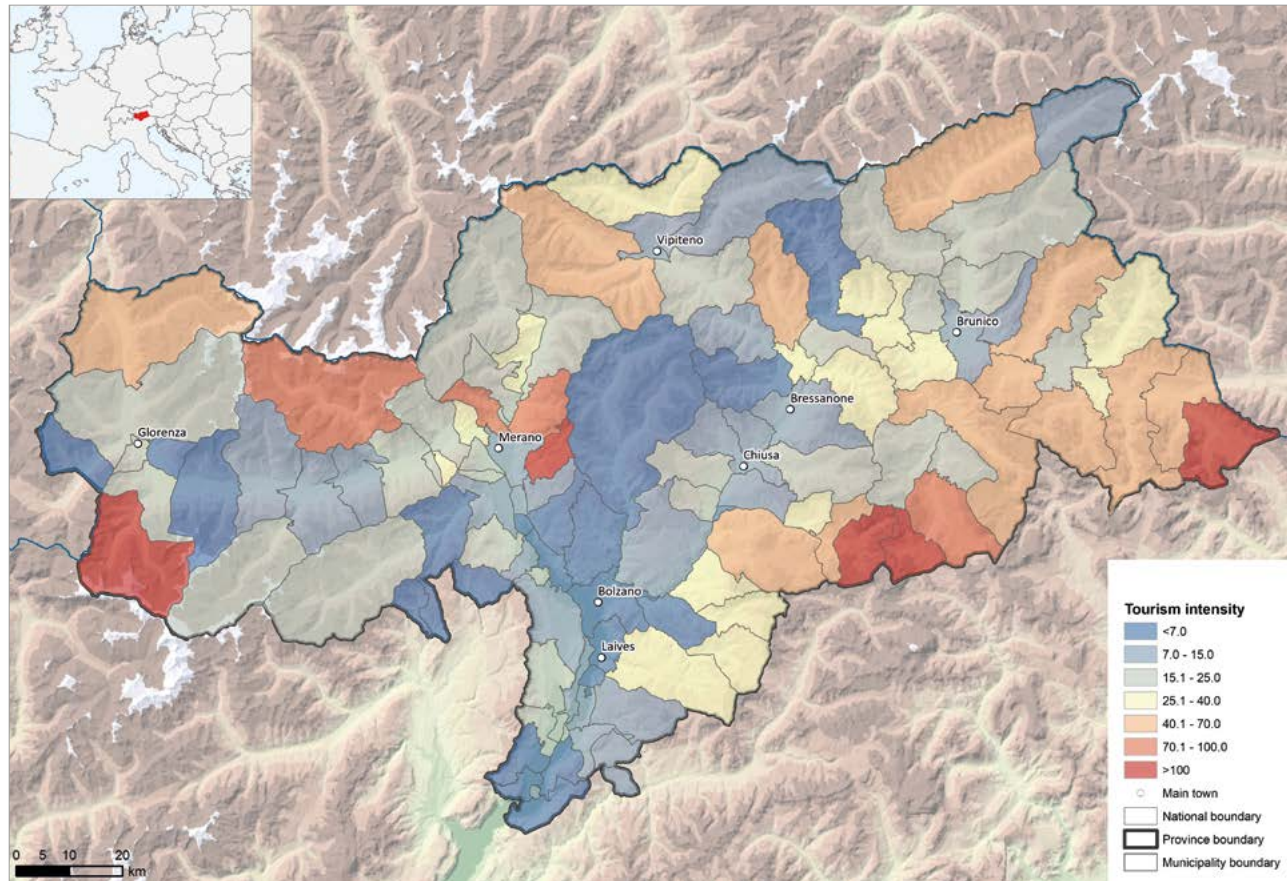


Figure 24: Map of tourism intensity index. South Tyrol, 2018. Source: ASTAT, own elaboration.

5.2 PRICES OF RENTS IN THE DESTINATION

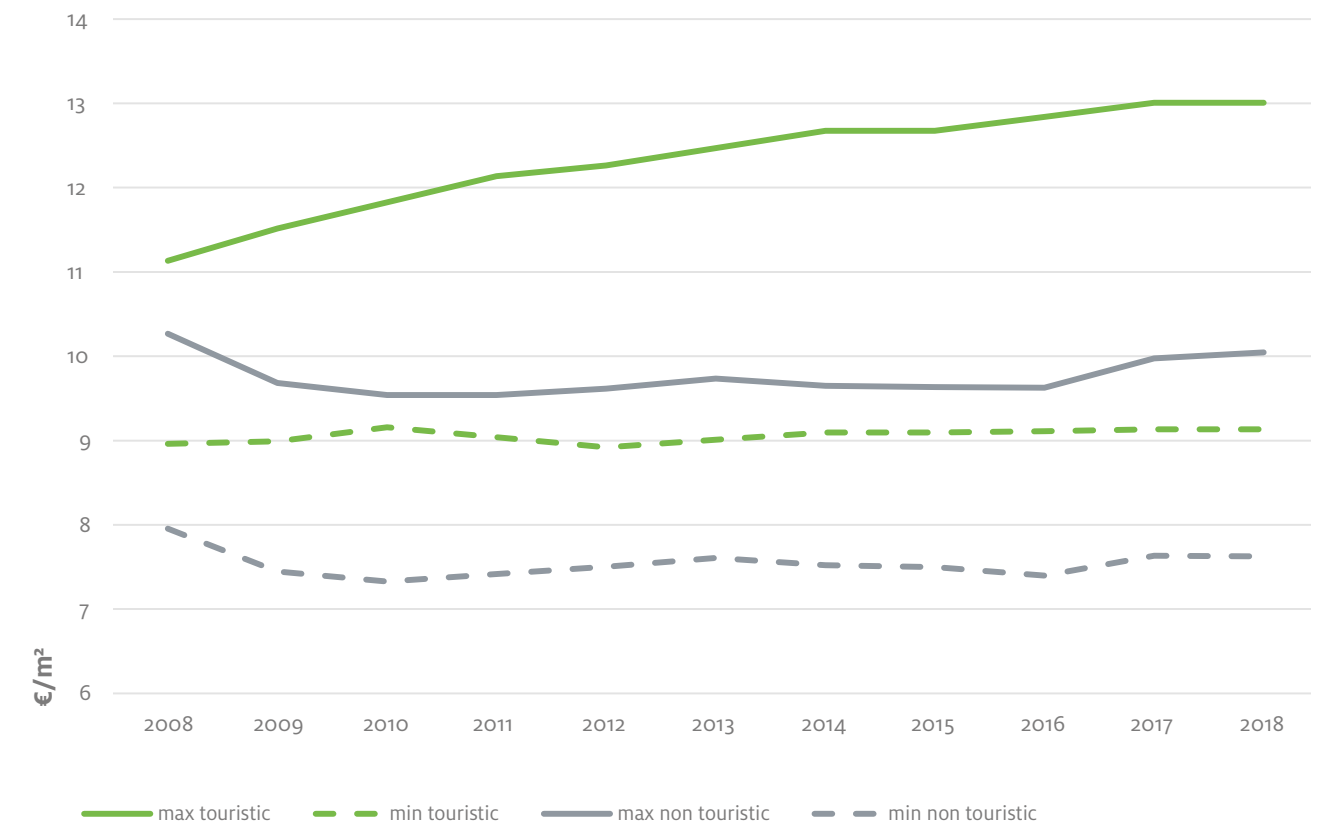


Figure 25: Prices of rents in the central area of touristic and non-touristic municipalities by year, selected South Tyrolean municipalities*, 2008-2018. Average values in €/m². Source: Agenzia del Territorio, elaboration by ASTAT and Eurac Research. *Touristic and non-touristic municipalities were defined based on ASTAT (2019b).

High touristic intensity is likely to pressure upwards inflation on goods, prices and accommodation. **Figure 25** shows the price trend of accommodation rents expressed in euros per square meter. According to the data, there is evidence of inflationary pressure on rent prices in touristic locations compared to non-touristic areas, both in the maximal and minimal price. In 2018 the difference between the maximum price in touristic locations and the maximum price in non-touristic areas was almost 3€/m²; moreover, the maximum price in non-touristic locations is comparable to the lowest rent price in more touristic municipalities (less than 1€/m² difference). As a result, people living permanently in touristic locations are also

touched by the inflated prices. Residents of touristic municipalities need to pay much more for renting a flat than residents of less touristic places, while owners of houses in these municipalities benefit from higher rents. In the long run, such a phenomenon might cause an erosion of the number of houses rented to the stable population and an increase in temporary rental services, such as, e.g. Airbnb. This phenomenon is not desirable, especially in Alpine or other rural areas, because the geographical segregation of local inhabitants might cause disfunction in the maintenance of building standards (e.g. local architecture) and the provision of primary services (e.g. commercial activities out of season).

BOX 3 :

INFLATION EFFECTS ON PRICES OF GOODS AND SERVICES IN TOURISTIC MUNICIPALITIES

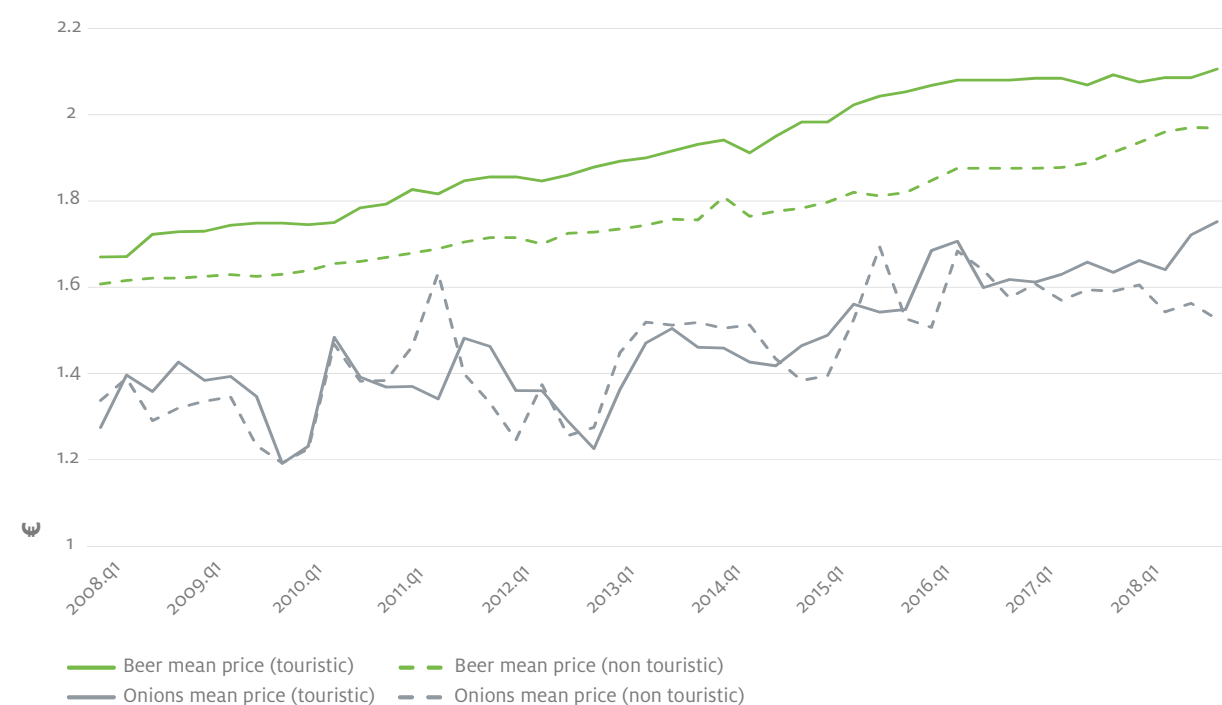


Figure 26: Prices of selected goods in touristic and non-touristic municipalities by quarter, selected South Tyrolean municipalities*, 2008-2018. Average values in Euro. Source: ASTAT, own elaboration. *Touristic and non-touristic municipalities were defined based on ASTAT (2019b).

Tourism increases demand for products and services, which in turn leads to an increase in prices. Moreover, tourists in South Tyrol – especially those from Northern Europe markets – are likely to have more spending power to absorb local prices than residents, a fact that causes an additional upward pressure on prices. The relationship between tourism and prices can also be statistically found in the data. Using price data from ASTAT, we estimate a positive correlation between tourism intensity and prices. That is, we find that an increase in tourism intensity of one percentage point is associated with an average

increase in product prices between 0.2 cents and 3 cents. However, not all products are similarly affected. The price elasticity of a product with respect to tourism depends on its relevance for tourists. To make the point more clearly, **Figure 26** displays the average price of beer and onions over time. Thereby, the prices for beer and onions are shown once for municipalities with a high tourism intensity and once for municipalities with a low tourism intensity. While the average price of a beer is clearly higher in touristic places than in non-touristic places, the prices of onion are similar in both.

5.3 TOURIST SATISFACTION WITH PRICES

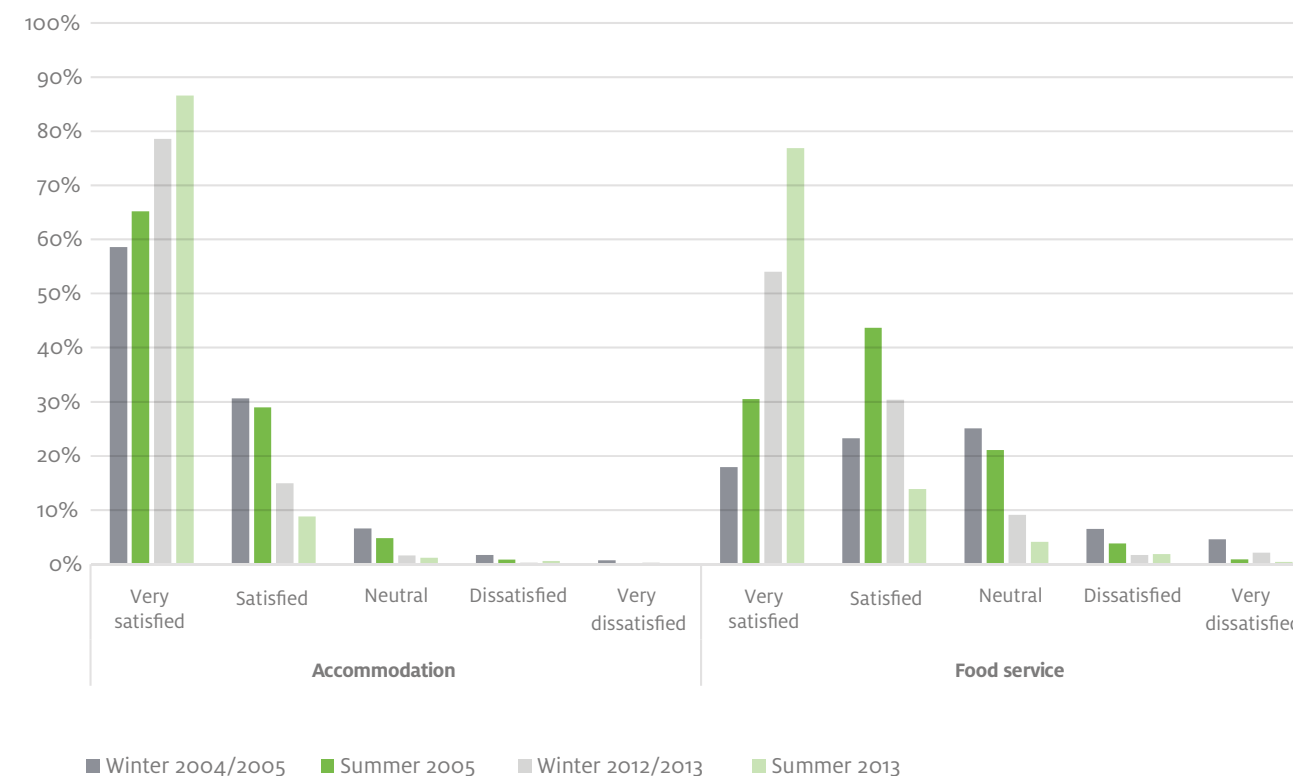


Figure 27: Tourist satisfaction with prices by season, South Tyrol 2004/05 and 2012/13. Average values. Source: ASTAT and Eurac Research, own elaboration.

Notwithstanding the higher level of prices in touristic municipalities, a sample survey conducted by ASTAT and Eurac Research in 2004/2005 and 2012/2013, representative of South Tyrol (ASTAT, 2015b), shows a high satisfaction level of tourists with local prices. 78.6% of winter tourists and 86.6% of summer tourists in 2012/2013 were very satisfied with the prices of the accommodation facilities, whereas 54.0% (in winter) and 76.9% (in summer) reported very high satisfaction levels with the food service. These figures in turn seem to support the hypothesis of the higher spending power

of some tourists and/or the high value for money perceived while buying goods and services on site. Guests show higher degrees of satisfaction in the summer season than in the winter season and in 2012/13 than in 2004/2005. This might be related to the high price of the skipass in winter (around 40-50 € per person per day). Finally, the accommodation sector registers higher scores than the food service sector in both years. This difference might be explained both by the high-quality accommodation standards on site, and their increase over time, as shown in **Figure 2** above.



6 Energy management

The tourism industry requires vast amounts of energy for the creation of products, services, and visitor experiences. The energy consumption can be allocated either to mobile assets (mostly vehicles, but also, especially in alpine regions, cable cars, ski-lifts, and snow cannons), or to fixed assets (such as accommodation facilities, restaurants, and other buildings). Measuring the energy consumption in the tourism sector is not an easy task, as, beyond the energy directly attributable to tourism consumption, it is difficult to capture the indirect energy consumption, used in the production of goods and provision of services whose use is shared with the local population. Moreover, no information is available on the amount of thermal energy consumed in accommodation facilities for heating purposes and on the type of heating plant. For this reason, we decided to focus on accommodation facilities, ski lifts, and snow cannons, areas in which the consumption of electricity is (relatively) easy to ascribe to tourists or to estimate using literature-based coefficients. Moreover, the number and geographical location of charging stations for e-mobility is also monitored, in order to provide an overview on how capillary energy is provided to encourage alternative forms of mobility. It should be noted that in South Tyrol energy is mostly produced by renewable sources, especially by hydroelectric power plants (Legambiente, 2018), which makes the use of electric energy more sustainable.

Within this area, a topic a future think tank will tackle is how to facilitate the energy transition, i.e. the transformation of the energy sector from fossil-based to zero-carbon to reduce carbon emissions and mitigate the effects of climate change thanks to the adoption of global IT solutions, and smart technology, that will have to be enforced locally thanks to policy frameworks and market instruments.

6.1 ESTIMATED MINIMUM ELECTRICITY CONSUMPTION IN ACCOMMODATION FACILITIES



P

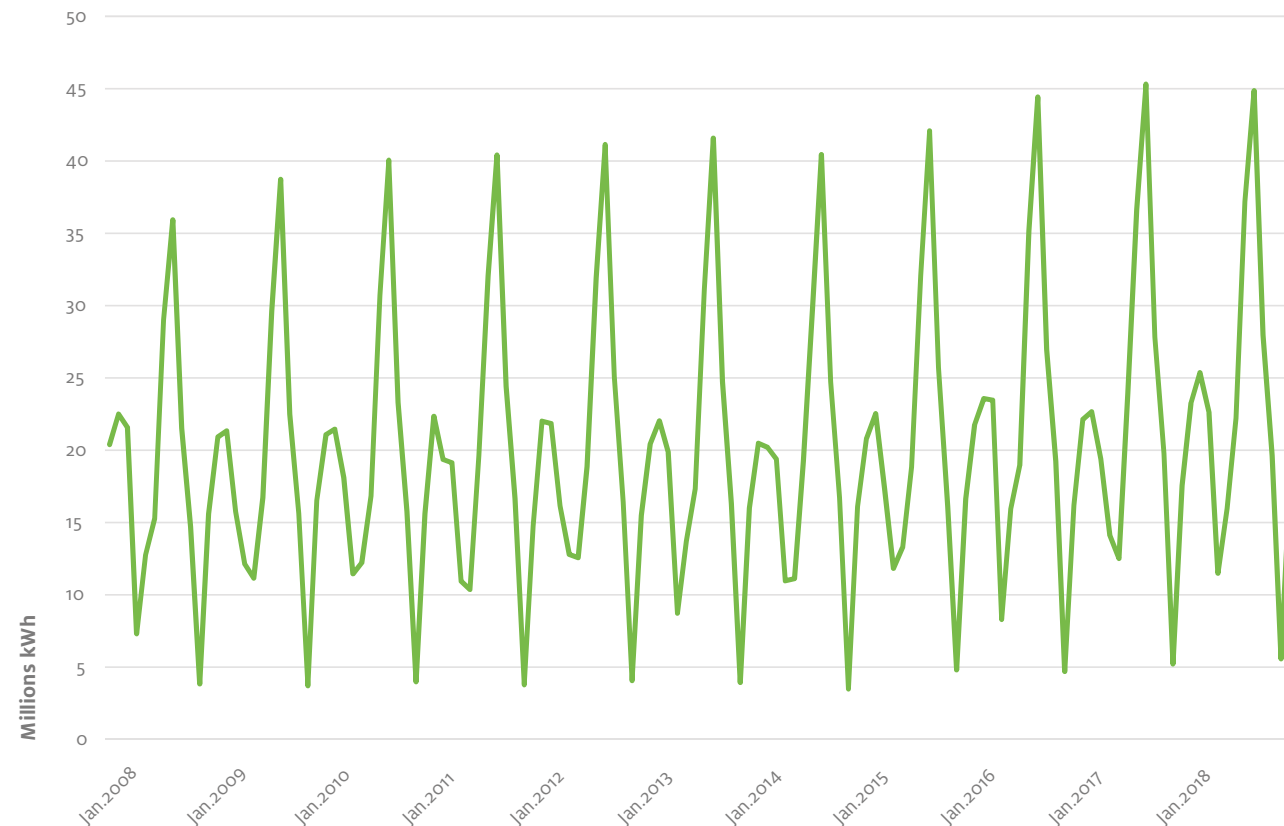


Figure 28: Estimated minimum electricity consumption* for accommodation facilities by month, South Tyrol 2008-2018. Millions of kWh. Source: own elaboration.

*The estimation procedure is based on energy consumption coefficients estimated per night and accommodation category according to the Bundesministerium für Wirtschaft, Familie und Jugend Wirtschaftskammer Österreich, Fachverband Hotellerie, Fachverband Gastronomie, Österreichische Hotelierversammlung (2011).

In order to illustrate the amount of electricity consumed by tourists, we created an estimation based on overnight stays and a coefficient for electricity consumption (Bundesministerium für Wirtschaft, Familie und Jugend Wirtschaftskammer Österreich, Fachverband Hotellerie, Fachverband Gastronomie, Österreichische Hotelierversammlung, 2011), under the assumption of energy-efficient accommodation facilities in South Tyrol. Hence, since no information is available on the energy efficiency of local accommodation facilities, one can interpret the estimate as a lower bound. **Figure 28** shows the estimated electricity consumption in accommodation facilities (hotels and similar establishments

and other accommodation services) from 2008 to 2018. The figure shows a clear seasonal pattern that – due to the calculation procedure – reflects the seasonal pattern of arrivals (see **Figure 10**): consumption increases in peak seasons (especially in August) and declines in low seasons (April and November). Further, the electricity consumption has been steadily rising throughout the last decade. Given that the estimated monthly average electricity consumption in 2017 amounted to 22 million kWh, it could be stated that accommodation facilities are estimated to account for 8.7% of the Province's total electricity consumption (equal to 3,027 million kWh in 2017, ASTAT³).

³ <https://astat.provincia.bz.it/territorio-ambiente-energia.asp>

6.2 ELECTRICITY CONSUMPTION BY SKI-LIFTS AND SNOW CANNONS



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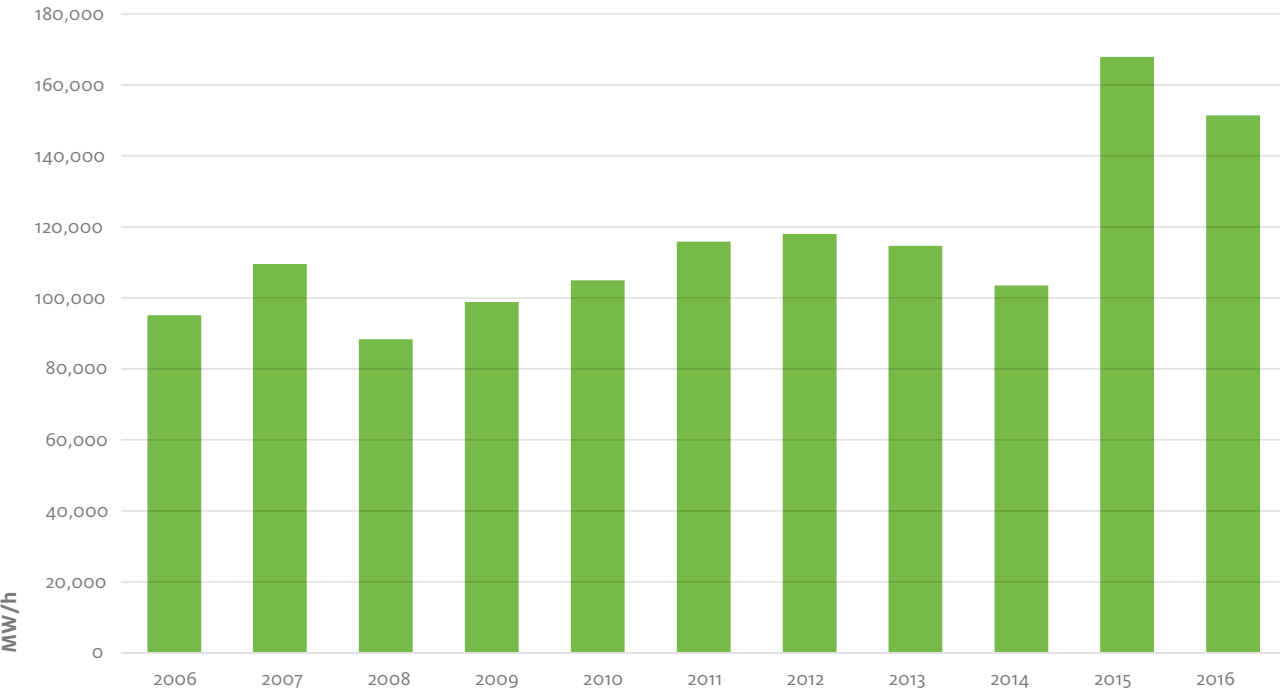


Figure 29: Electricity consumption by ski lifts and snow cannons, South Tyrol 2006-2016. MW/h. Source: Agenzia del Territorio, elaboration by ASTAT.

Being surrounded by mountains, skiing represents an important activity for tourists. However, this activity is suffering from the increased temperatures (+0.8°C in winter since the 1960s in South Tyrol, source: Zebisch et al., 2018) and the trend towards less snowfall, two phenomena that are strictly related to global warming. In order to ensure a high-quality and less weather-sensitive skiing experience, 3,765 snow cannons operate on the 3,847 ha of ski slopes in South Tyrol. They ensure snow quality standards, extend the ski seasons and counterbalance moments of scarcity of natural snowfall. **Figure 29** plots the energy consumed by the artificial snowmaking system between 2005 and 2016. The energy consumption

by ski lifts saw a great increase in 2015 and 2016 compared to previous years; in 2014 the energy consumed by ski lifts reached 103,473 thousand MW/h, while in 2015 it skyrocketed to 167,857 MW/h, an increase by 66.6% in just one year. 2015 was in fact an exceptional year with scarce natural snowfall by the beginning of the winter season, and it was one of the warmest years of the last three decades (Zebisch et al., 2018). In 2016 electricity consumption decreased again to 151,411 MWh. However, notwithstanding exceptional years, the trend in energy consumptions by ski lifts and snow cannons is generally increasing, probably reflecting the adaptation strategies of ski lift businesses to the effects of climate change.

6.3 CHARGING STATIONS OFFERED FOR
E-MOBILITY IN HOTELS AND PUBLIC SPACES

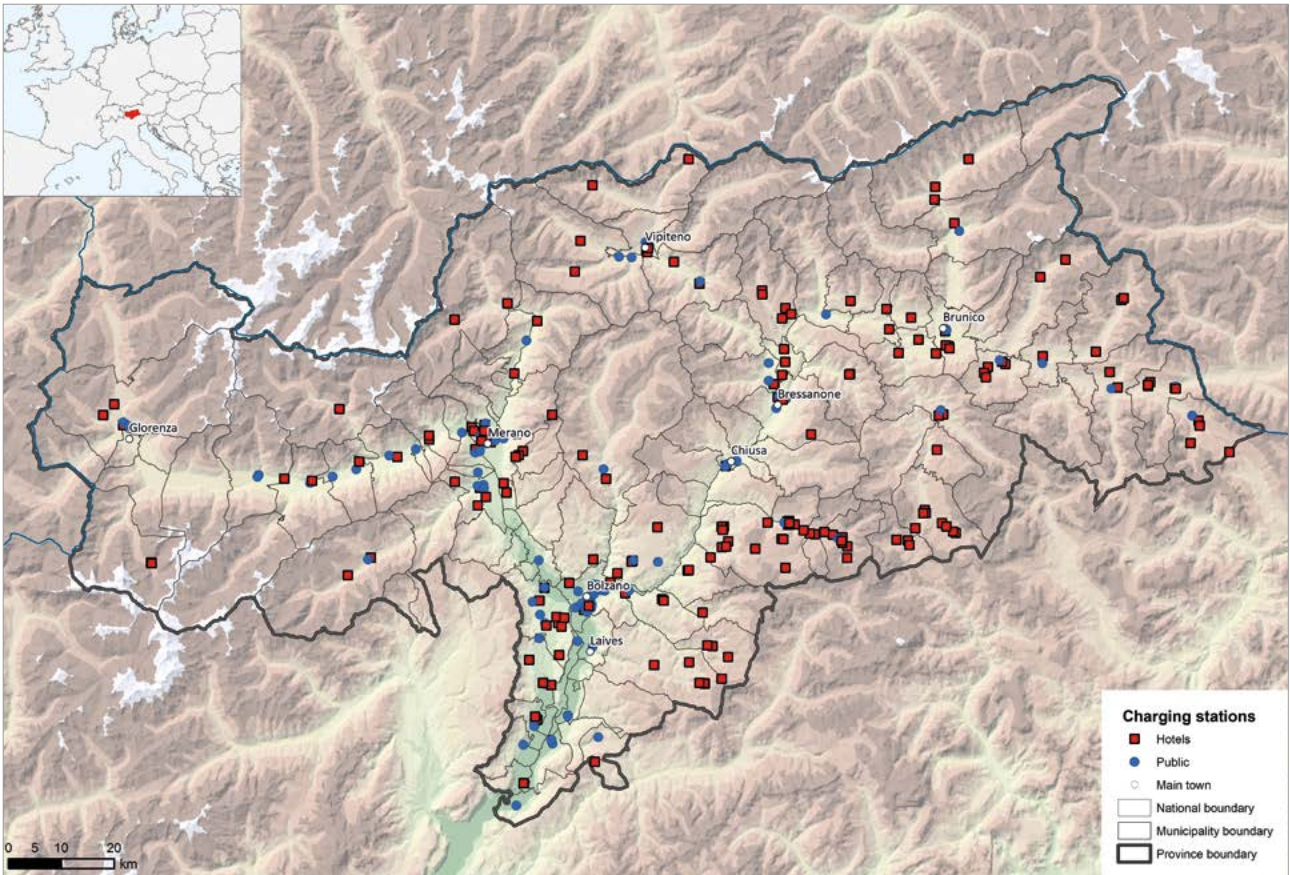


Figure 30: Map of hotel-based and other charging stations for e-mobility, South Tyrol 2019.
Source: Alperia and Tesla, elaboration by Eurac Research.

Among the climate change mitigation strategies implemented in South Tyrol, the support for e-mobility is prominent. In fact, a strategy for sustainable mobility (www.greenmobility.bz.it/en/) was developed in the destination that both encourages a modal shift towards public transport, and subsidizes e-vehicle purchasing. The development of e-mobility solutions, however, is strictly related to the availability of charging infrastructure. If this is present, not only the resident population, but also niches of tourists driving e-vehicles might be encouraged to visit the region (Scuttari, Isetti, 2019). To monitor the development of charging infrastructure on site, and to evaluate the importance of the tourism sector in providing alternative forms of mobility, **Figure 30** represents the number of charging stations in hotel accom-

modation facilities (in red) compared to those in other public spaces (in blue). Out of the 300 charging stations available in 2019, 202 are in accommodation facilities, showing the relative importance of the hospitality sector in promoting e-mobility. These charging stations are not only available to guests, but also to the local community, creating thereby indirectly positive social effects on the local population. Moreover, the south-eastern part of the province, which has the highest tourism intensity and accommodation density and hosts the Dolomites WHS, shows a higher concentration of charging stations in the map. This might suggest that those areas with higher tourist inclination are also more reactive to sustainability challenges, with local businesses also trying to leverage on e-mobility to sharpen their strategic positioning.





7 and 8 Water & Waste water management

Fresh water is an essential resource for tourism, as it is consumed directly by tourists, e.g. for hygienic purposes, but also by the hospitality industry, e.g. for the irrigation of gardens, to fill up swimming pools and supply wellness and spa facilities, and for cleaning rooms and washing bed and table linen. Moreover, it is linked to many leisure activities, such as golf and skiing (Gössling, 2015). Tourism impacts not only on the direct water use, but also on waste water treatment: for this reason, the waste water aspect is analyzed separately in this report.

Due to climate change, which causes reduced snowfall and a greater evapotranspiration, water is an increasingly scarce resource in South Tyrol (Zebisch et al., 2018), and in the future there might be cross-sectoral conflicts for its use, e.g. between tourism and agriculture in rural areas. Monitoring water consumption is therefore essential to foresee and warn local stakeholders against potential water shortages and stresses. However, like energy consumption, secondary data on tourism-related water use are only partly available, and not for the hospitality sector. Therefore, we estimated water use in accommodation facilities using literature-driven coefficients specific for each hotel category. We also included available data for water consumption by snow guns, as water cycle for snow making and technological advancement to make it more efficient could be an interesting topic for a dedicated think tank.

Waste water management is an issue area in which significant activities must be planned for future monitoring, since there is little data available. While it is known that all the water in hotels and similar establishments is treated in South Tyrol, there is a lack of knowledge about the amount of mountain huts with waste water treatment. This issue should be tackled in future monitoring actions. For the moment, the only available data relates to the amount of waste water attributable to tourism according to the calculations of the Provincial Agency for Environment, as explained below.

7.1 ESTIMATED MINIMUM WATER CONSUMPTION IN ACCOMMODATION FACILITIES

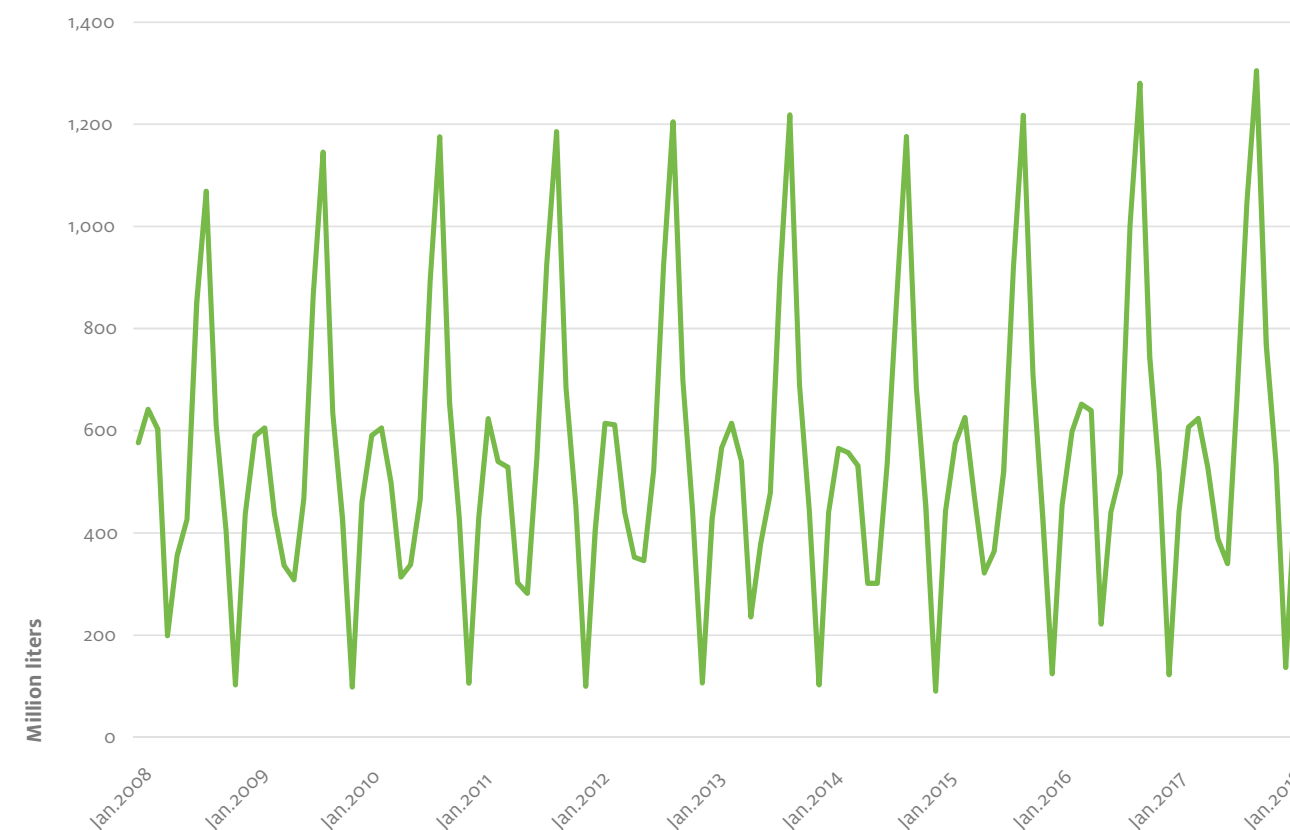


Figure 31: Estimated minimum water consumption* for accommodation facilities by month, South Tyrol 2008-2018. Millions of liters. Source: own elaboration.

*The estimation procedure is based on water consumption coefficients estimated per night and accommodation category in Bundesministerium für Wirtschaft, Familie und Jugend Wirtschaftskammer Österreich, Fachverband Hotellerie, Fachverband Gastronomie, Österreichische Hotelierversammlung (2011).

Similar to energy consumption, the minimum water consumption in accommodation facilities (estimated using water consumption coefficients per night and accommodation category provided by Bundesministerium für Wirtschaft, Familie und Jugend Wirtschaftskammer Österreich, Fachverband Hotellerie, Fachverband Gastronomie, Österreichische Hotelierversammlung, 2011) reflects the seasonal trend of overnight stays: consumption rises in peak seasons (especially in August)

and declines in low seasons (April and November). Notwithstanding seasonality, water consumption has been steadily rising throughout the last decade. Given that the 2015 estimated monthly average water consumption amounted to 561 million liters, it could be stated that accommodation facilities are estimated to account for 8% of the Province's total potable water consumption (equal to 83.4 million cubic meters in 2015, ASTAT 2018a).

7.2 WATER USE BY SNOW GUNS

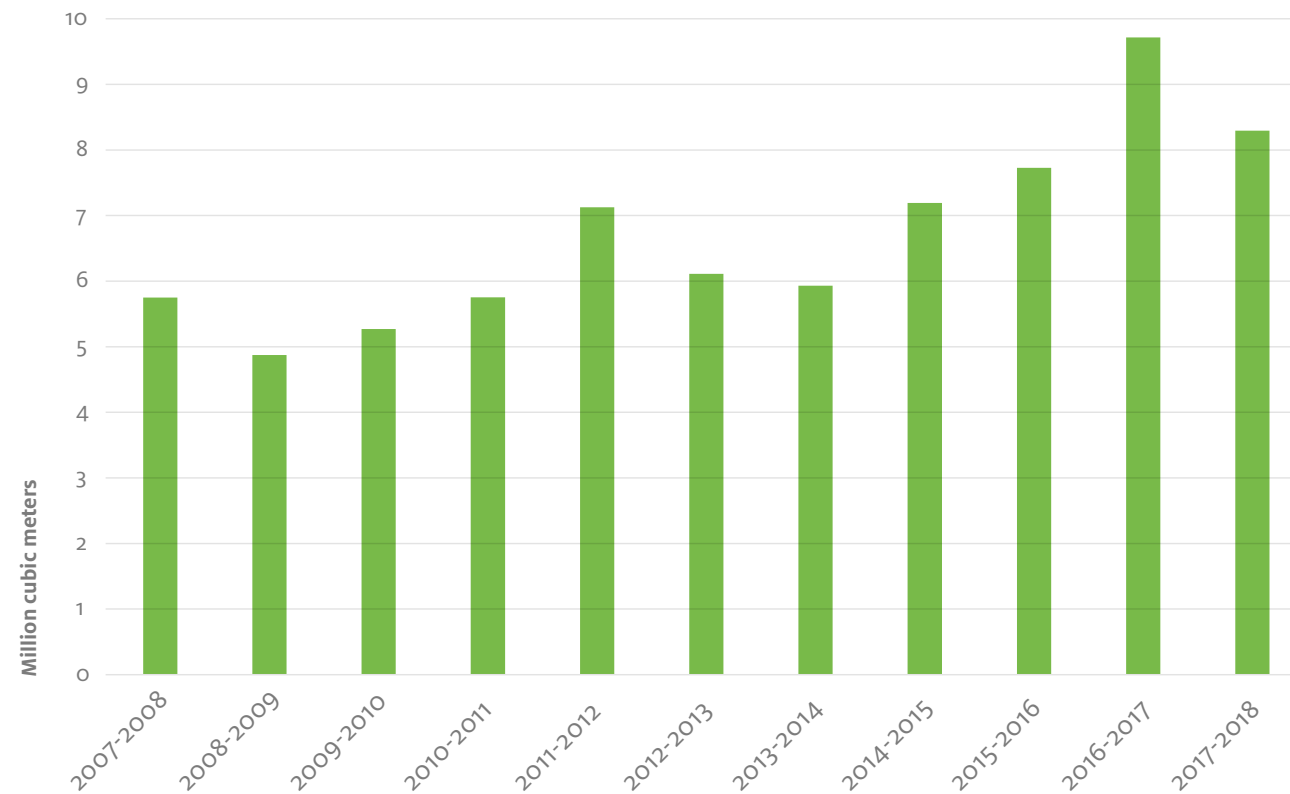


Figure 32: Water consumption by snow guns, South Tyrol winter season 2008-2018. Million cubic meters. Source: APPA, data available on demand.

According to Zebisch et al. (2018), the surface with natural snow cover in South Tyrol has been decreasing since 2014. Especially in the winters from 2014 to 2017, the snowfall in December and January was far below the average of the last 15 years (Zebisch et al., 2018, 39-41), which explains the corresponding increase in water consumption by snow production (which peaked in 2016-2017 to 9,716,819 cubic meters of water, as shown by Figure 32). It is also worth mentioning that in late fall and early winter, with the weather of the upcoming winter still unpredictable, snow production is used to ensure high-quality snow

by the opening of the slopes, even in years with high natural snowfall and cold temperatures. This is the reason why, even in years with abundant natural snow cover, the snow production does not substantially decrease (Rixen et al., 2011). It should be noted that the impact of snowmaking on alpine water resources management is still an underexplored research field (de Jong, 2015); however, some studies assert that the increasing water demand for snowmaking and the diversion of water from its water cycle might cause hydrological impacts and water conflicts (see, e.g. de Jong, Barth, 2007).

8.1 DISCHARGE OF SEWAGE WATER ATTRIBUTABLE TO TOURISM

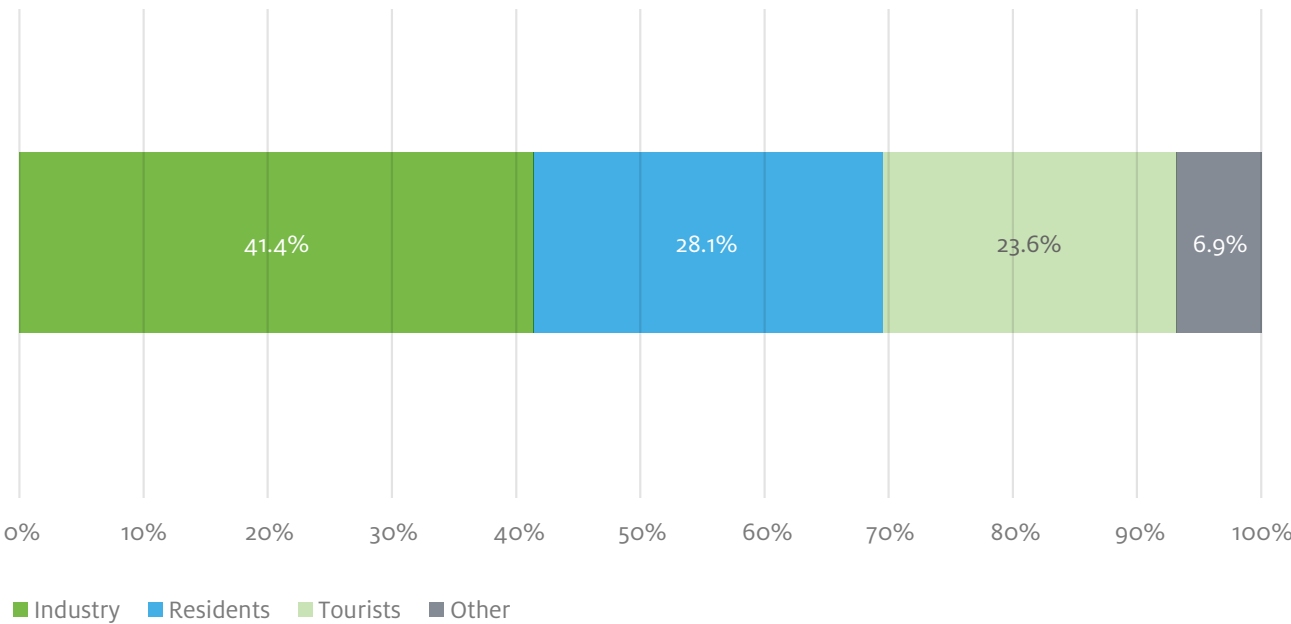


Figure 33: Estimation of users connected to sewerage and sewage treatment plants, South Tyrol 2014. Percentage values, population equivalent. Source: APPA (2015).

According to the data provided by APPA (2015), it is possible to classify users connected to sewerage and sewage treatment plants in four main categories: industry, residents, tourists, and others. To estimate the capacity of these plants, APPA calculates the number of estimated users per category. While resident users are estimated based on population data, tourists are assessed by calculating a population equivalent according to hydraulic engineering standards that link back to available beds in accommodation facilities. Therefore, total users connected to sewerage and sewage treatment plants in South Tyrol were estimated at around 1,684,160 in 2014. Among them, tourists amount to 397,327, making up 23.6%. It should be noted here that this is an upper-bound assessment of the impact of tourism on waste water, and that more specific and more recent data should be generated in this field, as outlined above.



9 Solid waste management

Solid waste is generated in nearly all activities that humans undertake. However, it is acknowledged that tourism-related activities produce amounts of waste well above those encountered in normal domestic usage (Hamele & Eckardt, 2006). In fact, they often expect higher standards of hygiene and a wider range of choices in food and other services, which translate into more waste. Moreover, while on vacation, people tend to use more disposable products than at home, a habit that also increases waste volumes. To mitigate the impacts of these phenomena, a good waste management system and well-made information policies for guests and staff members can help. In turn, to sensitize guests and staff members to waste reduction mechanisms, a solid background of knowledge on the waste volumes produced, and the management processes implemented is needed (UNWTO, 2004). Strategies to minimize waste generally include reduction, reuse, recycling, residual treatment, and residual disposal of waste: their adoption should be considered at destination level and particularly within accommodation facilities. An efficient waste management might also represent a source of cost savings for a tourism business, whose entity depends also on the business location and the local waste management regulations (Pirani & Arafat, 2014). Notwithstanding the relevance of waste management for the tourism sector, the literature on the topic is very limited, making it difficult to pin down the impact of tourism on waste production. In order to circumvent this problem, similar to energy and water management, the decision was taken to estimate the production of waste in accommodation facilities using a coefficient retrieved from Hamele & Eckardt (2006) on the production of waste per overnight stay. The resulting graph shows the output of this estimation. As in the issue areas related to energy and water management, an additional effort is necessary in the future to produce more place-specific estimations.

9.1 ESTIMATED WASTE PRODUCTION IN ACCOMMODATION FACILITIES

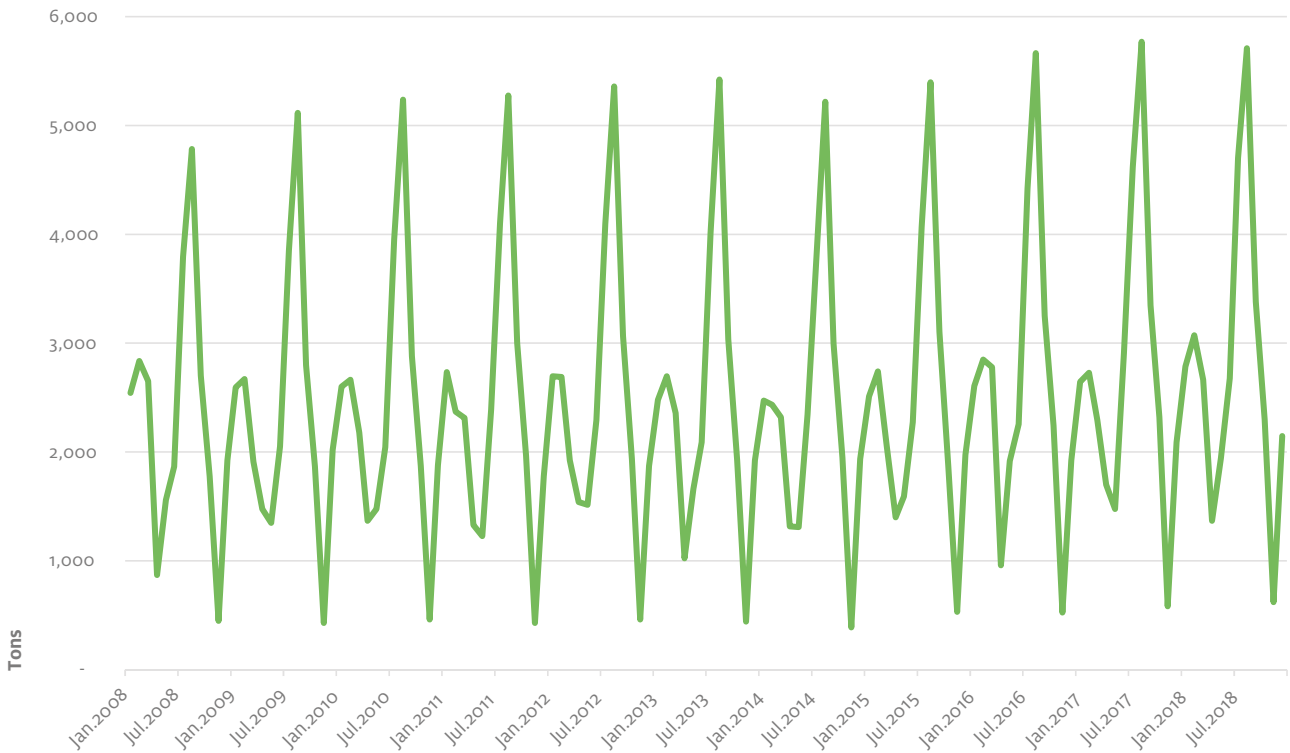
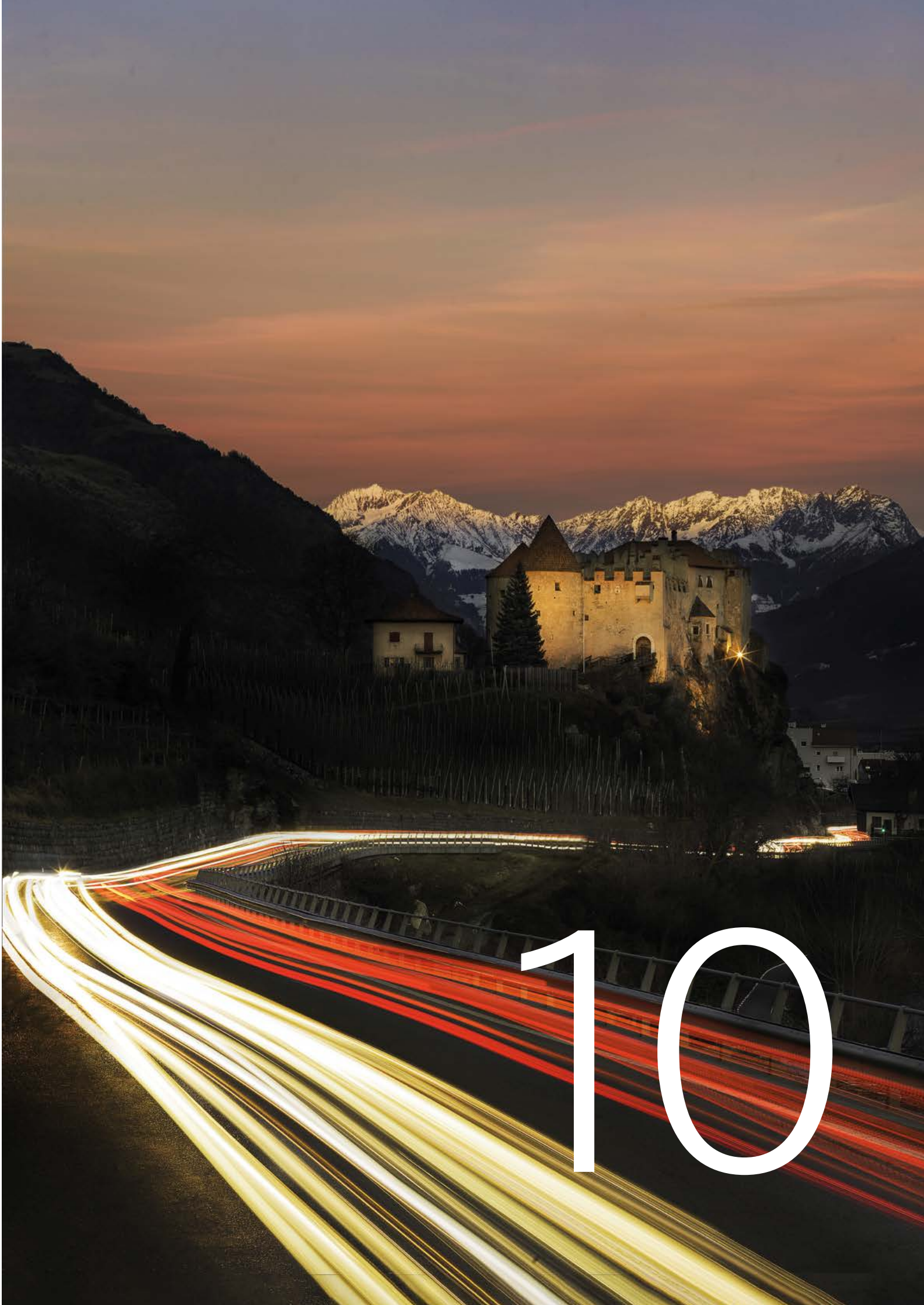


Figure 34: Estimated waste production* for accommodation facilities by month, South Tyrol 2008-2018. Tons. Source: own elaboration.
*The estimation procedure is based on waste production coefficients estimated per night in Hamele & Eckardt (2006).

The production of waste in accommodation facilities shows a clear seasonal trend, reproducing that of over-night stays: production rises in peak seasons (especially in August) and sharply declines in low seasons (April and November). Notwithstanding seasonality, waste production – like energy and water consumption – has been steadily rising throughout the last decade. Given that the estimated waste production in accommodation facilities in 2017 amounted to 32,436 tons, accommodation facilities are estimated to account for 9% of the total waste production (the total production of waste in South Tyrol in 2017 amounted to 347,900 tons, see APPA 2018).



10 Mobility



Tourism without transportation is unconceivable, as the tourist system is intertwined with transportation systems (Pearce, 2005). The process of accessing and returning from tourist sites alone, i.e. travel to the tourist location, requires approximately 90% of the energy used globally in tourism (UNWTO, 2014). The growing trend in international mobility pressures the environment, from land and spatial use, energy consumption, air and noise pollution, and greenhouse emissions. Monitoring transportation-related data provides an early warning of possible infrastructure pressures, and it might help forecast and therefore prevent congestions on peak days. Secondly, collecting knowledge on the modal split (i.e. the different modes used by visitors to reach the destination) creates a crucial knowledge milestone to design a more fitting mobility offer and incentivize more sustainable means of transport. Those in turn can be monitored once visitors have reached the destination by collecting data on their use of car sharing solutions and cable cars. Notwithstanding the energy use (see indicator 6.2) and the possible negative impact on the landscape, the use of cable cars in Alpine contexts can be generally read as an encouraging signal, as they can substitute less sustainable means of transport, such as private cars or motorcycles, especially in summer and in combination with traffic regulations and road closures (see, e.g., Scuttari et al., 2016).

In South Tyrol, 85.5% of incoming tourists enter the region by means of private transport and 55.7% use this means to travel around during their holiday (ASTAT, 2009; ASTAT, data available on demand). The fact that South Tyrolean tourism markets are not relying on the use of air connections is definitely positive in terms of greenhouse gas (GHG) emissions, however it translates into a high pressure on the local road infrastructure capacities, which are often overstretched during peak summer days and weeks. Given this heavy dependency on private transport, the already established think tank dedicated to this issue area focusses on the improvement of such private means, which means, first of all, the process of electrification of cars and motorcycles, but also other forms of technological innovation, e.g. in the field of automation. The distribution of tourism-related traffic flows in South Tyrol was estimated in previous analyses, showing that over half (51.2%) of the almost 14 million light vehicles entering South Tyrol in the tourism year 2007/2008 (November 2007 to October 2008) were tourism-related (Scuttari et al., 2013). Indicators in this issue area were selected to show the actions taken to tackle this problem and shift modal choices towards public transport or shared use of vehicles, rather than to estimate the magnitude of impacts. This choice was made because the presence of a provincial strategy for sustainable mobility and the availability of a capillary network of integrated public transport (including trains, buses, and some cable cars) has already encouraged responses to the traffic-related impacts of tourism. However, these have not yet been integratively monitored.

10.1 MOBILCARDS, BIKEMOBIL CARDS, MUSEUMOBIL CARDS AND GUEST TICKETS

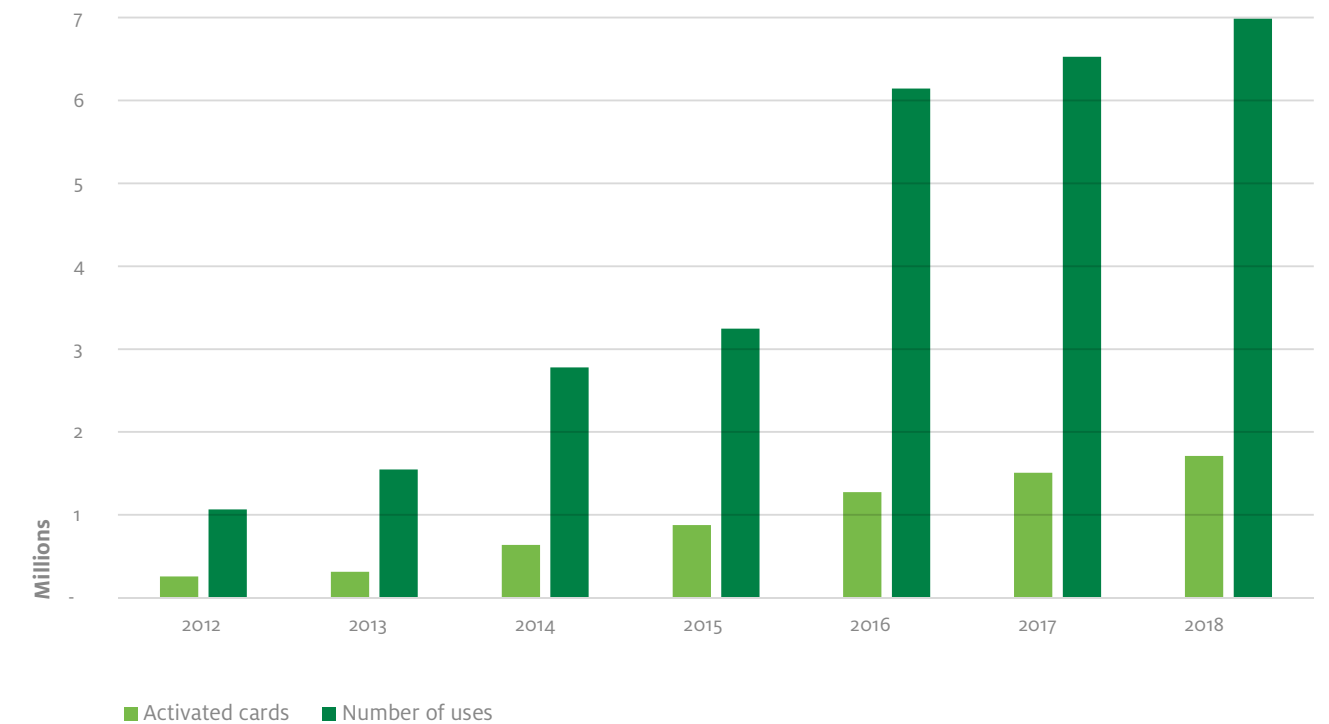


Figure 35: Activated Mobilcards, bikemobil cards, museumobil cards and guest tickets and their use in South Tyrol, 2012-2018. Millions. Source: Strutture Trasporto Alto Adige, data available on demand, own elaboration.

Tourists have different possibilities to move around South Tyrol with public transport: many of them receive a guest card at the hotel, or they can buy a special ticket. Special tickets are the Mobilcards, bikemobil cards or museumobil cards and they can be used without limits during the validity period (1, 3 or 7 days) on all the trains, buses, and some cable cars in South Tyrol and can include also access to bike rental (bikemobil cards) or museums and exhibitions (museumobil cards). Similarly to special tickets, guest tickets include several services (e.g. entry tickets to museums or exhibitions, cable car tickets, etc.) in addition to public transport, but the composition of these services varies from sub-region to sub-region. The difference between the two is that the former is a standard format for the whole province and can be bought also by residents and workers for a use in their free time, while the latter is place-specific and is

mostly distributed (and not directly paid) in accommodation facilities. Guest tickets are indirectly financed through overnight taxes. As of September 2019, 5,570 accommodation facilities (representing 55.0 % of total accommodation facilities in South Tyrol) were adhering to the initiative and were distributing guest tickets to their guests (Strutture Trasporto Alto Adige, data available on demand). It should be noticed that the impressive increase in activated cards (from 255,700 in 2012 to 1,711,514 in 2018) is mostly due to the increase in use of guest tickets, accounting for 96% of the total number of activated cards in 2018. On the other hand, the number of uses is much higher than the number of activated cards, because tickets need to be validated before each trip and are used multiple times during vacation. In fact, the average number of uses per card amounts to 4 in 2018 and is relatively stable across the available time span.

10.2 NUMBER OF SKI-LIFT AND CABLE CAR USERS BY SEASON

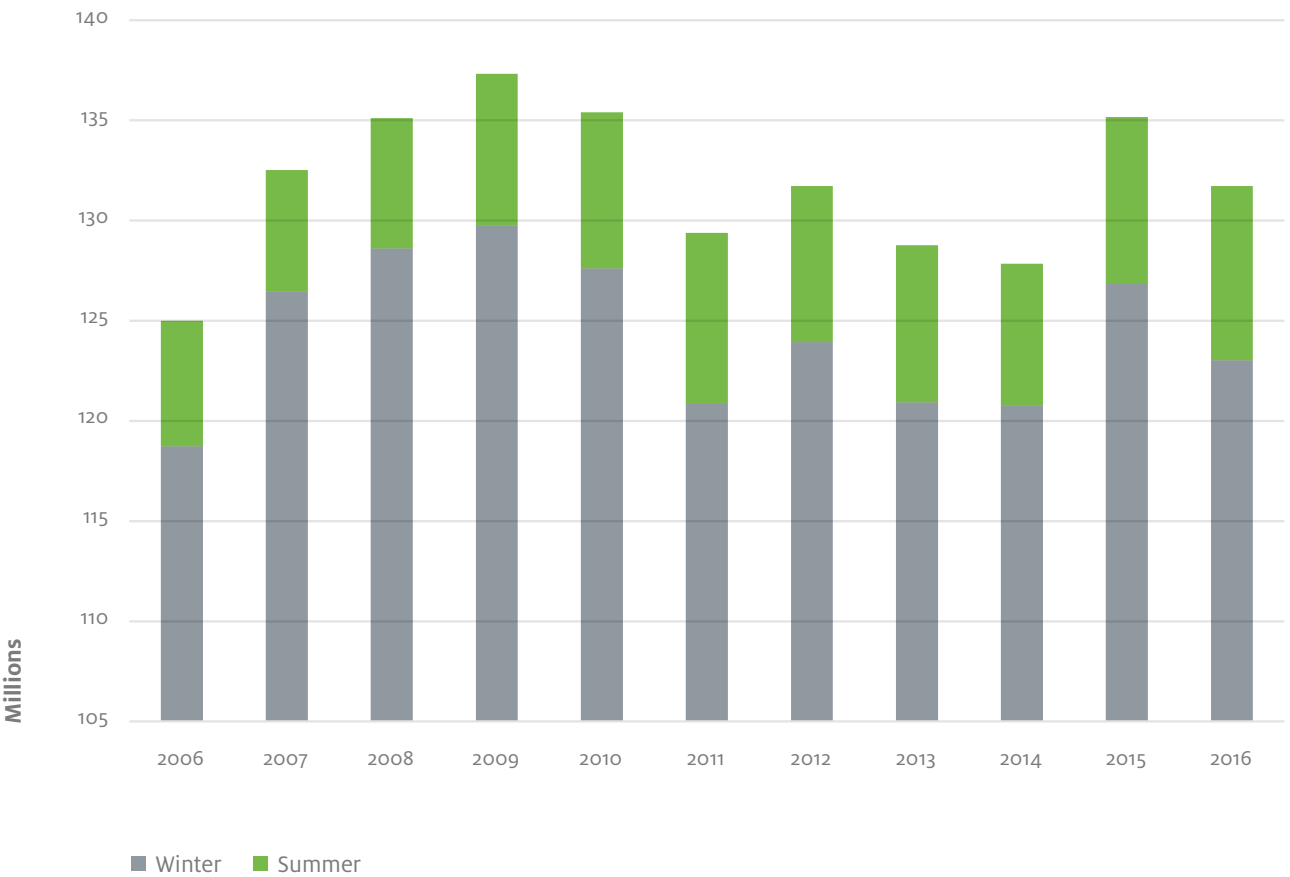


Figure 36: Number of ski-lift and cable car users by tourist season, South Tyrol 2006-2016. Millions.
Source: ASTAT (2018b).

Figure 36 shows the number of ski-lift and cable car users over time. The use of cable cars and ski-lifts is higher during the winter season, due to the importance of ski tourism. In summer, the use of ski-lifts and cable cars is much lower, because the trend to use ski lifts in summer is relatively recent. It should be noted here that users refer to both inhabitants and tourists, but the use of ski-lifts is related to recreational activities mostly ascribed to guests. During the last ten years, the total number of people transported has changed only slightly, but the decreasing numbers in 2014 recall the trend of arrivals and overnight stays presented above (**Figure 1**).

Note also that during the same period, passengers that used the ski-lift and cable car in winter grew by 3.6%, whereas the number of rides during summer increased by 38.7%. Given the decreasing trends in natural snow cover and the increasing consumption of water and energy for artificial snowmaking, the summer use of ski lifts might be an early sign of an adaptation strategy to climate change, according to which the same type of infrastructure (a ski lift) is used for a different and initially unplanned function (the transport of hikers, and increasingly, mountain bikers with their bikes).

10.3 KILOMETERS TRAVELLED USING CAR SHARING SERVICES BY NON-LOCAL USERS

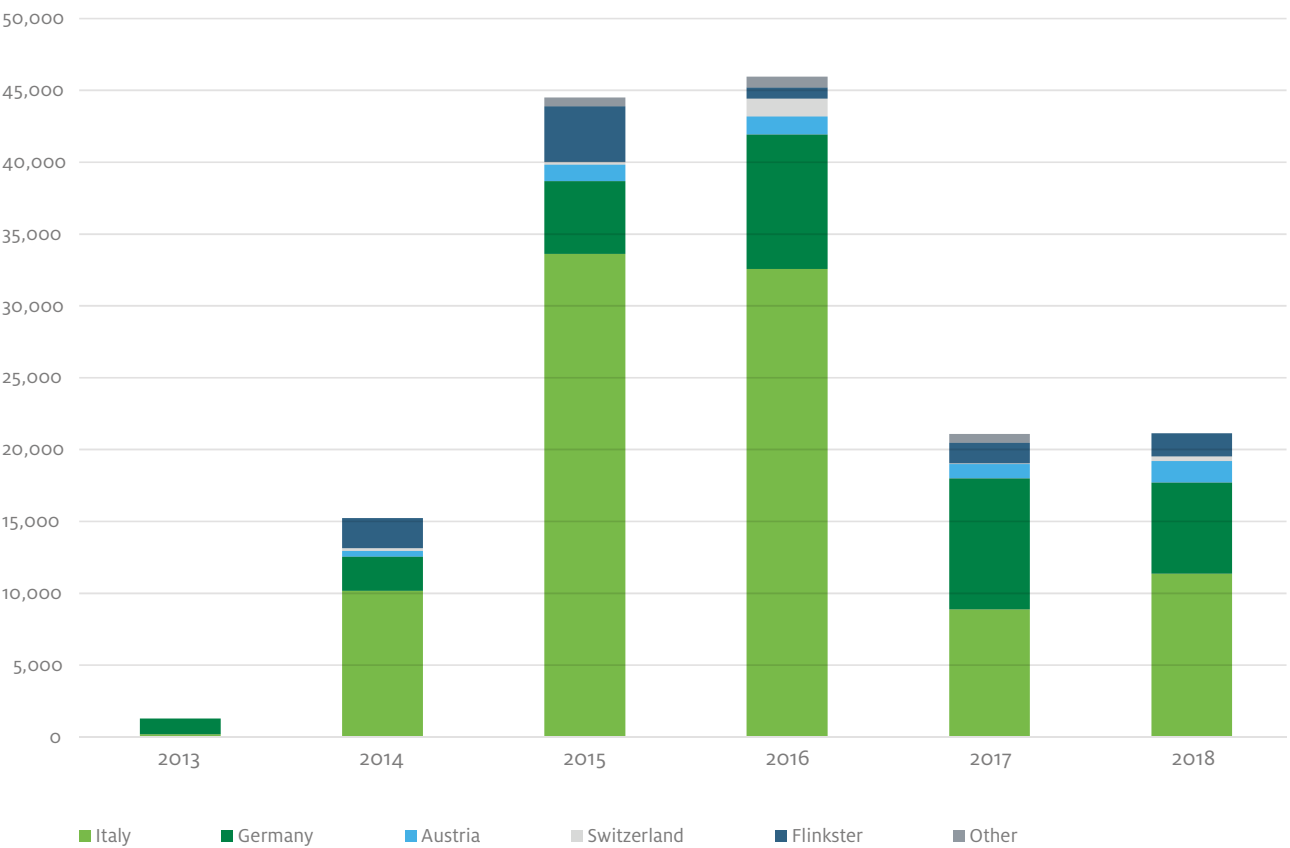


Figure 37: Kilometers travelled using car sharing services by non-local users, South Tyrol 2014-2018.
Source: Car Sharing South Tyrol, data available on demand, own elaboration.

Figure 37 illustrates the distances covered by car-sharing users that were classified as non-local, i.e. not resident in South Tyrol. On average, all Italian users from other regions travelled almost 19,000 km per year in total, whereas all German users travelled on average 6,400 km per year. All Flinkster users, i.e. all users of the carsharing operation of the railway and logistics company Deutsche Bahn (DB), cover almost 2,000 km per year. In general, it can be stated that the trend of car sharing use is quite irregular: while German users increased from 2014 to 2017 and slightly decreased in 2018, Italians were travelling much longer distances in 2015 and 2016 than in other years. Possible explanations provided by

the car sharing service of South Tyrol are the increase in applied prices up to 2016, the fluctuating cooperation mechanisms with tourism boards to promote the car sharing service, the loss of some business travelers that regularly came to South Tyrol using a shared car (although working and living somewhere else), and finally the increasing trend to use guest tickets and mobilcards (see indicator 10.1). For a correct interpretation of these data, please note that users considered in the analysis might not always travel for leisure purposes: they might be business travelers, or even commuters from other regions, a category that would only partly link to tourism.

BOX 3

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TRAILS ACCESSIBILITY
BY PUBLIC TRANSPORT: A STUDY
SUPPORTED BY ESRI SPAIN

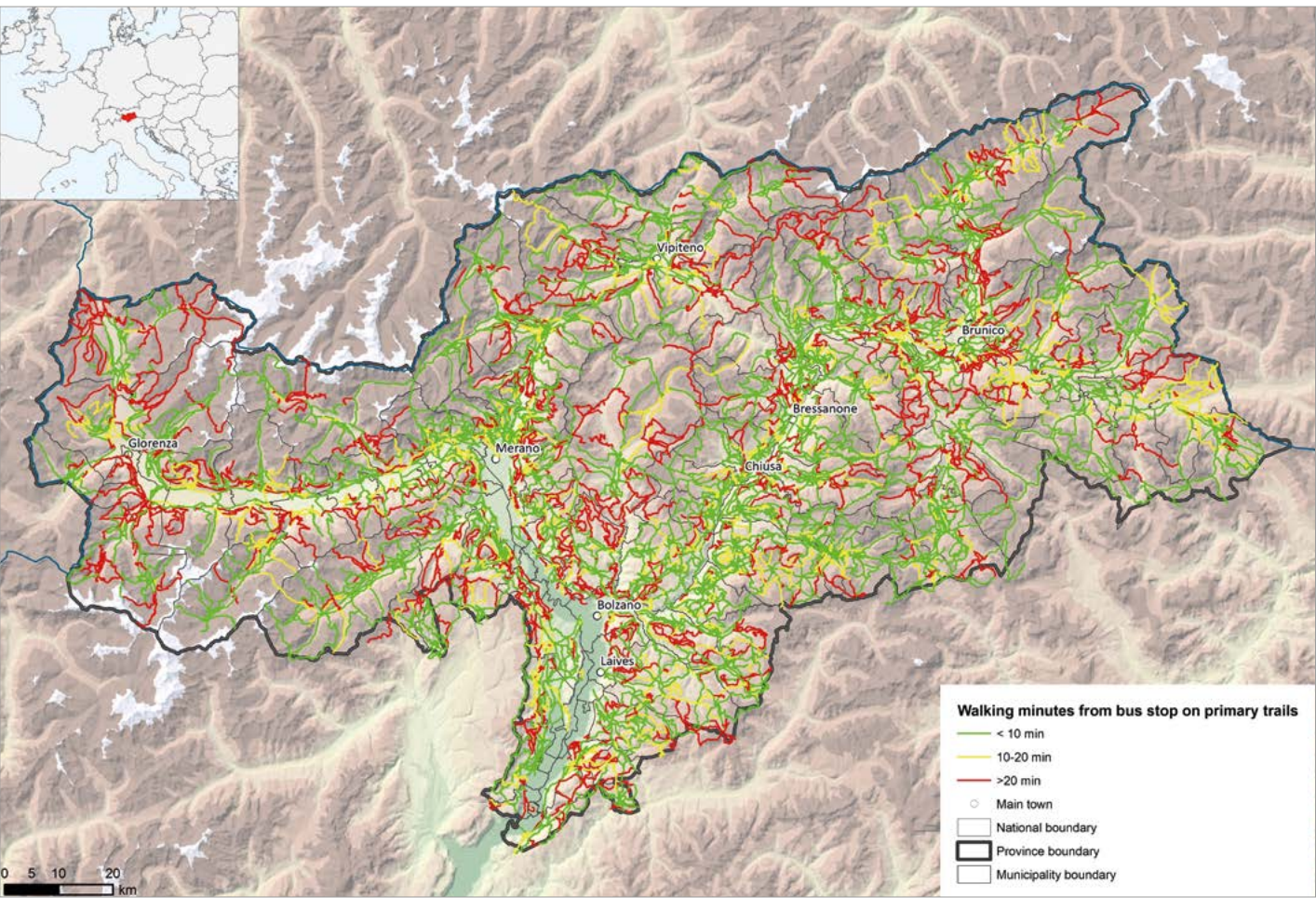


Figure 38: Map of primary hiking trails by walking distance from bus and train stops, South Tyrol 2018. Source: ESRI Spain and Eurac Research, own elaboration.

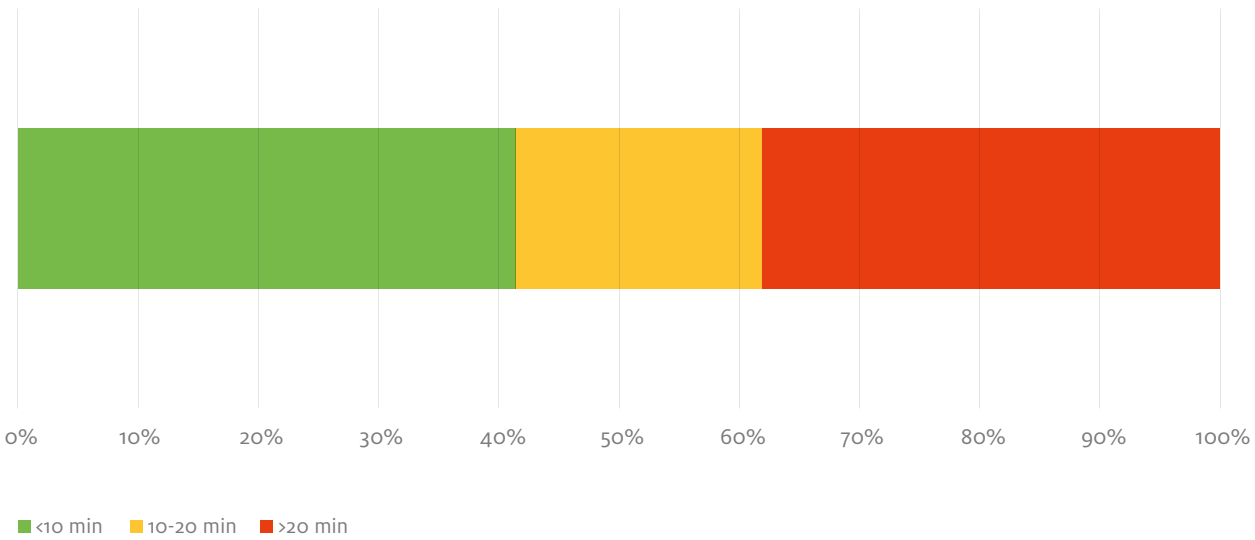


Figure 39: Primary hiking trails by walking distance from bus and train stops, South Tyrol 2018. Percentage values. Source: ESRI Spain and Eurac Research, own elaboration.

Hiking is one of the most important activities for tourists, whose visits to South Tyrol are mostly motivated by the practice of outdoor sports (ASTAT, 2015a). The network of trails is incredibly widespread in the whole South Tyrolean territory, which counts 4,386 numbered and maintained trails (i.e. around 38 trails per each municipality). Their geographical location is available on the local GIS portal (<http://geokatalog.buergernetz.bz.it/>), which was used as a main source for this analysis. The availability and accessibility of hiking trails by means of transport other than the private car is of great value to South Tyrolean guests, because it encourages less emissions on site and a better aesthetic landscape value in proximity of the departure points, due to less parking. It was therefore deemed important to assess the degree of accessibility of hiking trails and to monitor the sustainable transport available to guests. The degree of accessibility was calculated thanks to the collaboration of UNWTO, ESRI Spain, and local hiking associations (AVS and CAI), whose major contributions should be acknowledged here. The analysis was performed by means of GIS calculations, and results were cross-checked to be consistent with the real-life situation.

Figure 38 plots all the primary hiking trails of South Tyrol (i.e. low-level trails intersecting with urban areas or roads) and colors them according to their degree of accessibility via public transportation (i.e. bus or train). “Primary” trails were considered for this analysis, since they are the only ones with the potential to be accessible by public transport. All other trails are either reachable via cable cars or by hiking on primary trails and were excluded from this analysis. Primary trails represent two thirds of all trails in South Tyrol and over 40% of them are reachable within a 10-minute walking-distance from the closest bus stop or train station. Over 60% can be reached within a 20-minute walk and only 38% require more than 20 minutes. Of course, by only measuring the walking distance to the closest bus stop it is not possible to evaluate how widespread and how frequent the transport connection is, an aspect that might be relevant for hikers. Future research might assess this aspect, although it would require a huge effort in collecting data on the mobility patterns of hikers and the integrated transport system on site.



11 Land use and landscape diversity

Monitoring a destination's land use needs to take the natural environment, the urban areas and the current infrastructures into consideration. Both the natural environment and the built-up areas are shaped by tourism and by other activities simultaneously, and in turn they also actively constitute a bounding framework for economic activities performable on site. On the one hand, the infrastructure expansion for leisure activities cannot be directly ascribed to the tourism sector only, as it also serves the local population. On the other hand, the impact of tourism on landscape diversity might be less relevant than that of traditional industries and intensive agriculture. In sum, the effects of human activities on land use and landscape diversity are multifold, and do not relate to tourism only. Keeping this cross-sectoral relationship in mind, the assessment of landscape diversity and land use is relevant, since landscape diversity and the structural richness of landscapes are positively related to the scenic beauty of Alpine landscapes, whereas large homogeneous areas decrease the perceived level of scenic beauty (Schirpke, Tasser, Tappeiner, 2013). Landscape diversity and a balanced and varied landscape use – measured through the Shannon's Evenness Index – work as proxies for the scenic beauty of South Tyrol, and thereby its attractiveness for tourists. The development trend of building more accommodation facilities than any other buildings reflects the relative pressure of tourism on the urban environment. A further interesting topic that this issue area might embrace thanks to a think tank yet to be established, is a reflection on environmental and social impacts of the process of Airbnb-fication and its linked socio-spatial inequalities.

11.1 NUMBER OF HOTELS AND SIMILAR ESTABLISHMENTS OVER TOTAL NUMBER OF BUILDINGS

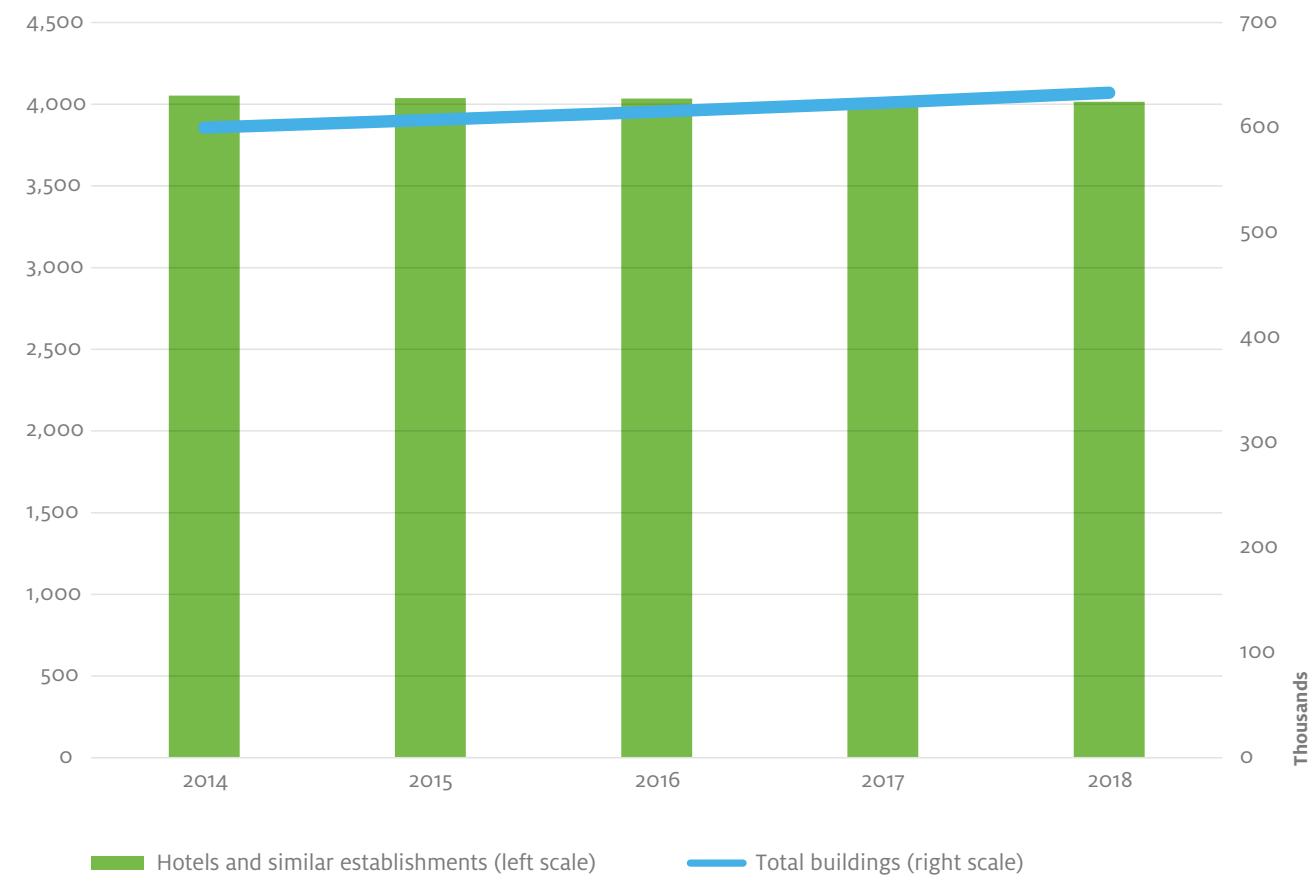


Figure 40: Number of hotels and similar establishments compared to the total number of buildings, South Tyrol 2014-2018. Source: Ripartizione provinciale Libro fondiario, Catasto fondiario e urbano, elaboration by ASTAT and Eurac Research.

As stated at the beginning of this report, the absolute number of hotels and similar accommodation facilities has slightly decreased over time (-0.9% between 2014 and 2018), a trend visible in **Figure 40** and opposite to the trend of all other buildings (including private houses, industries, commercial activities, and transport infrastructure, which registered a +5.6% in the same time span). Thereby the percentage of total buildings that are accommodation facilities has changed from 0.7% to 0.6% for the whole provincial territory. Similar to the

data in indicator 5.1 on tourism intensity, there might be relevant differences among municipalities, with high touristic areas having much higher rates. For instance, the tourism-intense municipalities of Corvara/Corvara in Badia, Wolkenstein/Selva di Val Gardena, Schenna/Scena and Dorf Tirol/Tirol show a much higher impact of the hotel industry on the built environment (respectively, 3.8% for both Schenna/Scena and Corvara/Corvara in Badia, 3.7% for Dorf Tirol/Tirol and 3.4% for Wolkenstein/Selva di Val Gardena).

11.2 SHANNON'S EVENNESS INDEX

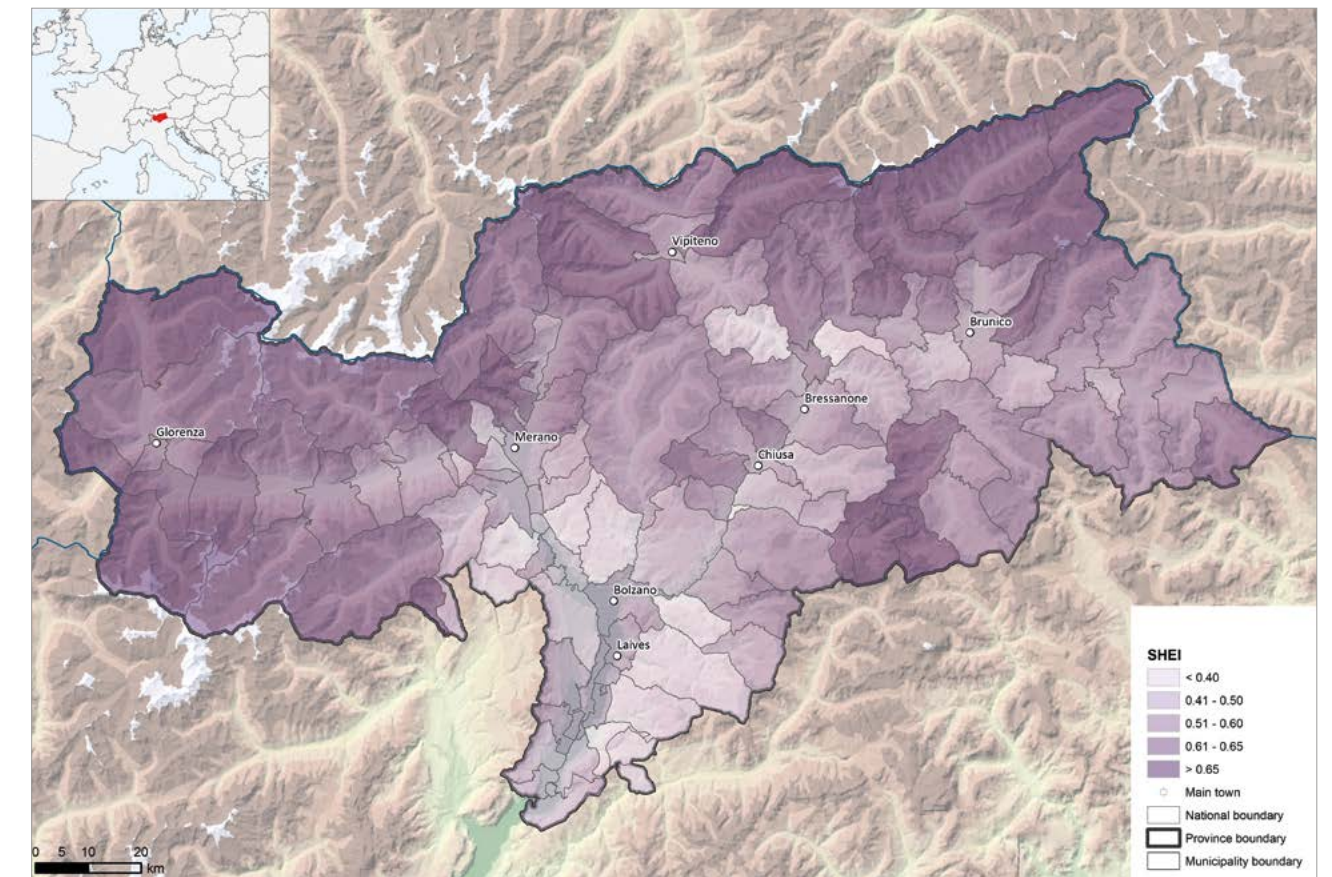


Figure 41: Map of the Shannon's Evenness Index, South Tyrol 2000-2012. Source: Eurac Institute for Alpine Environment, own elaboration.

The Shannon's Evenness Index (SHEI) is a measure of landscape diversity that "provides information on area composition and richness. It covers the number of different land cover types (m) observed along the straight line and their relative abundances (Pi)" (Eurostat, 2018). Since the indicator varies from 0 (low landscape diversity) to 1 (high landscape diversity), the areas of the map in a darker color should be interpreted as those with a co-existence of multiple land uses, whereas those with light colors show the opposite. The map seems to highlight that the north-eastern part of the province is

has a higher richness and diversity of landscapes, while the southern part – strictly bounded to wineries and other intensive agricultural practices – is more homogeneous, and thereby less attractive. The Dolomites UNESCO WHS (see **Figure 42**, area in yellow) are one of the most attractive destinations for tourism in South Tyrol, and they are in areas with a medium-high SHEI index. In further research, the SHEI might be correlated with tourism intensity in order to verify if a positive correlation exists between scenic beauty and tourist activities.



12



12 Nature conservation

Nature-based tourism in destinations such as South Tyrol is heavily reliant on recreational opportunities provided by the environment and, in turn, also contributes to the attractiveness and quality of destinations (see also Scuttari, Isetti, Habicher, 2019). In this context, tourism, depending on the intensity, concentration and behavior of visitors on site, can either endanger the environment or constitute an impulse for positive change. In fact, being based on an enjoyment of the natural and cultural environment, tourism can be a driver for nature protection, can play a positive role in awareness raising and consumer education through its vast distribution channels, and can provide an economic incentive to protect habitat that might otherwise be converted to less environmentally friendly land use (UNWTO, 2004). On the other hand, it might also work as a source of stress to certain fragile environments. In order to link tourism and nature conservation and identify those areas where a balance between conservation and enhancement is pursued, we decided to monitor the extent to which natural areas are protected.

As already stated in Section 11 for land use and landscape diversity, the effects of human activities on nature conservation are multifold and, among these activities, it is not always easy to define the weight of tourism. Nevertheless, it is useful for the purpose of this study, to measure at least the overall impact of human activities on nature by the hemeroby index, assessing the human activity impact on the ecosystem (Indicator 12.2).

Within this specific issue area, a think tank could revolve around the topic of biodiversity and, qualitatively, around the concept of beauty of the landscape, as it is perceived by visitors, but also by the local population.

12.1 NATURAL PARKS AND PROTECTED AREAS

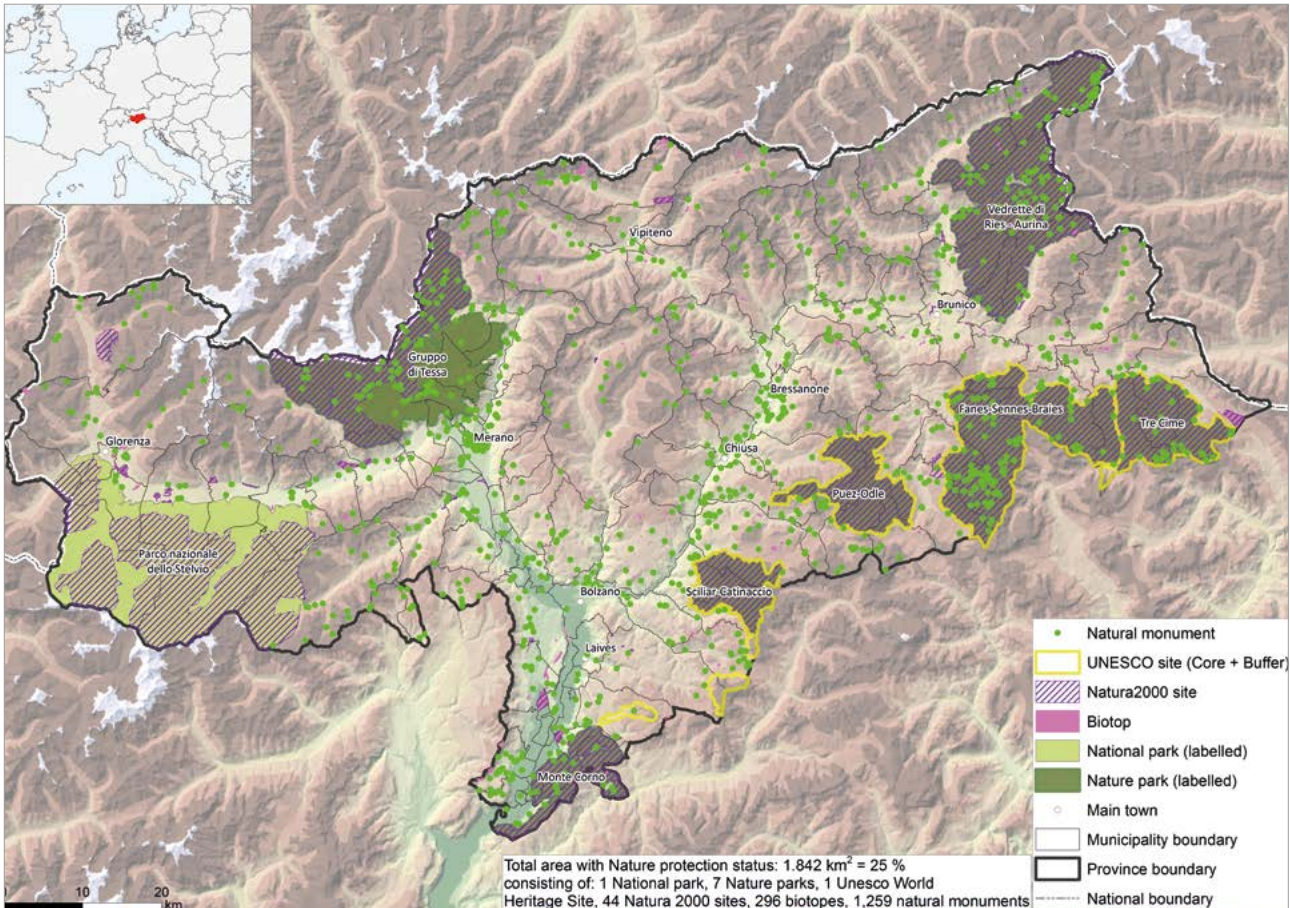


Figure 42: Natural parks and protected areas by park typology, South Tyrol 2018.
Source: Eurac Institute for Earth Observation.

One fourth of the South Tyrolean surface (25%) is under natural protection status. Among the different protection schemes are one national park, seven natural parks, 296 biotopes, 44 Natura2000 Sites, 1,259 natural monuments and the Dolomites UNESCO WHS, whose surface overlaps those of already-existing protected areas. The amount and composition of the protected surface has been relatively stable over the last decade, with some small exceptions regarding four Natura2000 Sites being

added to the list (Provincial Office for Natural Parks, data available on demand). These protected areas represent an attraction for visitors and South Tyrol increasingly faces the challenge of managing traffic on mountain passes, e.g. the Stelvio or Sella Pass. The paradox of preserving protected areas and enabling their enhancement through tourism might only be solved with tailored and well accepted solutions that require time and effort to be introduced (Scuttari, Isetti, Habicher, 2019).

12.2 HEMEROBY (HUMAN ACTIVITY IMPACT ON THE ECOSYSTEM)

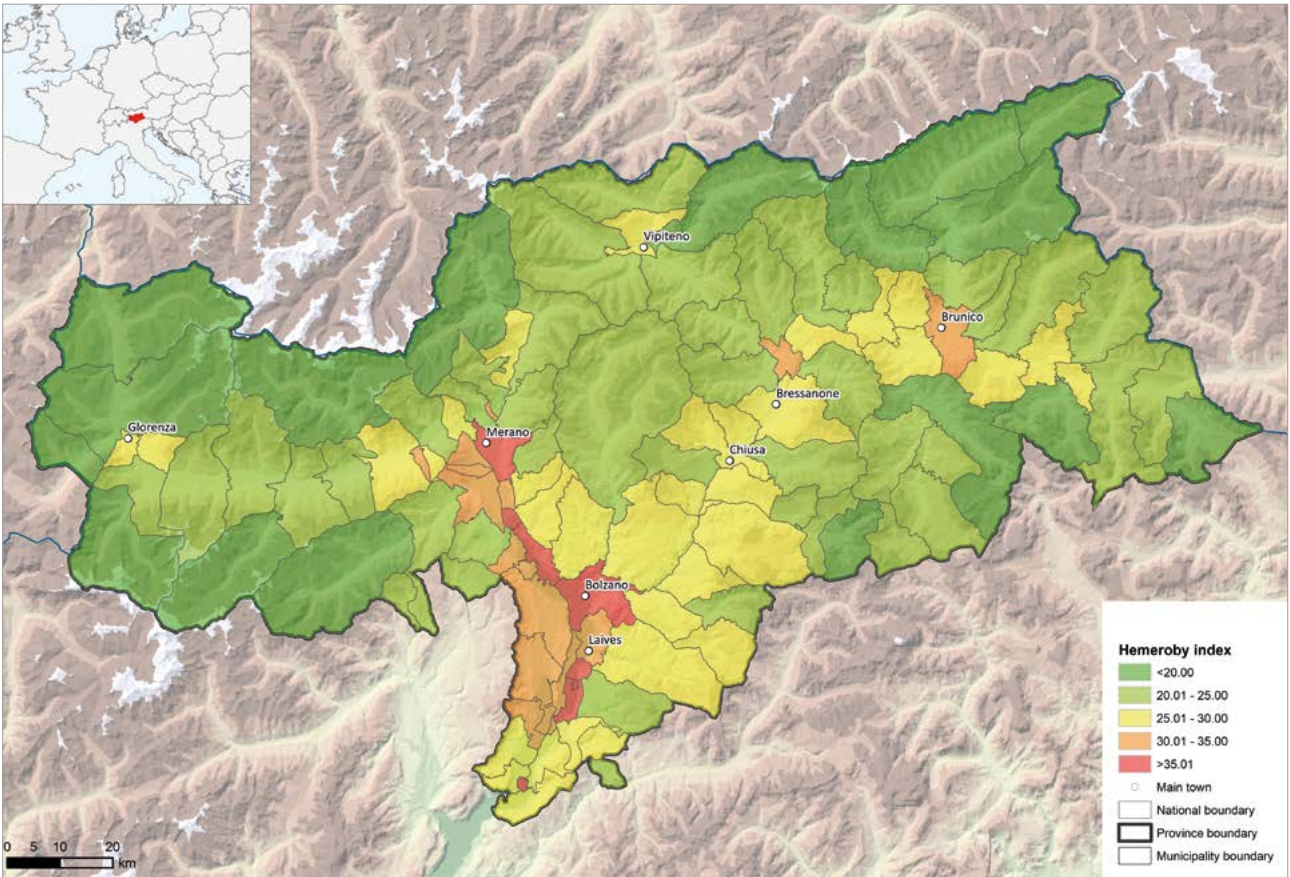


Figure 43: Municipalities by hemeroby values, South Tyrol 2000-2012.
Source: Eurac Institute for Alpine Environment.

The hemeroby index measures the hemerobiotic state of an area: the magnitude of the deviation from the potential natural vegetation caused by human activities. The degree of hemeroby increases with the increase of the human influence and decreases with the increase of naturalness. It should be noted here that the human influence measured is not directly linkable to tourism, since tourism-intense areas are not necessarily those with higher levels of hemeroby. Similar to the SHEI (see

indicator 11.2), the indicator should rather be interpreted as a proxy of attractiveness to tourists, since naturalness was shown to be a driver of scenic beauty (Schirpke et al., 2013). Reflecting the picture of SHEI, the hemeroby index also shows a difference between the core area of South Tyrol, where the valleys allow a higher anthropization, and the remote areas close to the northern borders, where the Alpine landscape is more natural and less touched by human interventions.



Conclusions and outlook

This report describes the first attempt to measure known aspects of sustainable tourism and uncover new concerns for a balanced touristic development in the South Tyrol region. The definition of sustainable tourism in this report refers to the ability to shape a regional-specific harmony that embraces development needs and the imperative of minimizing negative impacts. Both needs and impacts were assessed in this report, and major equality and environmental concerns were reported in their magnitude and development path. The flexibility of the INSTO instrument enabled the exploration of this delicate balance with reference to place-specific problematic issues, such as water and energy use for snowmaking, sustainable transport in rural areas, and the need to preserve the fragile Alpine landscape. Further, the classification of indicators according to the DPSIR model allowed the highlighting of the relationship of each monitored variable with the overall goal of increasing sustainability. Indirectly, the interpretation of data also showed how difficult it is to isolate tourism from other sectors, and how much sustainability might interact with growth dynamics and changing societal structures above the regional dimension.

The 29 indicators showed a clear development path for South Tyrol, along which accommodation quality than quantity, voluntary environmental certification schemes are promoted and increasingly welcomed, sustainable transport is supported both from the public and the private sector, and land use is carefully managed to preserve the landscape quality. These might be

farsighted reactions to an increased tourism pressure and resource use, as reported in this document, but they might also be reactions to market requirements, given the quality increases in accommodation structures and the spread of sustainability awareness over the most important tourism market for South Tyrol: Germany. If a “well-designed and managed tourism can make a significant contribution to the three dimensions of sustainable development” (United Nations, 2012, p. 25), then the effort of this report is to provide solid evidence to implement future policies.

Some knowledge gaps have emerged from this first annual report. Some topics deserve a deeper analysis in the following years and the introduction of further indicators to have a clearer and more complete overview of the single issue areas, such as energy, water and waste management, and the correlation between landscape quality and tourism. Within the topic of energy consumption, a more detailed analysis on greenhouses emissions by accommodation facilities (e.g. heating systems, etc.) by collecting specific primary data, is needed.

Next research steps will furthermore include a closer comparison of South Tyrolean touristic and non-touristic municipalities, to assess their differences in economic and societal structures. A specific analysis on those touristic municipalities hosting overcrowded hot-spots will help to understand critical and place-specific issues and support problem-solving processes towards more sustainable futures. Lastly, STOST will explore the possibility to leverage on big data to better analyze and comprehend tourist behavior in time and space.

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Annex 1: Data management workflow and participatory design

WORKFLOW AND TECHNICAL ASPECTS

This report contains a wide range of indicators on different subjects related to tourism. The indicators themselves are based on an even wider set of data that have been collected from different sources, i.e. we collected data from different statistical offices (ASTAT, ISTAT), the chamber of commerce (WIFO), the labor market office of South Tyrol (AMB), various sector associations as well as from private firms. Thereby, the collected data surpasses the amount that one can handle efficiently without a data managing plan. In order to handle the amount to data efficiently, we laid out the following workflow: First, we collect data from various data providers. As incoming data is transmitted to us in different data forms (xlsx, csv, RData, json, pdf) with varying data structures, in a second step, we use the statistical software R to pre-process the data. As most data can be represented in a timeseries format, we chose to transform the available data into R time series objects. Third, after transforming the data into R time series objects, we store the timeseries in PostgreSQL database. Particularly, we set up a time series database according to the R package timeseriesdb (Bannert, 2015). The basic idea behind the timeseriesdb package is a storage concept that uses the PostgreSQL extension hstore to store time series in a key-value-pair. Thereby, timeseriesdb maps R time series objects into their PostgreSQL counterparts for permanent storage. The package timeseriesdb also allows us to store meta information in several languages and associate it with the same series. Finally, we use the stored timeseries to compute the indicators used in this report. In order to ensure reproducibility of all results, all scripts used to transform the data and compute the indicators are managed within a GitLab environment. In cases of seasonal adjusted data, we seasonally adjust data using X-13Arima-SEATS library provided by the US Census Bureau. Specifically, we use the R package seasonal that provides a powerful interface between R and X-13ARIMA-SEATS (see Sax and Eddelbuettel, 2008). We use TRAMO-SEATS as the default procedure.

ORGANIZATIONS PARTICIPATING IN THE WORKING GROUP WORKSHOPS

During the development of STOST, many organizations participated in the Observatory's Working Group Workshops or joined bilateral meeting to share their knowledge and provide their data. Among them are: IDM, Eurac Research institutes other than the Center for Advanced Studies, ASTAT (Provincial Institute of Statistics), KlimaHaus Agency, Provincial Mobility Department, Provincial Department of Nature, Landscape and Spatial Planning, WIFO (Chamber of Commerce), HGV (South Tyrolean Hotels and Restaurants Association), VPS (South Tyrolean Non-commercial Accommodation Providers Association), SBB (South Tyrolean Farmers' Association), Free University of Bolzano, LTS (South Tyrolean Tourism Organizations Association), VCS (South Tyrolean Campsite Operators Association), AVS and CAI (associations of mountain huts/shelters), HDS (South Tyrolean Trades and Services Association), LVH (South Tyrolean Crafts and Services Association), Provincial Forestry Department, Provincial Nature Parks Office, Provincial Landscape Ecology Office, BikeHotels Consortium, South Tyrolean Umbrella Organization for Nature and Environment Protection (Dachverband für Natur- und Umweltschutz), Terra Institute, Provincial Environment Agency, Labor Market Monitoring Office, Alpine Convention, Technical School for Hospitality and Food Industry (Brixen-Bressanone).

Annex 2: Technical notes on indicators

1. TOURISM SEASONALITY

1.1 Tourist arrivals by month and market

“Tourist arrivals by market” stands for the absolute number of tourists arrived in South Tyrol, distinguished by market of origin. Data, provided by ASTAT, are available on a monthly basis. In order to summarize this vast amount of information, we decided to calculate monthly average absolute values for each available market of origin over the time span 2008-2018 in the following way:

$$Arrivals_m = \frac{1}{T - t + 1} \sum_{y=t}^T arrivals_{m,y}$$

Equation 1: Monthly average arrivals

Where T=last available year (2018), t= first available year (2008), m= month, y= year. Values can range from 0 to infinity.

1.2 % of annual tourist arrivals occurring in peak months by municipality

“Percentage of annual tourist arrivals occurring in peak months by municipality” stands for the number of tourists arrived in South Tyrolean municipalities within specific months, expressed as a percentage of annual arrivals. Data, provided by ASTAT, were available on a daily basis. In order to retrieve monthly average percentage values, we used the following procedure:

1. We calculate monthly relative arrivals

$$Rel.Arrivals_{y,m,i} = \frac{Arrivals_{m,y,i}}{\sum_{m=1}^{12} Arrivals_{m,y,i}}$$

Equation 2: Monthly relative arrivals

2. We calculate monthly average

$$Rel.Arrivals_{m,i} = \frac{1}{T - t + 1} \sum_{y=t}^T Rel.Arrivals_{y,m,i}$$

Equation 3: Monthly average arrivals (with relative values)

Where T=last available year (2018), t= first available year (2008), d= month, y= year and i represents a municipality. The graph in the report shows the ten municipalities registering the highest values. That is, those municipalities with the concentration of tourist arrivals in a specific month. Values can range from a minimum of 0% (no tourist arriving in one month) to a maximum of 100% (all the annual tourists arrive in the one month only).

1.3 % of annual tourist arrivals occurring in peak weeks by municipality

“Percentage of annual tourist arrivals occurring in peak weeks by municipality” stands for the number of tourists arrived in South Tyrolean municipalities within specific weeks, expressed as a percentage of annual arrivals. Data, provided by ASTAT, were available on a daily basis. In order to retrieve weekly average percentage values, we used the following procedure:

1. We calculate weekly relative arrivals

$$Rel.Arrivals_{w,y,i} = \frac{Arrivals_{w,y,i}}{\sum_{m=1}^{53} Arrivals_{w,y,i}}$$

Equation 4: Weekly relative arrivals

2. We calculate the average for each week

$$Rel.Arrivals_{w,i} = \frac{1}{T - t + 1} \sum_{y=t}^T Rel.Arrivals_{w,y,i}$$

Equation 5: Weekly average arrivals (with relative values)

Where T is the last available year, i.e. the year 2018, t is the first available year (2008), w represents the week, y represents a specific year and i represents a municipality. The graph included in report shows the ten municipalities with the highest values. That is, it displays those municipalities with the highest concentration of yearly tourists during one specific week. Values can range from a minimum of 0% (no tourist arriving in a week) to a maximum of 100% (all the annual tourists arrive during one week).

BOX 2: Easter effect on overnight stays

The box “Easter effect on overnight stays” shows how the absolute number of overnight stays in South Tyrol changes because of Easter. ASTAT provided overnight stays on a daily basis. In order to show the Easter effect, daily absolute values were retrieved in the following way:

- a) Identification of the Easter day during the time span from 2008 to 2018;
- B) Retrieval of daily absolute values (from 14 days before to 14 days after Easter) per year. Values can range from 0 to infinity.

2. EMPLOYMENT

2.2 % of employees in the accommodation and food service sector

“Percentage of employees in the accommodation and food service sector” stands for the number of employees working in the accommodation and food service sector in South Tyrol, expressed as a percentage of total employment. Data, provided by AMB, were available on a monthly basis and were distinguished by ATECO sector (classification of economic activity provided by the Italian National Institute of Statistics – ISTAT). For the sector “Accommodation and Food Service Activities”, which was the focus of our analysis, data have been further distinguished between the two sublevels, namely “Accommodation” and “Food service activities”. The indicator was determined in the following way:

Employees in the accommodation and food service sector (%)

=
$$\frac{\text{Accommodation sector employees}_m + \text{Food service sector employees}_m}{\text{All sectors employees}_m} * 100$$

Equation 6: Employees in the accommodation and food service sector proportion calculation

Where *m*= month.

It should be noted that these data report only employees, i.e. they exclude the self-employed. Moreover, we decided to calculate this indicator using data regarding employees working in South Tyrol, i.e. they may not necessarily live in South Tyrol. Values can range from a minimum of 0% (no employees working in the accommodation or food service sector) to a maximum of 100% (all the employees working in the accommodation or food service sector).

2.2 % of female enterprises in the accommodation and food service sector
“Percentage of female enterprises in the accommodation and food service sector” stands for the number of female enterprises active in the tourism sector in South Tyrol, expressed as a percentage of total enterprises active in the same sector. Data, provided by WIFO, were available on a yearly basis and were extracted by Infocamere, the database of Unioncamere. The indicator reports only the number of active enterprises. The indicator was determined in the following way:

female enterprises in the accommodation and food service sector_t (%)

=
$$\frac{\text{female enterprises in the accommodation and food service sector}_t}{\text{Total enterprises in the accommodation and food service sector}_t} * 100$$

Where t= year.

Unioncamere (the public entity representing the system of the Italian Chambers of Commerce), defines an enterprise as owned by a woman if different conditions are met, depending on the types of enterprises¹ . More specifically:

- For the Italian “società di capitali” (which could be classified as limited liability companies): female shareholders should be more than 50% of the shareholders;
- For “società di persone” (partnerships): female partners should be more than 50% of the partners;
- For “ditte individuali” (sole practitioners): the entrepreneur should be a woman;
- For other types of enterprises: more than 50% of the administrators should be women.

It should be noted that the remaining enterprises should not be necessarily classified as owned by men, as they could be controlled by an equal share of men and women or by legal persons. Values can range from a minimum of 0% (no female enterprises in the tourism sector) to 100% (all the enterprises in the tourism sector are female enterprises).

2.3 Tourism employees by citizenship
“Tourism employees by citizenship” stands for the number of employees working in the accommodation and food service sector in South Tyrol, distinguished by citizenship. The graph presented in the report shows this number expressed in percentage values over

¹ <http://www.imprenditoriafemminile.camcom.it/P42A0C0S806/Osservatorio-imprend%20%20itoria-femminile.htm>

total employment within the tourism sector only. Data, provided by AMB, were available on a monthly basis and were distinguished by ATECO sector (classification of economic activity provided by the National Institute of Statistics – ISTAT). For the sake of coherence with the other indicators, the tourism sector refers to the ATECO sector “Accommodation and Food Service Activities”.
It should be noted that these data report only employees, i.e. they exclude the self-employed. Moreover, we decided to calculate this indicator using data regarding employees working in South Tyrol, i.e. they may not necessarily live in South Tyrol. Values can range from a minimum of 0% (no employees with a specific citizenship working in the accommodation or food service sector) to a maximum of 100% (all the employees working in the accommodation or food service sector have a specific citizenship).

3. ECONOMIC BENEFITS AT THE DESTINATION LEVEL

3.1 Value added by industry
“Value added by industry” stands for the value of output minus the value of intermediate costs. When expressed by economic sector, it allows the growth of the economic system to be measured in terms of new goods and services available for final use. Data, provided by ISTAT, were available on a yearly basis and were distinguished by NACE Rev.2 sector (statistical classification of economic activities provided by Eurostat). Data are expressed in current prices and refer to South Tyrol. For the sake of coherence with the other indicators, the tourism sector refers to the NACE Rev.2 sector “Accommodation and Food Service Activities”. The graph presented in the report shows the value added of all industries expressed in percentage values over the total. Values can range from a minimum of 0% (the sector does not add any value to the economic system), to 100% (the sector alone adds all the value to the economic system).

3.2 Profit situation for the accommodation and food service sector (business climate index)
“Profit situation for the accommodation and food service sector (business climate index)” displays the perceived profit situation of South Tyrolean firms working in the accommodation and food service sector. The underlying data is collected and provided by WIFO on a yearly basis.
At the beginning of each year, WIFO conducts business tendency surveys among a large panel of private firms. These qualitative surveys are designed to receive timely data on economic development. Among other questions, the questionnaire asks firms to assess their profit situation of the previous year. Thereby, firms can assess their profit situation as good, satisfactory, or bad. In addition, firms are asked to express their expectations about the current year’s profit situation. Thereby, firms can state that the profit situation will increase, remain unchanged or decrease. WIFO provided us with the timeseries on each item for both questions. That is, we received the share of firms that ticked one specific item, i.e. the share of firms that stated that their profit situation will decrease, the share of firms that stated that their profit situation will remain unchanged as well as the share of firms that reported that their profit situation will increase. Using this information, we calculated the balance statistic between the possible answers (good, satisfactory, and bad) for each year. In this way, we get an estimate of the average assessment of the past profit situation as well as an estimate of the average expected business situation. Following CESifo Munich ², we use these resulting timeseries to calculate the business climate index (Geschäftsklima) which corresponds to the geometric mean of the two series. Specifically, the business climate is calculated as follows:

² <http://www.ces-munich.de/ifoHome/facts/Survey-Results/Business-Climate/Calculating-the-Ifo-Business-Climate.html>

$$Business\ climate_t = \sqrt{(Past\ assessment_{t-1} + 200)(Expectations_t + 200)} - 200$$

Equation 7: Business climate calculation

Where *Business climate_t* =business climate at time t, *Past assessment_{t-1}* = assessment of the profit situation of the past year, *Expectations_t* = expectations for the current year, *t*= time.

The business climate, as calculated in Equation 7, was then indexed, choosing t=2015 as reference year:

$$Business\ climate\ index_t = \frac{Business\ climate_t + 200}{Business\ climate_{2015} + 200} * 100$$

Equation 8: Business climate index calculation

Values can vary around 100, where a value of 100 indicates that the perceived business climate equals that of the reference year (2015). Values smaller (or bigger) than 100 indicate a worse (or better) perceived business climate than 2015.

3.3 - Gross occupancy rates of bed places

“Gross occupancy rates of bed places” indicates the extent to which available beds within accommodation facilities are occupied by tourists within a specific period in South Tyrol. The indicator can be interpreted as a capacity utilization indicator. Data, provided by ASTAT, were available on a yearly basis and were distinguished by type of accommodation (hotels and similar establishments, other accommodation services or total values). According to ISTAT (2008), the gross occupancy rate of bed places is calculated as follows:

$$Gross\ occupancy\ rate\ of\ bed\ places = \frac{overnight\ stays}{365 * bed\ places}$$

Equation 9: Gross occupancy rates of bed places calculation

Where *t*= year.

The number of days (365) does not take into account the days in which accommodation facilities are inactive, i.e. seasonal or temporary closures are not considered here. As data are expressed in percentage, values can range from a minimum of 0% (empty accommodation facilities) to a maximum of 100% (fully booked accommodation facilities).

4. GOVERNANCE

4.1 Number of municipalities, accommodation facilities and events involved in voluntary certification schemes for sustainability

“Number of municipalities, accommodation facilities and events involved in voluntary certification schemes for sustainability” aims at measuring the number of voluntary schemes adopted throughout South Tyrol to increase tourism sustainability. Data were provided by Casa Clima, ISPRA, Biohotel, Alpine Pearls and APPA. Given that not every data provider could make data available on a yearly basis, the status quo (2019 or 2018 in the case of Green Events) is shown, in order to start monitoring their evolution over time from the next year onwards. Values can range from 0 to infinity.

4.2 Number of “Red Rooster” branded agritourism ventures producing and selling regional products

“Number of Red Rooster branded agritourism ventures producing and selling regional products” aims at measuring the number of agritourism ventures offering certified regional products. Data, provided by Red Rooster, were available on a yearly basis. It should be noted that an agritourism venture could produce more than one type of products, therefore each time series shows how many agritourism venture produce a specific type of regional product. Values can range from 0 to infinity.

4.3 Organic milk sold to members of the main local buying syndicate

“Organic milk sold to members of the main local buying syndicate” aims at measuring the number of organic milk sales in South Tyrol, expressed as a percentage of total sold milk. Data, provided by Hogast, the major purchasing organization of the hotel and food service sector in South Tyrol, were available on a yearly basis. The indicator has been calculated as follows:

$$organic\ milk\ sales_t\ (%) = \frac{Organic\ milk\ sold_t}{Total\ milk\ sold_t} * 100$$

Equation 10: Organic milk sales calculation

Where *t*= year.

It should be noted that organic milk sold by an organization different from Hogast is not recorded here. Values can range from a minimum of 0% (only non-organic milk is sold) to a maximum of 100% (only organic milk is sold).

5. LOCAL AND VISITOR SATISFACTION

5.1 Tourism intensity index

Tourism intensity aims at measuring the ratio between tourists and resident population. As such, it can be measured in different ways, e.g. with arrivals or overnight stays. Following ASTAT (2015a), we decided to adopt the following definition: “tourism intensity index” stands for the ratio between overnight stays in accommodation establishments within a specific area and the product between the population residing in the same area and the days of the period analyzed. Given that data on the resident population, provided by ASTAT, were available only on a yearly basis (and it can reasonably be assumed that the number of inhabitants remains stable throughout one year), we chose to use the year as reference period.

$$Tourism\ intensity\ index = \frac{Annual\ overnight\ stays / 365}{Total\ resident\ population} * 100$$

Equation 11: Tourism intensity index calculation

Where *t*= year.

Values can range from a minimum of 0% (every 100 inhabitants, 0 tourist overnight stays within a year) to a maximum of 100% (every 100 inhabitants, 100 tourist overnight stays within a year), but the index can potentially take on values higher than 100%, given that there is no limit to the number of overnight stays with respect to the number of inhabitants.

5.2 Prices of rents in the destination

“Prices of rents in the destination” stands for the prices of rents in the central areas of selected South Tyrolean municipalities, as recorded by the real estate registry (Agenzia del Territorio). Data, elaborated by ASTAT, were available on a yearly basis and were distinguished by central and peripheral areas of each municipality. To summarize this vast amount of information, we decided to compare the evolution of rent prices between touristic and non-touristic municipalities. These were selected according to the standard used by ASTAT for monitoring prices of goods and services (see BOX 3), that refers to tourism intensity index (ASTAT, 2019b). Accordingly, Welschnofen/ Nova Levante, Dorf Tirol/ Tirol, Mühlbach/ Rio di Pusteria and Abtei/ Badia represent the touristic municipalities, while Neumarkt/ Egna, Schlanders/ Silandro, Sterzing/ Vipiteno and Sand in Taufers/ Campo Tures represent the non-touristic ones. We calculated average values of prices for each municipality group and available year. Values are expressed in Euros and can range from 0 to infinity.

BOX 3: Inflation effects on prices of goods and services in touristic municipalities

The figure presented in the box “inflation effects on prices of goods and services in touristic municipalities” shows the average price of beer and onions in touristic and non-touristic municipalities. We followed ASTAT (2019) to select touristic and non-touristic municipalities. We display the average prices for each product over time. We then performed a comparison between the prices of selected goods with potentially high or low relevance for tourists across time and municipality type (touristic vs. non touristic). That is, we estimated the effect of tourism intensity on prices using the following panel regression.

Price_{i,j,t} = \alpha + \beta Intensity_{j,t} + \gamma_i + \delta_j + \theta_t ,

Equation 12: Panel regression estimation

where $Price_{i,j,t}$ represents the price of product i in municipality j at time t . The variable $Intensity_{i,j,t}$ represents the tourism intensity of municipality j at time t . $\alpha, \gamma_i, \delta_j$ and θ_t represent the constant as well as product, municipality and time fixed effects. The sample provided by ASTAT consists of quarterly data from 2008Q1 to 2018Q4. Overall, we observe price data for 52 products in 16 municipalities in South Tyrol. As not all products are observed all the time, we estimate the same model once using a balanced sample and once using an unbalanced sample. The point estimates between the two versions are very similar. Using the balanced sample, we obtain slightly more precise coefficient estimates. Additionally, for both the balanced and the unbalanced sample, we estimate four different versions of the model, including different fixed effects. Model (1) and (5) include product, municipality, and time fixed effects. Model (2) and (6) include product and municipality fixed effects. Model (3) and Model (7) include product and municipality fixed effects and Model (4) and Model (8) include only product fixed effects. The model is estimated using least squared. We cluster standard errors on a product- municipality level when using the balanced sample and report heteroscedasticity robust standard errors when using the unbalanced sample. Table 3 reports the estimation results. In all versions, the coefficient β is estimated to be positive, suggesting a positive correlation between tourism intensity and product prices. In many cases the coefficient is statistically significant at conventional significant levels. An increase of tourism intensity by one percentage point increases prices between 0.2 and 3 Euro cent.

Table 3: Regression Table showing the correlation between product prices and tourism intensity. Estimation is based on quarterly municipality data from 2008Q1 to 2018Q4. Clustered standard errors are reported for the balanced sample. For the unbalanced sample, we report robust standard errors.

DEPENDENT VARIABLE: PRICE IN EUR								
	BALANCED SAMPLE				UNBALANCED SAMPLE			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intensity	0.002** (0.001)	0.031*** (0.009)	0.005** (0.002)	0.029*** (0.008)	0.001 (0.003)	0.031*** (0.002)	0.003 (0.003)	0.029*** (0.002)
Constant	1.898*** (0.065)	1.596*** (0.107)	2.207*** (0.011)	1.935*** (0.017)	0.281*** (0.042)	-0.069** (0.034)	0.718*** (0.025)	0.390*** (0.006)
Product FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipality FE	Yes	No	Yes	No	Yes	No	Yes	No
Time FE	Yes	Yes	No	No	Yes	Yes	No	No
Observations	18,933	18,933	18,933	18,933	26,233	26,233	26,233	26,233
R²	0.981	0.980	0.979	0.978	0.981	0.980	0.980	0.979
Adjusted R²	0.981	0.980	0.979	0.978	0.981	0.980	0.980	0.979
Note:	*p<0.1; **p<0.05; ***p<0.01							
	We report double clustered standard errors (product & municipality level) for model (1) – (4)							
	We report robust standard errors for model (5) – (8)							

5.3 Tourist satisfaction with prices

“Tourist satisfaction with prices” stands for tourists’ evaluation of prices in South Tyrol. Data, collected by ASTAT and Eurac Research during the winter and summer season of 2004/2005 and 2012/2013 (ASTAT, 2015b), consist of survey data. This specific question was aimed at measuring the extent to which tourists were satisfied with prices of accommodation facilities and food services, using a 5-point Likert scale. For each possible answer (very satisfied/satisfied/neutral/dissatisfied/very dissatisfied), percentage values of respondents are reported, ranging from a minimum of 0% to a maximum of 100%.

6. ENERGY MANAGEMENT

6.1 Estimated minimum electricity consumption in accommodation facilities

“Estimated minimum electricity consumption in accommodation facilities” stands for an estimation of the minimum electricity consumption in all accommodation facilities (hotels and similar establishments and other accommodation services) using coefficients from existing literature (Bundesministerium für Wirtschaft, Familie und Jugend Wirtschaftskammer Österreich, Fachverband Hotellerie, Fachverband Gastronomie, Österreichische Hotelierversammlung, 2011). Coefficients for electric energy are different according to accommodation category and performance conditions of the facilities. We chose to use those expressed in units per overnight stay. Given that data provided by ASTAT on overnight stays were available on a monthly basis, the resulting indicator is on a monthly basis as well. Therefore, we estimated the minimum electricity consumption in accommodation facilities based on the following formula:

$$minimum\ monthly\ electric\ energy\ consumption = \sum_{i=1}^n o_i * \alpha_i$$

Equation 13: Minimum electric energy consumption calculation

Where i =type of accommodation categories, o =overnight stays, α =electric energy consumption coefficient under optimal performance conditions and t =month. We obtain data on monthly overnight stays by accommodation category (n=3) from ASTAT. The categories provided by ASTAT are comparable to the categories found in the guidelines provided by the Bundesministerium für Wirtschaft, Familie und Jugend Wirtschaftskammer Österreich et al. (2011). In this way, we can estimate the minimum electricity consumption. That is, the electricity consumption in the case that all accommodation facilities are energy efficient. Values are expressed in millions kWh and can range from 0 to infinity.

6.2 Electricity consumption by ski-lifts and snow cannons

“Electricity consumption by ski-lifts and snow cannons” stands for the amount of electric energy consumed by these two infrastructures. Data are provided by ASTAT on a yearly basis and are available only aggregated (consumption by ski-lifts cannot be distinguished by that of snow cannons). Values are expressed in MW/h and can range from 0 to infinity.

6.3 Charging stations offered for e-mobility in hotels and public spaces

“Charging stations offered for e-mobility in hotels and public spaces” aims at showing how many charging stations for e-mobility are available throughout South Tyrol and of which type. Stations can in fact be public or located in accommodation facilities. We obtain data from the Alperia and Tesla websites, that are the main providers for charging stations. Data can range from 0 to infinity and refer to the year of 2019 as we were not able to obtain earlier data. We will start monitoring the evolution over time from the next year onwards.

7. AND 8. WATER & WASTE WATER MANAGEMENT

7.1 Estimated minimum water consumption in accommodation facilities

“Estimated minimum energy consumption in accommodation facilities” stands for an estimation of the minimum water consumption in all accommodation facilities (hotels and similar establishments and other accommodation services) using coefficients from existing literature. The same calculation used for energy consumption was done using the water coefficients available in literature (Bundesministerium für Wirtschaft, Familie und Jugend Wirtschaftskammer Österreich, Fachverband Hotellerie, Fachverband Gastronomie, Österreichische Hoteliervereinigung, 2011). For the calculation formula, please refer to Equation 13. Values are expressed in million liters and can range from 0 to infinity.

7.2 Water use by snow guns

“Water use by snow guns” stands for the quantity of water used by snow guns throughout South Tyrol. Data, provided by APPA, were available on a yearly basis, referring to the winter season only. Values are expressed in million cubic meters and range from 0 to infinity.

8.1 Discharge of sewage water due to tourism

“Discharge of sewage water due to tourism” stands for the proportion of sewage water attributable to tourism when compared to other users. Data are provided by APPA on a

yearly basis. The calculation done by APPA is based on the population equivalents for tourism, which is calculated according to hydraulic engineering standards, in conformity with local legislation (Decreto del Presidente della Provincia 21 gennaio 2008, n. 6, Disciplina degli scarichi di acque reflue, Allegato A³). For accommodation facilities the population equivalent is based on the number of beds (1 or 2 population equivalent per bed, depending on the accommodation category). This calculation is used to estimate the maximum capacity of waste water treatment plants, rather than their actual use. That is, APPA uses the calculation estimate the maximum capacity a plant must be able to handle. Values can range from a minimum of 0% (the discharge of sewage water is not attributable to tourists at all), to a maximum of 100% (the discharge of sewage water is entirely attributable to tourists).

9. SOLID WASTE MANAGEMENT

9.1 Estimated waste production in accommodation facilities

“Estimated waste production in all accommodation facilities” stands for an estimation of the average waste production in accommodation facilities using coefficients from existing literature (Hamele & Eckardt, 2006). The average weight of waste per overnight stay according to Hamele & Eckardt (2006) amounts to 1.98 kg per overnight stay. This coefficient was retrieved by an analysis of 36 hotels in the 2 to 4-star categories in Germany and Austria. We decided to use this coefficient because of the similarities between South Tyrol, Germany, and Austria in terms of geographical characteristics, governance, target markets and seasonality. Given that data provided by ASTAT on overnight stays were available on a monthly basis, the resulting indicator is on a monthly basis as well. Therefore, we estimated the average waste production in accommodation facilities based on the following formula:

$$average\ waste\ production_t = o_t * 1.98kg$$

Equation 14: Average waste production calculation

Where o represents overnight stays and t indicates time. The output is therefore an estimate of the waste production in South Tyrol under the assumption that accommodation facilities are comparable with the sample used by Hamele & Eckardt (2006). Values are expressed in tons and can range from 0 to infinity.

10. MOBILITY

10.1 Mobilcards, bikemobil cards, museumobil cards and guest tickets

“Mobilcards, bikemobil cards, museumobil cards and guest tickets” stands for the number of tickets giving access to public transport that have been activated throughout South Tyrol and their use. Data, provided by the South Tyrolean agency responsible for public transport are available on a yearly basis and are distinguished by card type. Values can range from 0 to infinity.

³ Available here: http://lexbrowser.provinz.bz.it/doc/it/dpgp-2008-6/decreto_del_presidente_della_provincia_21_gennaio_2008_n_6.aspx?view=1

10.2 Number of ski-lift and cable car users by season

“Number of ski-lift and cable car users by season” stands for the number of users of either ski-lifts or cable car throughout South Tyrol, distinguished by season (winter and summer). Data, provided by ASTAT, were thus provided twice a year. Values are expressed in million users and can range from 0 to infinity.

10.3 Kilometers travelled using car sharing services by non-local users

“Kilometers travelled using car sharing services by non-local users” stands for the number of kilometers travelled using Car Sharing South Tyrol by non-local users. That is, by persons have their residence outside South Tyrol. Data are then distinguished by user type (Italian, German, Austrian, Swiss, Flinkster or other users). Car Sharing South Tyrol provides data on a daily level. We aggregate the daily data to annual data using summation. Values are expressed in kilometers and can range from 0 to infinity.

BOX 4: Trails accessibility by public transport: A study supported by ESRI Spain

The box “trails accessibility by public transport” shows the extent to which hiking trails are accessible by buses or trains, distinguished by walking distance (less than 10 minutes, between 10 and 20 minutes and more than 20 minutes). The calculation was done using ArcGIS in cooperation with UNWTO and ESRI Spain. Data on the location and number of trails, on the road system and on the location of bus and train stops were retrieved from the local web portal of geodata (http://geokatalog.buergernetz.bz.it). Trails whose accessibility has the potential to occur through public transport were assumed to be those intersecting with urbanized areas or intersecting with the road system. These were called primary trails and represent two thirds of the whole South Tyrolean network of trails. The classification of trails was performed using the select by location function of ArcGIS by intersecting spatial layers of urbanized areas, trails and the road system. In a second step, we calculated a series of buffer zones around each bus or train station using the service area function within a custom network, that spatially reflected 5, 10, 20 or 30 minutes walking distance. Finally, we examined whether the primary trails are intersecting with the buffer zones and assigned their corresponding degree of accessibility.

11. LAND USE AND LANDSCAPE DIVERSITY

11.1 Number of hotels and similar establishments over total number of buildings

“Number of hotels and similar establishments over total number of buildings” aims at showing the extent to which the number of hotels and similar establishments, in relation to the total number of buildings, changed over time in South Tyrol. Data on the number of buildings by building category are provided by the real estate registry (Ripartizione provinciale libro fondiario, catasto fondiario e urbano) and elaborated by ASTAT. Data is available on a yearly basis. We display data corresponding to the buildings labeled as “hotels and guesthouses” according to the real estate registry. Values (both the number of accommodation facilities and the total number of buildings) can range from 0 to infinity.

11.2 Shannon’s Evenness Index

The Shannon’s Evenness Index (SEI) provides information on area composition and richness. Data were provided by the Eurac Institute for Alpine Environment and refer to the time span 2000-2012. The indicator is calculated as follows:

$$SEI = \sum_{i=1}^n \frac{(P_i * \ln(P_i))}{\ln_m}$$

Equation 15: Shannon’s Evenness Index formula

Where m refers to the number of different land cover types and P_i refers to the relative abundance (of m). Values can range between 0 and 1, where 0 indicates a low landscape diversity and 1 a high landscape diversity.

12. NATURE CONSERVATION

12.1 Natural parks and protected areas

“Natural parks and protected areas” aims at monitoring the extent to which the South Tyrolean territory is under protection status, distinguished by protection status type (natural monument, UNESCO site, Natura2000 site, Biotope, national and nature park). Data were provided by the Eurac Institute for Earth Observation. Data displayed refer to the year 2018, since we were not able obtain older data. We will start monitoring the evolution over time starting next year.

12.2 Hemeroby (human activity impact on the ecosystem)

“Hemeroby” measures the magnitude of the deviation from the potential natural vegetation because of human activities. Data were provided by the Eurac Institute for Alpine Environment and refer to the time span 2000-2012. Hemeroby, or mean degree of naturalness (N), is calculated as follows:

$$N = 100 * \sum_{i=1}^n p_i * m_i$$

Equation 16: Mean degree of naturalness (hemeroby) formula

Where n= number of land use type, p_i= area proportion of land use type i on the total area of the reporting unit, and m_i= degree of naturalness (on a scale from 0 to 7, from more natural systems to more artificial systems). The higher the human influence on the ecosystem, the higher hemeroby values; the lower human influence, the lower the hemeroby values.

List of abbreviations

- AMB:** Amt für Arbeitsmarktbeobachtung [Department of Labour Market Observation]
APPA: Environmental Agency of the Autonomous Province of Bolzano/Bozen
ASTAT: Statistic Institute of the Autonomous Province of Bolzano/Bozen
ISTAT: Istituto nazionale di statistica [National Institute of Statistics]
WIFO: Institut für Wirtschaftsforschung [Institute of Economic Research], Chamber of Commerce of Bolzano/Bozen

Notes

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