

Forest recreation as a governance problem: four case studies from Switzerland

Journal Article**Author(s):**

Wilkes-Allemann, Jerylee; Hanewinkel, Marc; Pütz, Marco

Publication date:

2017-06

Permanent link:

<https://doi.org/10.3929/ethz-b-000240243>

Rights / license:

[In Copyright - Non-Commercial Use Permitted](#)

Originally published in:

European Journal of Forest Research 136(3), <https://doi.org/10.1007/s10342-017-1049-0>

Forest recreation as a governance problem: four case studies from Switzerland

Jerylee Wilkes-Allemann¹ · Marc Hanewinkel² · Marco Pütz³

Received: 15 July 2016/Revised: 30 March 2017/Accepted: 10 April 2017/Published online: 18 April 2017
© Springer-Verlag Berlin Heidelberg 2017

Abstract Recreational activities have undergone a change from mainly passive forms (e.g. rest, relaxation, reinvigoration, solitude and escape) to more active forms (e.g. mountain biking, climbing and running). Correspondingly, the demand for forest recreation infrastructure to support the more active forms has increased. However, very little is known about what features characterise the planning and management of forest recreation infrastructure. This study takes four in-depth mountain-bike trail cases in Switzerland to characterise the planning and management of forest recreation infrastructure. The analysis is performed using the institutional analysis and development framework (Ostrom in *Governing the commons: the evolution of institutions for collective action*, Cambridge University Press, New York, 1990) and qualitative data based on cases and interviews. We argue that by considering the identified external features (formal and informal rules, location) and process features (partnerships, public participation, conflicts, profitability perspectives, time frame of process,

funding of process and approval), we can better plan and manage active forms of forest recreation. Conflict situations and response strategies associated with mountain-bike-trail planning and management are also identified. The findings are relevant for other regions facing the growing use of forests for recreational and leisure activities.

Keywords Forest recreation · Forest planning and management · Forest governance · Mountain biking · Mountain-bike trail · Institutional analysis and development framework

Introduction

Increasing numbers of people in developed countries spend their leisure time in forests (Burgin and Hardiman 2012). Over the last decade, recreational activities have changed from passive forms (e.g. rest, relaxation, reinvigoration, solitude and escape) to more active forms (e.g. mountain biking, climbing and running) (Burgin and Hardiman 2012). Consequently, the demand for forest recreation infrastructure (e.g. mountain-bike trails, high-rope parks) for the more active forms of forest recreational activities has increased (Schroff et al. 2005). However, we know very little about what features characterise the planning and management of forest recreation infrastructure. To provide science-based advice on forest recreation planning and management, those processes have to be better understood. To enable learning from case studies, this paper examines the planning and management of forest recreation infrastructure using four in-depth cases from Switzerland.

Two observations and trends motivated this paper's perspective on the planning and management of forest

Handling Editor: Martin Moog.

✉ Jerylee Wilkes-Allemann
jwilkes@ethz.ch

Marc Hanewinkel
marc.hanewinkel@ife.uni-freiburg.de

Marco Pütz
marco.puetz@wsl.ch

¹ Natural Resource Policy, ETH Zurich, Universitätstrasse 16, 8092 Zurich, Switzerland

² Chair of Forestry Economics and Forest Planning, University of Freiburg, Tennenbacher Str. 4, 79106 Freiburg, Germany

³ Economics and Social Sciences, Swiss Federal Research Institute WSL, Zürcherstrasse 111, 8903 Birmensdorf, Switzerland

recreation infrastructure. First, the increasing demand for forest recreation infrastructure is leading to crowded urban forest areas, making the provision of such infrastructure an ongoing challenge for urban forestry (Pütz et al. 2015), and to negative environmental impacts (Ballantyne et al. 2014). Consequently, conflicts among recreational users as well as over opposing uses of forests may become more intense and frequent in the future (Wilkes-Allemann et al. 2015b; Pröbstl et al. 2010). Thus, a better governance understanding can help to improve the planning and management of forest recreation. Second, the planning and management of infrastructure in already-crowded forest areas is posing challenges (e.g. conflict management) to forest managers and local stakeholders (Wilkes-Allemann et al. 2015b; Verlic et al. 2015; Jay and Schraml 2012; Harshaw et al. 2007; Schroff et al. 2005; Schuett 1997). Consequently, case studies are needed in order to devise effective planning and management. Additionally, case studies are needed to handle the challenges that forest managers and local stakeholders are facing and, subsequently, to satisfy stakeholder demands. In summation, investigating the governance of in-depth cases of forest recreation could strongly contribute to better planning and management of forest recreation. It could contribute especially to improving the planning and management of forest recreation infrastructure (e.g. mountain-bike trails) in frequently used and sensitive forest areas by, for example, mitigating conflicts between forest users and improving the profitability of local enterprises (e.g. cable car services).

Conceptually, the paper applies the institutional analysis and development (IAD) framework developed by Ostrom (1990) and her colleagues to investigate the planning and management of forest recreation. Methodologically, the study was based on qualitative data gathered from case studies and interviews. The study aimed to identify and characterise the planning and management of forest recreation infrastructure, focusing on cases regarding mountain-bike trails in Switzerland. Assuming that different forest recreational activities are characterised by different planning and management structures, we chose to study biking and, more specifically, mountain-bike trails, because among the various recreational activities taking place in the forests of Switzerland, both are increasing in importance (Pröbstl et al. 2010). Additionally, we focused on mountain-bike trails as a form of forest recreation infrastructure through which to investigate planning and management, because such trails are planned and managed exclusively for mountain biking and have been posing challenges (e.g. conflict management) to forest managers and local stakeholders. The planning and management of mountain-bike trails was the main unit of analysis in this study.

Specifically, we aimed to (1) identify the features of the planning and management of mountain-bike trails in

Switzerland, and (2) identify the conflict situations that arise between bikers and forest managers or forest owners and how they are addressed in the planning and management of forest recreation infrastructure. Our findings are of interest for the planning and management of other forest recreational activities and for other countries facing similar developments and challenges.

The paper is structured as follows. “**Conceptual framework**” section introduces the conceptual framework. “**Methodology**” section outlines the applied methods and data collection strategy. “**Results**” section presents the results. “**Discussion**” section provides a discussion of the findings, and “**Conclusion**” section offers further research questions and recommendations for practice.

Conceptual framework

Forest recreation in Switzerland displays important characteristics of an open-access resource: non-excludability and rivalry in use of the natural resource (Ostrom 1999, 2011). Non-excludability is given by the free access right under Article 699 of the Swiss Civil Code (1907) and under Article 14 of the Federal Forest Law. In Article 699 of the Swiss Civil Code (1907), it is stated that entering forests and pastures and the appropriation of wild berries, mushrooms and the like are permitted. In Article 14 of the Federal Forest Law, it is stated that the cantons ensure that the forest is accessible to the general public and where necessary [e.g. conservation of forests] the cantons can (a) restrict accessibility to certain forest areas and (b) subject the staging of major events in the forest to obtaining a permit. Rivalry, because forests close to urban areas and used for recreation might face problems such as congestion and overuse, which are dealt with in forest planning and management. Investigating the planning and management of forest recreation infrastructure refers conceptually to environmental governance and, perhaps more specifically, to forest recreation governance. Here, we define governance as “the purposeful effort to steer, control or manage sectors or facets of society” (Kooiman 1993: 2). The IAD framework, developed by Ostrom (1990), is used as the conceptual framework because it is suited to analyse open-access and common-pool resources. The heart of the IAD framework is the action situation. Action situations are the social space where stakeholders or groups of stakeholders interact and outcomes (e.g. adopted rules or prohibitions) are produced (Ostrom 2005). Stakeholders are defined as individuals or groups functioning as collective actors (Ostrom 2011). Action situations are shaped by external variables representing the biophysical conditions, the community attributes and institutional rules (including formal or written rules and informal or non-written rules).

Based on the IAD framework, the planning and management of forest recreation infrastructure is regarded as an action arena (i.e. it begins with the idea for the infrastructure and ends with its implementation and use). The action arena has specific action situations and stakeholders that interact with each other to assert their interests. In this paper, the elements of the IAD framework are used to identify the features of planning and managing forest recreation infrastructure. The features we refer to represent the IAD framework's biophysical conditions, community attributes, institutional rules, stakeholders, interactions and outcomes.

The IAD framework has been used in several empirical studies. However, in forestry research, it has been applied in only a limited number of areas, including forest management with a particular focus on (a) local institutions (Mehring et al. 2011) (b) decentralisation and forest governance (Clement 2010), and (c) participation in forest management (Sekher 2001); forest conflicts with an emphasis on identifying conflict situations and response strategies in urban forest governance (Wilkes-Allemand et al. 2015b); forest recreation governance with a special focus on identifying stakeholders and institutions which frame forest governance in urban areas (Wilkes-Allemand et al. 2015a); community forestry with a focus on sanctioning and monitoring (Coleman and Steed 2009); reforestation policies with an emphasis on deforestation policies and land use change (Clement and Amezaga 2008) and decentralisation in forestry with a focus on the application of the IAD to the decentralisation process (Andersson 2006).

Other environmental resource-related fields in which the IAD framework has been used to analyse the planning and management of natural resources include the following: (1) fisheries, for example, to investigate common property arrangements (Mulazzani et al. 2012), to analyse governance (Fielman et al. 2012; McGinnis 2011; Beitel 2011) and to survey ecosystem-based fisheries (Rudd 2004); (2) water, for example, to investigate water management (Raheem 2014; Toriman et al. 2012; Mokhtar et al. 2011; Imperial 1999), to research watershed partnerships (Hardy and Koontz 2009), to survey water policy making (Koontz 2005), and local institutions (Snell et al. 2013); and (3) agriculture, where multi-stakeholder platforms are used to link small farmers to value chains (Thiele et al. 2011). Each author added a different focus to the further development of the IAD framework. For example, McGinnis (2011) added the focus to networks of adjacent action situations in polycentric governance. Beitel (2011) added the focus to the role of common property arrangements in the ecological sustainability of mangrove fisheries on the Ecuadorian coast. And, Andersson (2006) contributed to understand decentralised forest governance. However, to our knowledge, the IAD framework has not been used to characterise

infrastructure planning and management, nor have any studies used the planning and management of mountain-bike trails as their main unit of analysis. Thus, the main contribution of the present paper is the identification and characterisation of external and process features to improve forest recreation infrastructure planning and management.

Methodology

Case study selection

Following Yin (2009), a case study approach allowed us to be both exploratory and descriptive in order to determine the planning and management of heterogeneous mountain-bike trails. A qualitative small-N research design is well suited to our problem because it systematically takes into account the specific local context affecting the planning and management of each mountain-bike trail (Yin 2009). The general institutional setting of forest recreation in Switzerland and more specifically of planning and managing mountain-bike trails is framed by the open-access definition of forests for recreation (Civil Code 1907). At the cantonal level (state level), the cantons are allowed to restrict the open-access resource right if forests and the forest habitat is endangered. Thus, identifying cases considered to be good examples may guide and improve the planning and management of mountain-bike trails at the regional and national level. To select cases, we first conducted two interviews with experts working in the field of forest recreation. Following the snowball principle, we asked each of them if they knew cases that could be considered exemplary examples to be investigated and why. At the same time, we compiled a list of all mountain-bike trails in Switzerland as registered on the official mountain-bike trail website mountainbikeland.ch, a platform hosted by the Switzerland Mobility Foundation to promote non-motorised traffic for leisure and tourism in Switzerland. Out of the thirty-five facilities listed, we considered only mountain-bike trails situated in forested areas (Table 1). Bike parks and pump tracks have not been considered, as these are built mainly outside of forested areas and therefore do not fall within the scope of this analysis. The nine remaining potential cases have been divided into two groups based on both predefined criteria: (1) trails built in urban forest areas, and (2) trails built in non-urban forest areas. This categorisation was performed to represent the different characteristics of the biophysical world and community attributes according to the IAD framework. Thereafter, cases have been categorised into three main approaches, which are mixed leadership, bottom-up (led by local and private actors) and top-down (led by public actors) showing the potential interaction forms that could

Table 1 Official mountain-bike trails in Switzerland according to www.mountainbikeland.ch. Source <http://www.mountainbikeland.ch/> (accessed 24.04.2015)

Nr.	Where?	Trail name	Trail type	Urban/ non-urban	Leadership (contact lead)
1	Bern	Gurtenrail	MBT	Urban	Bottom-up (Trailnet)
2	Biel	BielTrail—Downhill Track	MBT	Urban	Bottom-up (Trailnet)
3	Davos	Bikepark Färich Davos	MBT and BP	Non-urban	Top-down (Destination Davos Klosters)
4	Emmetten	Wood Trail und Natural Bike Park	MBT and BP	Non-urban	Top-down (Tourismus Emmetten)
5	Gränichen	Bike-Lehrpfad Gränichen	MBT and BP	Non-urban	Bottom-up (Racing Club Gränichen)
6	Flims	694 Runca Flowtrail Freeride	MBT	Non-urban	Top-down (Flims Laax Falera)
7	Kandersteg	Freeride Trail Sunnbüel-Kandersteg	MBT	Non-urban	Bottom-up (Luftseilbahn Sunnbüel)
8	Klosters	691 Gotschna Freeride	MBT	Non-urban	Top-down (Destination Davos Klosters)
9	Laax	695 Never End Freeride	MBT	Non-urban	Top-down (Destination Davos Klosters)
10	Lenzerheide	Bikepark Lenzerheide mit Skill Center und fünf Freeride-Strecken	MBT and BP	Non-urban	Top-down (Ferienregion Lenzerheide)
11	Samnaun	Freeride Samnaun	MBT (mostly outside forest area)	Non-urban	Top-down (Tourismus Engadin Scuol Samnaun AG)
12	Schiers	Bikeparcours Schiers	MBT	Non-urban	Top-down (Prättigau Tourismus)
13	Schwanden-Brienz	Biketrail Schwanden-Brienz	MBT	Non-urban	Bottom-up (Verein IG Bergvelo)
14	St. Moritz	696 Corviglia Flowtrail Freeride	MBT (outside forest area)	Non-urban	Top-down (Tourismusorganisation Engadin St. Moritz)
15	Zürich	Biketrail Triemli	MBT	Urban	Mixed leadership (led by Grün Stadt Zürich)

develop. Making this difference is crucial in order to analyse the external features that allow for enabling planning and management. Finally, four cases were selected—on the basis of expert consultation (Table 2, Fig. 1)—for extensive and in-depth analysis.

Data collection and analysis

For the analysis, mainly qualitative data have been collected, based on official documents and semi-structured interviews. To select interviewees, first, the contact person of the trail as specified in [mountainbikeland.ch](http://www.mountainbikeland.ch) was contacted and interviewed. Based on this interview, further interview partners have been selected (e.g. a participant in the process, a member of the public administration such as forest or tourism administration or in smaller municipalities the head of public administration). In cases of opposition against the mountain-bike trail, interviews with opponents have been conducted. Forest owners have not been specifically interviewed as forest areas where cases are situated are public forest areas and therefore forest owners are represented through, e.g. the head of public administration or the forest administration itself. Semi-structured interviews have been conducted with eleven stakeholders,

including one female (“Appendix 1”). The questions for the interviews were developed based on the elements of the IAD framework (e.g. stakeholders, interactions, funding, institutional rules, “Appendix 2”). The interview was introduced to the interviewees by briefly stating the goal of the study. Interviewees agreed to take part in the interview and were comfortable with the recording of the interview. The interviews, which have been conducted, recorded and transcribed by the authors, occurred between March and May 2015 and lasted from 16 min to 1 h and 22 min. The interview data analysis (“Appendix 2”) preceded inductively using Mayring’s (2010) approach of qualitative content analysis, an approach of systematic, rule-guided qualitative text analysis. Subsequently, first, for each interview question, categories and levels of abstraction of each IAD element was determined. Second, a stepwise formulation of inductive categories from the interview material was done and if necessary new categories were formulated. Third, formulated categories have been revised after having analysed 50% of the interview material. Last, the results have been interpreted based on the IAD elements. The data categories for the inductive analysis have been coded using the software MAXQDA11. The data and quotes presented here have been translated into English and

Table 2 Selected cases for characterising the planning and management of mountain-bike trails. *Source* Compiled by the author based on www.mountainbikeland.ch (accessed 30.05.2016)

Region/case	Mountain-bike trail name	Mountain-bike trail short name	Urban/non-urban Area	Leadership	Length (m)	Difference in altitude (start/end) (m)
Flims	694 Runca Flowtrail Freeride	Runca trail	Non-urban area	Tourism organisation (top-down)	6000	700
Schwanden-Brienz	Biketrail Schwanden-Brienz	Schwanden-Brienz trail	Non-urban area	Biker (bottom-up)	1200	140
Zurich	Biketrail Triemli	Triemli trail	Urban area	Several different stakeholders (mixed leadership)	3500	350
Bern	Gurtrientrail	Gurten trail	Urban area	Biker (bottom-up)	1700	270

Cases were selected based on the following aspects, which were relevant from a governance perspective: whether the trail was built in an urban forest area or a non-urban forest area and which type of leadership, such as bottom-up or top-down, was present. These categories combined to represent the interaction forms that could occur

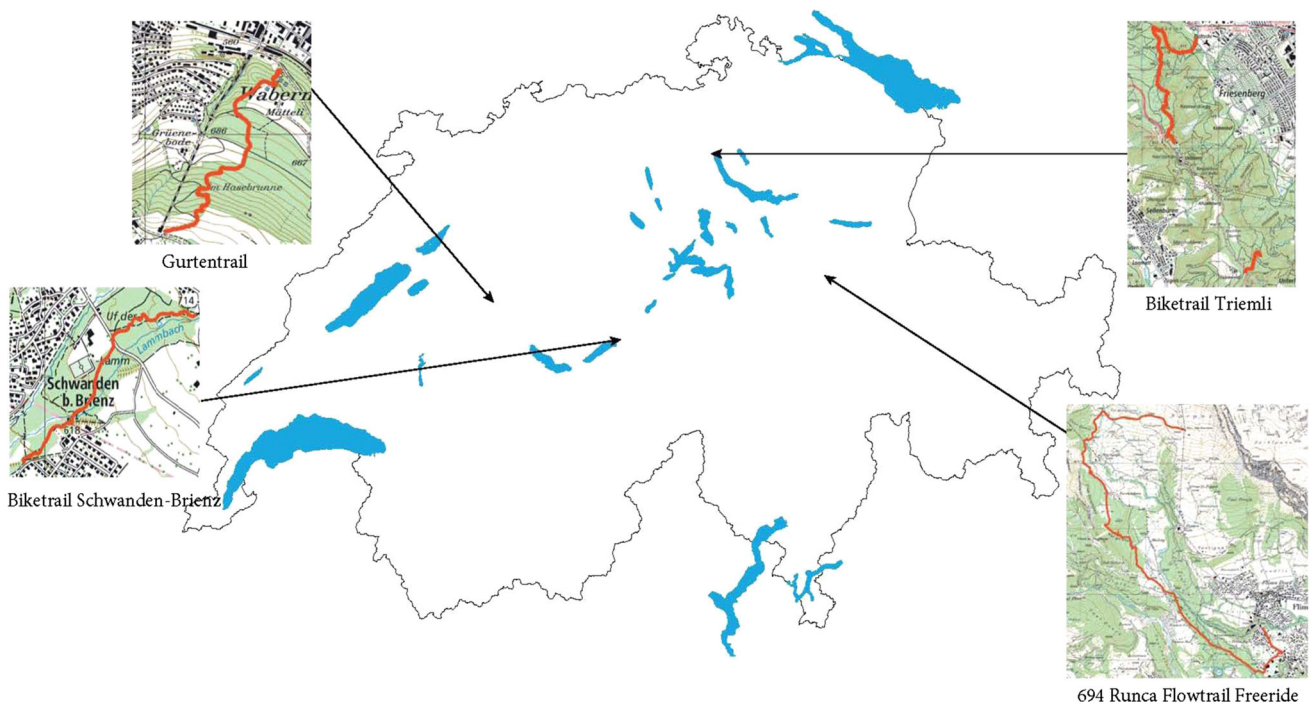


Fig. 1 Map of the mountain-bike trails showing where they are located and the trail itself. Cartography: B. Weilenmann (WSL, 01.03.2016)

edited to ensure both readability and the anonymity of the interviewees. Quotes are numbered as T1–T11, with each number representing an interview partner.

Results

Characteristics of planning and managing mountain-bike-trails

The four exemplary cases show distinct commonalities and differences across the urban versus non-urban and top-

down versus bottom-up dimensions, as well as in local biophysical conditions, community attributes and institutional rules. Table 3 is used to visualise these commonalities and differences and to indicate which features have the highest degree of difference and similarity among the cases. The properties of each feature are shown in Table 4. The table contains only features with a range of at least two different properties. Certain obvious features, such as slopes as a biophysical condition for mountain biking, are not considered. Table 4 can be used as a guideline for better planning and management of mountain-bike trails in the future. Subsequently, Table 4 is used to show the

Table 3 Process features of forest recreation infrastructure for each case study. *Source* Compiled by the author based on interview data

Case study	Triemli trail	Gurten trail	Runca trail	Schwanden-Brienz trail
Urban/non-urban area	Urban	Urban	Non-urban	Non-urban
Leadership	Several different stakeholders (mixed leadership)	Biker (bottom-up)	Tourism organisation (top-down)	Biker (bottom-up)
Funding of process (yes/no)	Yes	Yes	Yes	Yes
Time frame of process (short [<1 year]/long/very long [>5 years])	Long	Very long	Long	Short
Profitability perspectives (yes/no)	No	Yes	Yes	No
Public participation (without/with)	With public participation	With public participation	With public participation	With public participation
Partnerships (many/few/no)	Few	Many	Few	No
Conflicts (with few/with many/without)	With many conflicts	With conflicts	Without conflicts	Without conflicts
Location (predetermined/determined in the process)	Predetermined	Predetermined	Determined in the process	Determined in the process
Approval (with few/with several/without objections)	Without objections	With several objections	Without objections	With few objections
Formal rules (mix of rules available and defined/new rules defined/rules were available)	Adopted rules	Rules were available	Mix of adopted and already-available rules	Rules were available
Informal rules (many/few/no)	Few	Many	Few	Many

external and process features needed to consider for analysing the planning and management of forest recreation infrastructure. This is done based on the elements of the IAD framework (Fig. 2).

Triemli Trail and Gurten Trail are located in urban areas. Both have been characterised by several conflicts during the planning and management of forest recreation infrastructure. One reason is that there are several different forest users using forests for recreation in these areas. Specifically, in both cases, a source of conflict was the construction of these trails in predetermined locations; both trails have been illegally built and retrospectively legalised. The reason for legalisation has been that several stakeholders put pressure on to take action (Gurten Trail) and that conflicts between stakeholders were intensifying (Triemli Trail). An interviewee stated that the concerned stakeholders realised that it is better to have one official and organised trail than to have bikers riding wildly everywhere in the forest [T5]. Several other users use the same forest area for other types of recreation activity. Thus, the intensified use leads to conflicts, not only between forest recreation users (e.g. hikers, bikers) but also between users of other forest functions (e.g. timber harvesting, nature conservation). Subsequently, it leads to an increased pressure to the local administration (e.g. forest administration or other type of administration) in order to take action and to improve the planning and management of forest recreation infrastructure.

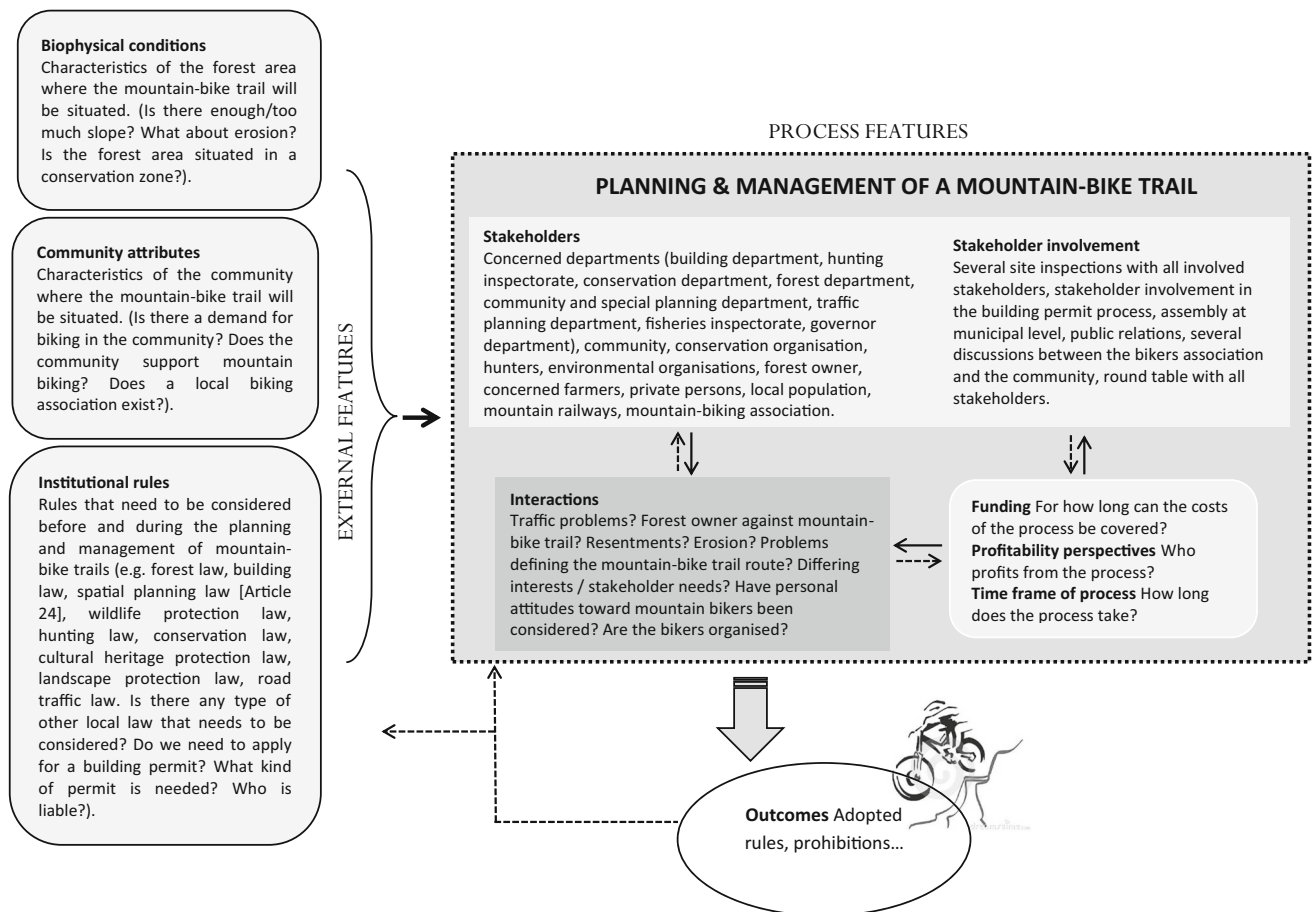
Schwanden-Brienz Trail and Runca Trail are located in non-urban areas. Both are characterised by users having to determine the location of the trail. The locations of the trails have been either determined by the community (Schwanden-Brienz Trail) or framed by the biophysical conditions (e.g. slope and risk of erosion, as with Runca Trail). Both trails have been also characterised by a lack of conflict during the building permit process (in the case of Runca Trail, the community democratically voted for the trail to be built). Thus, it can be argued that, as there are less forest users, or not so many concentrated in a specific forest area compared to urban forest areas, the initiator can freely choose in coordination with the forest owner and taking the biophysical conditions into account where to potentially build the trail. After the forest owner has given his OK to build the trail, and both (the forest owner and initiator) have decided where to build the trail the process can officially start. The initiator has to prepare a business plan including an explanation (with a map) where it is planned to be build, who will be involved in the process and when. How the process will be financed and the liability of the trail has to be clarified as well. Additionally, it has to be defined who will pay for the costs to remove the trail if it has to be removed (e.g. initiator does not want to lead anymore the trail, there is no funding to maintain the trail, etc.). The business plan is the leading written document of the process and serves as the basis for receiving the approval of the local administration. If the process fails the

Table 4 External and process features of the planning and management of forest recreation infrastructure based on the elements of the IAD framework. *Source* Compiled by the author

IAD framework	Feature	Properties of the feature	Description
External features			
Institutional rules	Formal rules	(a) Mix of available and adopted rules (b) Adopted rules (c) Available rules	Available rules are those given at the national and regional level (e.g. forest law) Adopted rules are those that have been adopted in the local context to allow for mountain biking or to solve acute conflicts between stakeholders
	Informal rules	(a) Many (b) Few (c) No	Informal rules are defined locally and are therefore specific to the locality (e.g. riding hours for bikers, requiring bikers to respect hikers). Few rules mean that only 1–2 rules are available. Many mean that several (>2) rules are needed to consider
Biophysical conditions and community attributes	Location	(a) Predetermined (b) Determined in the process	The location is predetermined if an illegal bike trail is being legalised, if the community attributes (e.g. local community) define a specific forest area where it can be built or if the biophysical conditions frame the area where it can be built (e.g. because of erosion, slope, forest type, etc.) The location is determined in the process depending on the community attributes (e.g. which stakeholders are involved, how the stakeholders are involved, the presence of a biker lobby in the community, etc.) and depending on the biophysical conditions (e.g. whether there is enough slope, whether erosion will occur, whether the foreseen area is defined as a conservation area, etc.)
Process features			
Stakeholders	Public participation	(a) With (b) Without	Public participation is the involvement of (local) stakeholders in all action situations. Not all stakeholders need to be involved in all action situations. Stakeholder involvement varies depending on the action situation taking place and on the necessity of involving stakeholders. Stakeholder involvement can take various forms, is defined locally and is context specific
	Partnerships	(a) Many (b) Few (c) No	Partnerships are established mainly with local stakeholders to address the demands and interests of stakeholders and as a way to minimise conflicts (e.g. partnerships with hunters to use the same area and to avoid interactions between two conflicting forest uses). Partnerships are defined locally and are context specific. Few partnerships mean that only up to two partnerships were needed. Many partnerships mean that several (>2) partnerships were necessary
Interactions	Conflicts	(a) With few (b) With many (c) Without	The intensity (few (<2), many (>2), no) of conflicts between stakeholders involved in the process depends on the interests and demands of stakeholders. Conflicts also arise depending on who is involved in the process (e.g. were local people involved?), who leads the process (e.g. is a biker the one who leads or is an official institution?), who pays for the costs (e.g. do local people have to pay for the cost or are there sponsors?), who profits from it (e.g. local people?) and so forth. Therefore, conflicts are locally defined and context specific. Few and many conflicts can not only be differentiated on the amount of conflicts they present but also on the severity of these conflict and the efforts needed to disentangled these
Stakeholders and interactions	Profitability perspectives	(a) With (b) Without	Profitability perspectives (i.e. the economic interests of a group, such as a cable car provider, in the trail) depend on the local stakeholders involved and the local circumstances
Stakeholders and interactions	Time frame of process	(a) Short (b) Long (c) Very long	The time frame of the process is locally defined and depends on the stakeholders involved and the interactions given (e.g. short: less than 1 year because the initiator is familiar with the local circumstances and stakeholders to be involved in the process; long 1–5 years because several objections are given, several stakeholders need to be involved and the initiator has to have the nerves to continue trying; very long more than 5 years)

Table 4 continued

IAD framework	Feature	Properties of the feature	Description
Stakeholders and interactions	Funding of process	(a) Yes (b) No	Funding of process is dependent on the stakeholders involved and the interactions given (e.g. the willingness of stakeholders [local community] to financially support the process)
Outcome	Approval	(a) Without objections (b) With few objections (c) With several objections	The outcome depends on the course of the process (e.g. stakeholders involved, biophysical conditions, community attributes, institutional rules, interactions). With few and with several objections can be differentiated on the amount and severity of the objections (e.g. is there only one party who is objecting, if yes than can be defined as few, are there many parties objecting the process? If yes, can this objections be solved or mitigated?)

**Fig. 2** Planning and management of mountain-bike trails according to the IAD framework. *Source* compiled by the author (adapted from Ostrom 2009: 420)

business plan serves as a basis to improve the process in case the initiator wants to apply the building permit once more. Additionally, if the process takes too long or more stakeholders need to be integrated in the process the business plan can be updated and the new stakeholders can follow the development of the project over the last years.

Runca Trail is defined as following a top-down approach, whereas Triemli Trail is defined as following a

mixed leadership approach. Both are characterised by the community having funded the process (e.g. the community bore the expenses because the trail was built in community forest land, and the trail is thus owned by the community). Both are further characterised as having occurred over a long time frame (1–5 years). The time frame of the planning and management process strongly depends on the amount of conflicts available and the response strategies

used to mitigate these. In both cases, several stakeholders have been involved in the process, and their differing interests hindered the process (e.g. farmers did not want bikers to cross the pastures of the community, or the community had to buy land because an forest owner was sceptical about the process). However, even though several stakeholders with differing interest hindered the process both trails received their approval without objections. An interviewee stated, “We said we will concentrate the bikers into one single trail and prohibit biking outside this trail [and], from this moment on, the nature and landscape department supported us” [T7]. In the case of Runca Trail the reason is, that several stakeholders have been involved all over the process and, by doing so, conflicts have been addressed at the time given. In the case of Triemli Trail, no objections were given, because something needed to change in order to steer the behaviour of bikers and to mitigate the conflicts. This “something” is the allowing of the trail. In the case of Runca Trail it started as an official international weekend event. After the event the trail infrastructure was not removed by the tourism administration and the trail stayed as an illegal trail. For some years the organisers kept organising mountain-bike events and promoting the trail in the community by arguing that the trail could be seen as a source of income (e.g. hotels, restaurants, etc.). Finally, the community voted in a referendum to officialise the trail and to cover the costs of the trail. Runca Trail and Triemli Trail are also characterised by having many informal rules (e.g. bilateral discussions with stakeholders involved in the process). Informal rules play a crucial role to steer the process and to address the demands of other stakeholders (e.g. hunters, hikers). However, only Runca Trail has a mix of adopted and already-available formal rules. The adopted formal rules outlined include clearly defined hiking and biking roads and biking hours to avoid conflicts (e.g. with hunters). Triemli Trail defined a user rule (such as, e.g. guidelines on what to consider when building a mountain-bike trail in order to avoid accidents) during the planning and management of forest recreation infrastructure. The user rule is intended to avoid non-occupational accidents. At the time of its formulation, it was seen as a precondition for the further development of the process. Today, this user rule is a precondition for planning and managing new trails in the canton of Zurich. In the case of Runca Trail and Triemli Trail partnerships with stakeholders not involved in the process have been formed. These partnerships developed as a way to avoid conflicts (e.g. with hunters) and to receive the support of important local stakeholders (e.g. political party). Thus, it can be said, that partnerships are an important element, which needs to be considered when analysing the planning and management of trails in urban and non-urban forest areas.

Gurten Trail and Schwanden-Brienz Trail are defined as having followed a bottom-up approach. Both are characterised by the community not having funded the process. The reason for the process not being funded was that a “promoter” initiated each trail and will, as stated by interviewees, exist as long as the promoter (or bike organisation) is willing to participate on a voluntary basis in the trail planning and management [T2, T6]. It can be said that not having to fund the process by “yourself” or finding ways to do it (e.g. through the community) makes the process much affordable and easy (e.g. sponsors, partnerships with the bike industry, local taxes). The time frame of the process was short (less than 1 year) in the case of Schwanden-Brienz Trail. A reason is that the promoter is from the municipality and knows many stakeholders involved in the process. In the case of Gurten Trail, the process was very long (more than 8 years), because several stakeholder interests had to be considered. Both trails are characterised by having received their approvals with objections. One interviewee said, “We needed 8 years to legalise the mountain-bike trail” [T10], and another stated, “We got an objection from the nature conservation department; therefore, we had to relocate the trail” [T2]. These statements show that both trail projects could be finalised successfully and are characterised by different establishment stages including major obstacles such as objection by stakeholders and needs to relocate the trail.

Gurten Trail and Runca Trail are characterised by having profitability perspectives (e.g. the mountain-bike trail was purposefully built next to a cable car provider so that mountain bikers would pay for the cable car to transport their bicycles to the beginning of the trail). Therefore, it can be said that if a trail offers profitability perspectives in areas where the local populations lives from winter tourism, a source of income can be generated in the summer-time. Subsequently, the local stakeholders will strongly support the process. If a cable car provider is unprofitable and it is legalised, thereafter it starts to be profitable. The reason is that bikers start using the cable car. Thus, local stakeholders will strongly support the process resulting in a win–win situation for both.

Finally, all four cases show the following similarities: first, all cases have, through the involvement of several stakeholders, managed to establish the mountain-bike trail. However, the form of involvement varies from undertaking one or more site inspections to creating a stakeholders’ advisory group involved throughout the process. Second, the lead or promoter plays a crucial role in all cases and governance forms (bottom-up, top-down or mixed leadership approach). The lead has to be predefined and he/she has to be willing to go throughout the different steps of the process. Third, having several site inspections to clarify the route of the trail is also important. By doing so several

conflicts can be avoided and stakeholders can be involved. Last, the funding of the trail (during and after the process) has to be clarified. However, the funding form varies between the cases (e.g. from financed by the community to financed by member fees).

Conflict situations between bikers and forest managers or forest owners and response strategies of mountain-bike-trail planning and management

We addressed the conflict situations of planning and managing forest recreation infrastructure using the planning and management of a mountain-bike trail as the unit of analysis. This was done in order to understand what features of planning and management have proven successful for the establishment of forest recreation infrastructure. During the interviews, we asked which conflict situations have been encountered and how they have been dealt with (i.e. what response strategies have been used). Based on this, we clustered the conflict situations into group types that we defined as conflict dimensions, as follows: (1) the technical infrastructure dimension (2) the negotiating dimension, (3) the personal dimension, and (4) other dimensions. These are further defined in Table 5. The technical infrastructure dimension applied in the following cases: if the planned mountain-bike trail crossed several forest roads (e.g. hiking roads), if there was no standardised knowledge about the material needed to build the mountain-bike trail, if there was no experience regarding the qualities of the soil (e.g. erosion) needed to build the mountain-bike trail or if there was a lack of transport routes over which to transport the material needed to build the mountain-bike trail. An interviewee stated, “After years of trying different techniques, we now know which material is needed and how best to build a mountain-bike trail” [T8]. The negotiating dimension applied if too many (more than three) agreements needed to be reached between the stakeholders (Schwanden-Brienztal Trail), if the negotiating procedure had to be optimised (e.g. involve stakeholders at an earlier stage of the process, Gurten Trail), if bikers did not follow the terms (e.g. harvest the foreseen trees or use the foreseen substrate for the trail) laid out during the planning and management process (Schwanden-Brienztal Trail) or if none of the bikers have been willing to act as the contact person and, by doing so, assume liability for the mountain-bike trail (Triemli Trail).

A conflict had a personal dimension if other forest users have been for example against mountain bikers because they simply do not like them or if other users have not been in favour of new recreational activities (Triemli Trail). The other dimension category applied if farmers (or other non-forest users) have been against mountain bikers crossing over “their” pastures (Runca Trail) or if the bikers have not been organised at all (Triemli Trail). According to one

interviewee, “We talked to the farmers and told them that, because they have the right to let their cows graze on the pastures owned by the community, the tourism administration also has the right to make use of that land. Thus, both sides have to find ways to handle it” [T7]. For each conflict dimension, there have been several possible response strategies (see Table 5). However, response strategies were not available for all dimensions. Therefore, to avoid the development of conflict dimensions into conflict situations, it is crucial to involve as many stakeholders with as many different backgrounds as possible in the planning and management of mountain-bike trails.

Discussion

The findings indicate that the planning and management of mountain-bike trails can be identified and characterised by using the IAD categories and by transforming these categories into external and process features. The external features we refer to are: biophysical conditions, community attributes and institutional rules. Each of these are context specific and do not change over long periods of time. On the other hand, we find process features, which include stakeholders, interactions and outcomes. Each of these varies depending on the planning and management process we are characterising and can vary between mountain-bike trails presenting similar external features (e.g. being planned in the same forest area).

Our findings indicate that the planning and management of forest recreation infrastructure varies between cases based on the process features presented. The variation can be explained, on the one hand, through the different external features where cases are situated, and on the other hand, through the lead of the process and the reason for starting the planning and management process of forest recreation infrastructure (e.g. is a local mountain biking organisation who is “just for fun” starting the process? Or, is the local forest organisation trying to legalise an illegal mountain-bike trail in order to minimise conflicts?). However, even though there is a variation between cases, our findings indicate that cases display a common pattern when looking at the planning and management steps of (1) identifying relevant stakeholders, (2) deciding the best form of stakeholders involvement to address their concerns, and (3) defining who will fund the process.

Our findings show, that among all the features identified, process features (such as, e.g. time frame and funding of the process) are the most important to consider. One reason is that without funding the infrastructure cannot be build and the maintenance of the trail cannot be secured. Currently, in some cantons, there are innovative funding schemes for supporting forest recreation infrastructures. One example is the municipality of Rheinfelden, where a

Table 5 Conflict dimensions and response strategies used in mountain-bike trails planning and management in Switzerland. *Source* Compiled by author based on interview data

Case study	Conflict dimensions	Example	Response strategy (if applied)
Gurten trail	Conflicts within forest recreation	Opposition of forest owners to mountain-bike trail	Through educational work, forest owners were convinced that it is better to have a legal mountain-bike trail than to have thousands of illegal mountain-bike trails and bikers riding everywhere through the forest
	Technical conflicts	Intersection of mountain-bike trail with several roads	Traffic safety measures were implemented
Runca trail	Other dimension	Opposition of farmers to mountain-bike trail (trail would pass, at least partly, through several pastures)	It was clearly stated that the pastures are owned by the community. Therefore, everyone has the right to use them. Farmers have to tolerate bikers, and bikers have to respect farmers
	Technical infrastructure dimension	Lack of transport routes (for transporting the material to build a mountain-bike trail)	
	Technical infrastructure dimension	Lack of knowledge of material needed and soil qualities for building a mountain-bike trail	“After years of trying different techniques, we now know which material is needed and how best to build a bike trail” [T8]
	Technical infrastructure dimension	Erosion	A slope of more than 10% was avoided
	Technical infrastructure dimension, negotiation dimension	Difficulty defining the mountain-bike-trail route at the beginning of the building permit process	Flexibility was shown during the planning process; the chosen route was adapted to the local circumstances and/or needs of other stakeholders
	Conflicts within forest recreation	Recreational conflicts	Infrastructure types were disentangled (e.g. clear differentiation between hiking and biking routes)
Schwanden-Brienztal trail	Negotiating dimension	Too many disagreements	
	Technical infrastructure dimension	Intersection of mountain-bike trail with several roads	Traffic safety measures were implemented
	Negotiating dimension	Non-compliance with the terms set in accordance with the different departments	Everyone was reminded of the terms accorded
Triemli trail	Conflicts within forest recreation	Differing stakeholder interests (e.g. foresters vs. bikers) and opposition	Stakeholders and their interests were involved early in the planning process
	Personal dimension	Personal resentment	
	Conflicts within forest recreation, personal dimension	Negative personal attitudes towards mountain bikers	
	Other dimension	Bikers were not organised	A local biker organisation was established
	Personal dimension	Limited acceptance	
	Conflicts within forest recreation, personal dimension, negotiating dimension	Difficulty bringing all stakeholders together	Advisory group: “Hiking and biking at Uetliberg”
	Personal dimension, negotiating dimension	Lack of willingness among bikers to take responsibility for acting as a contact person	

voluntary mountain-bike-forest pass (“Bikerwaldpass”) is applied, meaning that bikers can on a voluntary basis buy the pass in any bike store in the region of Rheinfelden to support the maintenance of the mountain-bike trail (Schroff et al. 2005). Other forms of funding schemes could be given by charging users for the service offered, such as through selling cable car tickets, as is done in some municipalities of the canton of Wallis and in the Gurten

Trail case. Finally, further forms of funding could be public–private partnerships. However, public–private partnerships in forest recreation infrastructure have not been extensively analysed. Further research could investigate how public–private partnerships could potentially support the funding of the planning and management of forest recreation infrastructure. Another reason for the high importance of process features is that if the time frame of

the planning and management process is too long (e.g. more than 5 years) it can constrain the process as, e.g. bikers or local foresters lose the enthusiasm to continue with the process. Subsequently, how to improve the time frame of the planning and management process and to make it as short as possible will remain a challenge for local stakeholders, forest managers and future scholars. One way of reducing the time frame of the planning and management process is to target potential stakeholders that are against the planning and management process in an early stage of the planning and management process and let them be part of it by addressing their concerns. Another way of reducing it is, depending on who is the lead, to integrate more intensively the local forest administration or, if the lead lies in an administration, to integrate strategically the local nature conservancy organisation in the process, as most probably they will be against the trail. The time frame of the process can also be reduced if cantonal guidelines on how to proceed during the whole planning and management process (in urban and non-urban forest areas) are enacted and followed by the lead, as have been developed in the canton of Bern. Finally, the time frame of the process can also be reduced by, e.g. having several site inspections with all relevant local stakeholders and by concretely addressing their concerns.

Our findings show, that stakeholders can constrain the planning and management of forest recreation infrastructure. Therefore, identifying relevant stakeholders at the beginning of the process and properly involving them in the process (e.g. having several site inspections) is necessary for planning and managing forest recreation infrastructure. Additionally, the interactions stakeholders have within each action situation can vary resulting in different outcomes such as, e.g. allow or prohibit a mountain-bike trail. Thus, if stakeholders are properly addressed interactions can be minimised. In all cases analysed by us, stakeholders (state and non-state actors) have been involved in the planning and management of forest recreation infrastructure. However, the form of involvement varies between the cases. We think that involving stakeholders is necessary for forest governance—that is, for better addressing, at least in our case, bikers (and if possible societal) demands, minimising conflict situations and steering response strategies. Involving stakeholders will remain a necessary condition for forest recreation infrastructure planning and management to be legitimate and efficiently, confirming what other scholars have identified: that involving stakeholders is a key characteristic of forest governance (Bruña-García and Marey-Pérez 2014; Cantiani 2012; Ruppert-Winkel and Winkel 2009; Newig and Fritsch 2009; Leskinen 2004; FAO-ECE-ILO 2000). Thus, involving stakeholders in further processes will likely play a crucial role in the provision of forest recreation infrastructure and, more specifically, in the

decision-making process of forest recreation; this is in line with the findings of other studies (Wilkes-Allemann et al. 2015a; Bruña-García and Marey-Pérez 2014; Ruppert-Winkel and Winkel 2009). Wilkes-Allemann et al. (2015a) categorised different stakeholder types that need to be considered when analysing the governance of forest recreation. Bruña-García and Marey-Pérez (2014) found out that public participation is crucial for forest planning and that it has been applied so far using different models of involvement. However, guidelines should be developed to best involve stakeholders in all phases of forest planning. Ruppert-Winkel and Winkel (2009) found out that the opportunity for participation by all interested groups and citizens at the operational level is indispensable when taking forest planning decision. Who to involve, at what time of the planning and management process, how much power to give to their voice and how to involve stakeholders will remain a challenge for forest managers and the planning and management process itself. Not all stakeholders need to be involved in all stages of the planning and management process and if they are involved not all of them need to have the same power to take decisions (e.g. lobbyist could constrain the process). Thus, further research on this issue is necessary to improve the planning and management process. Further research could provide guidelines on at which stage of the process it is best to involve stakeholders, and “who has the power to decide” at each stage of the planning and management process.

Our findings suggest that interactions within the process and between other forest users constrain the planning and management of forest recreation infrastructure. Therefore, addressing the causes of conflicts is a necessary condition for the success of any interaction-management attempt (Ostrom 1999). On the basis of the conflict dimensions identified, several outcomes are expected (e.g. adopted rules, prohibitions) that could potentially influence the context conditions and, subsequently, the planning and management of forest recreation infrastructure. It is widely recognised that conflict situations develop for a variety of reasons and are influenced by the context conditions outlined in the IAD framework (Wilkes-Allemann et al. 2015b). Additionally, conflict situations stem from the action taking place, the involved stakeholders and the form of stakeholder involvement (Wilkes-Allemann et al. 2015b). Wilkes-Allemann et al. (2015b) identified two types of conflict situations: those within forest recreation and those between forest recreation and other forest functions. However, these conflict-situation types did not emerge in our study; instead, we identified technical and personal types of conflict situations. Thus, we clustered conflicts into conflict dimensions. We argue that identifying and characterising each conflict dimension helps to improve the planning and management of forest recreation infrastructure by allowing those processes to better address

societal demands and involve stakeholders in decision-making. However, identifying conflict situations in an early stage of the planning and management process is a precondition for an efficient planning and management process. Though, identifying conflict situations remains a challenge because both parties do not always perceive conflicts as a conflict. Thus, finding methodologies for identifying conflict situations and mitigating these will further improve the planning and management process.

We can say that the easiness of the process depends on who the initiator is (e.g. Is he/she a biker?, The local administration?, A tourism organisation?). As shown in the findings, top-down approaches developed because several conflicts (between local forest administration and bikers) needed to be minimised (Triemli Trail) or because there are financial incentives behind (Runca Trail). On the contrary, bottom-up approaches developed because a local stakeholder (bikers association) wanted to satisfy the needs of other local stakeholders (mountain bikers, as with Schwanden-Brienz Trail). However, both approaches could profit by having guidelines on how to proceed when planning and managing a forest recreation infrastructure. The results presented here could serve as a basis for doing this.

Finally, we are confident that the results presented in this study can contribute to improve the planning and management of forest recreation infrastructure. This can be done through the identification and classification of the features characterising the process. Additionally, the results presented can be used as a basis to develop guidelines for planning and managing forest recreation infrastructure in urban and non-urban forest areas by taking the presented external and process features into account. Properly planning and managing forest recreation infrastructures is a necessary condition to mitigate conflict situations (either between recreation users, between representatives of forest functions or other forms of conflicts), to address better local stakeholders demands and to allow certain type or recreation activities which normally need a planning and management (e.g. paintball, mountain biking) to occur. Furthermore, due to our case study approach, the results presented provide valuable in-depth knowledge and are very context sensitive, which limits their generalisability to other regions or recreational activities. However, it provides a basis for understanding the planning and management of forest recreation infrastructure not only in highly urbanised forest areas. To improve the understanding of the planning and management of mountain-bike trails, further empirical research could investigate factors influencing the success and failure of the planning and management of mountain-bike trails or of other recreational activities in urban and non-urban forest areas. Further research could also investigate the planning and management of nature discovery parks that are challenged by growing societal demands and conflict situations. Finally,

future studies could analyse the role of financing in governance processes or how societal demands are addressed with forest management instruments.

Conclusion

Focusing on mountain-bike trails the planning and management of forest recreation infrastructure has been identified and characterised. Conflict situations and response strategies used in mountain-bike-trail planning and management could also be identified. Thus, the research design used in this study could possibly be applied to European countries facing challenges and developments similar to the ones discussed in this study. We conclude that the planning and management of mountain-bike trails does display a common pattern when looking at the planning and management steps of (1) identifying relevant stakeholder, (2) deciding the best form of stakeholder's involvement to address their concerns, and (3) defining who will fund the process. We argue that by characterising the planning and management of forest recreation infrastructure using external and process features derived from the categories of the IAD framework, we can better address bikers demands and improve the planning and management of forest recreation infrastructure. Thus, the analytical categories of the IAD framework proved useful for identifying and characterising the planning and management of forest recreation infrastructure. We also conclude that involving stakeholders in forest recreation governance enhances public commitment, helps build consensus and reduces conflicts. Further, we conclude that to be able to propose more generalisable results, further empirical research is needed. Future studies could propose the characterisation of other types of forest recreational activities (e.g. high-rope parks) and methodologies for better integrating societal (bikers) demands into forest management plans. As the demand for forest recreation in urban areas is expected to increase, gaining insights from other regions and countries into how to handle forest recreation planning and management could be highly beneficial. Finally, we suggest that integrating societal (bikers) demands into forest management plans could help to improve the planning and management of forest recreation infrastructure by legitimating the process and forest governance in general. Thus, a better understanding of governance might help to improve the planning and management of forest recreation infrastructure in both highly urbanised and other forest areas.

Acknowledgements We thank all interview participants for their essential contribution to the study, Christian Hirschi, Susanne Menzel and Stefanie Engel for comments on an early draft of the manuscript for helping us to improve this paper. The Swiss State Secretariat for Education and Research, to whom we are very grateful, funded the research presented under COST Action FP0804 Forest Management Decision Support Systems (FORSYS).

Appendix 1

See Table 6.

Table 6 Interview partners

Case study	Gender	Category
Gurten trail	Male	Biker, founder and member of Trailnet
	Male	District forester
	Male	Forester at a forest enterprise (“Forstbetrieb”)
Runca trail	Male	Representative of the Weisse Arena AG and biker
	Male	Community forester
Schwanden-Brienz trail	Male	Biker, founder and member of IG Bergvelo
	Male	Representative of the community council
	Male	Game warden
Triemli trail	Female	Representative of Grün Stadt Zürich
	Male	Biker, founder and member of Züritrails
	Male	Biker and representative of the Swiss Competence Centre for Accident Prevention
Expert	Male	Researcher, biker and mountain-bike trail expert for Switzerland
	Male	Expert in forest recreation and mountain-bike trail

Appendix 2

See Table 7.

Table 7 Categorisation scheme of interview data based on the interview questions

Planning	Financing	Role of (?)	Rules-in-use	Approval	Stakeholders	Conflicts	Barriers and drivers
Was the place of establishment to be determined or predetermined?	What were the costs of the planning and management process?	Which role did the forestry administration play?	What formal rules were used/available?	Which kind of building permit form was necessary/applied/submitted?	Who initiated the process?	Were there potential conflicts? (yes/no)	What were the drivers of the process?
How long was the expected time frame of establishment (ad hoc/short term/long term)?	What were the actual costs of the planning and management process?	What role did the community play?	What informal rules were used/available?	Were there objections to the building permit form? (yes/no)	Who led the process?	What types of conflicts occurred?	What were the barriers to process?
Were obstacles encountered during the planning and management process? (yes/no)	What were the expected costs of the planning and management process?	What role did the forest owner play?	Did partnerships develop during the process? (yes/no)	Who submitted objections?	What stakeholders were involved in the process?	What response strategies were used?	

Table 7 continued

Planning	Financing	Role of (?)	Rules-in-use	Approval	Stakeholders	Conflicts	Barriers and drivers
What kinds of obstacles were encountered?			What type of partnerships developed?	Comment on the process.	What forms did stakeholder involvement take on?		
What decisions were important for the planning and management process?							
Where, during the process, were different stakeholders given interest?							

References

- Andersson K (2006) Understanding decentralized forest governance: an application of the institutional analysis and development framework. *Sustain Sci Pract Policy* 2(1):25–35
- Ballantyne M, Pickering C, Gudes O (2014). http://mmv.boku.ac.at/refbase/files/2014-Ballantyne_How_formal_and_informal_mountain_biking.pdf. Accessed 22 Dec 2015
- Beitl CM (2011) Cockles in custody: the role of common property arrangements in the ecological sustainability of mangrove fisheries on the Ecuadorian coast. *Int J Commons* 5(2):485–512
- Bruña-García X, Marey-Pérez MF (2014) Public participation: a need of forest planning. *iForest* 7: 216–226 [online 2014-02-27] <http://sisef.it/forest/contents/?id=ifor0970-007>
- Burgin S, Hardiman N (2012) Extreme sports in natural areas: looming disaster or a catalyst for a paradigm shift in land use planning? *J Environ Plan Manag* 55(7):921–940
- Cantiani MG (2012) Forest planning and public participation: a possible methodological approach. *iForest* 5:72–82. doi:10.3832/ifor0602-009
- Civil Code (1907) Schweizerisches Zivilgesetzbuch vom 10. Dezember 1907. SR 210. Stand 21. Dezember 2004
- Clement F (2010) Analysing decentralized natural resource governance: proposition for a “politicized” institutional analysis and development framework. *Policy Sci* 43:129–156
- Clement F, Amezaga JM (2008) Linking reforestation policies with land use change in northern Vietnam: why local factors matter. *Geoforum* 39:265–277
- Coleman EA, Steed BC (2009) Monitoring and sanctioning in the commons: an application to forestry. *Ecol Econ* 68:2106–2113
- FAO-ECE-ILO (2000) Public participation in forestry in Europe and North America. Report of the FAO/ECE/ILO Joint committee team of specialists on participation in forestry. Working paper 163, Sectorial activities departement, International labour office, Genève, Switzerland, pp 137
- Fielman P, Evans L, Fabinyi M, Foale S, Cinner J, Rosen F (2012) Governing large-scale marine commons: contextual challenges in the Coral Triangle. *Mar Policy* 36:42–53
- Hardy SD, Koontz TM (2009) Rules for collaboration: institutional analysis of group membership and levels of action in watershed partnerships. *Policy Stud J* 37(3):393–414
- Harshaw HW, Sheppard SRJ, Kozak RA (2007) Outdoor recreation and forest management: a plea for empirical data. *For Chron* 83(2):231–238
- Imperial MT (1999) Institutional analysis and ecosystem-based management: the institutional analysis and development framework. *Environ Manag* 24(4):449–465
- Jay M, Schraml U (2012) Managing city forests for or in spite of recreation? Perspectives of forest managers. *Eur J For Res* 132(1):93–105
- Kooiman J (1993) Modern governance: new government society interactions. SAGE, London
- Koontz TM (2005) We finished the plan, so now what? Impacts of collaborative stakeholder participation on land use policy. *Policy Stud J* 33(3):459–481
- Leskinen LA (2004) Purposes and challenges of public participation in regional and local forestry in Finland. *For Policy Econ* 6:605–618. doi:10.1016/S1389-9341(03)00009-1
- Mayring P (2010) Qualitative Inhaltsanalyse. Grundlagen und Techniken [Qualitative content analysis. Theoretical foundation and basic procedures]. Weinheim und Basel: Beltz Verlag, pp 144
- McGinnis MD (2011) Networks of adjacent action situations in polycentric governance. *Policy Stud J* 39(1):51–77
- Mehring M, Seeberg-Elverfeldt C, Koch S, Barkmann J, Schwarze S, Stoll-Kleemann S (2011) Local institutions: regulation and valuation of forest use-Evidence from Central Sulawesi, Indonesia. *Land Use Policy* 28:736–747
- Mokhtar MB, Toriman MEH, Hossain MAA, Tan KW (2011) Institutional challenges for integrated river basin management in Langat River Basin, Malaysia. *J Food Agric Environ* 10(2):866–870
- Mulazzani L, Curtin R, Andres M, Malorgio G (2012) Multilevel governance and management of shared stocks with integrated markets: the European anchovy case. *Mar Policy* 38(1):407–416
- Newig J, Fritsch O (2009) Environmental governance: participatory, multi-level- and effective? *Environ Policy Gov* 19:197–214. doi:10.1002/eet.509
- Ostrom E (1990) Governing the commons: the evolution of institutions for collective action. Cambridge University Press, New York
- Ostrom E (1999) Institutional rational choice. An assessment of the institutional analyses and development framework. In: Sabatier

- PA (ed) Theories of the policy process. Westview Press, Boulder, pp 35–71
- Ostrom E (2005) Understanding institutional diversity. Princeton University Press, Princeton, p 376
- Ostrom E (2009) A general framework for analyzing sustainability of social-ecological systems. *Science* 325(5939):419–422
- Ostrom E (2011) Background on the institutional analysis and development framework. *Policy Stud J* 39(1):7–27
- Pröbstl U, Wirth V, Elands B, Bell S (eds) (2010) Management of recreation and nature based tourism in European forests. Springer, Berlin, p 343. doi:[10.1007/978-3-642-03145-8_2](https://doi.org/10.1007/978-3-642-03145-8_2)
- Pütz M, Schmid S, Bernasconi A, Wolf B (2015) Urban forestry: definition, trends and Folgerungen für die Waldakteure in der Schweiz. *Schweizerische Zeitschrift für Forstwesen* 166(4):230–237
- Raheem N (2014) Using the institutional analysis and development (IAD) framework to analyze the acequias of El Río de las Gallinas, New Mexico. *Soc Sci J* 51(3):447–454
- Rudd MA (2004) An institutional framework for designing and monitoring ecosystem-based fisheries management policy experiments. *Ecol Econ* 48:109–124
- Ruppert-Winkel C, Winkel G (2009) Hidden in the woods? Meaning, determining, and practicing of ‘common welfare’ in the case of the German public forests. *Eur J For Res* 130:421–434
- Schroff U, Ammann S, Bernasconi A (2005) Bikerwaldpass Rheinfelden. Grundlagen und Umsetzung eines innovativen Finanzierungsmodells, pp 18
- Schuett MA (1997) State park directors’ perceptions of mountain biking. *Environ Manag* 21(2):239–246
- Sekher M (2001) Organized participatory resource management: insights from community forestry practices in India. *For Policy Econ* 3:137–154
- Snell M, Bell K, Leahy J (2013) Local institutions and lake management. *Lakes Reserv Res Manag* 18(1):35–44
- Thiele G, Devaux A, Reinoso I, Pico H, Montesdeoca F, Pumisacho M, Andrade-Piedra J, Velasco C, Flores P, Esprella R, Thomann A, Manrique K, Horton D (2011) Multi-stakeholder platforms for linking small farmers to value chains: evidence from the Andes. *Int J Agric Sustain* 9(3):423–433
- Toriman ME, Mokhtar MB, Hossain MdAA, Abdul Aziz NA, Mohamad S, Hashim NMD, Ahmad S, Ali N, Fuad M, Habibah MJA, Hamzah J, Hussainet A (2012) Social leaning approach in integrated river basin management-lessons from the Langat River Basin, Malaysia. *Adv Nat Appl Sci* 6(1):42–51
- Verlic A, Arnberger A, Japelj A, Simoncic S, Pirnat J (2015) Perceptions of recreational trail impacts on an urban forest walk: a controlled field experiment. *Urban For Urban Green*. doi:[10.1016/j.ufug.2014.12.004](https://doi.org/10.1016/j.ufug.2014.12.004)
- Wilkes-Allemann J, Pütz M, Hirschi C, Fischer C (2015a) Conflict situations and response strategies in urban forests in Switzerland. *Scand J For Res*. doi:[10.1080/02827581.2014.1002217](https://doi.org/10.1080/02827581.2014.1002217)
- Wilkes-Allemann J, Pütz M, Hirschi C (2015b) Governance of Forest Recreation: analysing the role of stakeholders and institutions using the institutional analysis and development (iad) framework. *Environ Policy Gov*. doi:[10.1002/eet.1668](https://doi.org/10.1002/eet.1668)
- Yin RK (2009) Case study research: design and methods, vol 5. Sage, Thousand Oaks