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Evolution and new potentials of landscape commons: Insights from Japan and Slovenia

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ABSTRACT

Commons were traditionally associated with rural societies, but socioeconomic changes have triggered new forms of commons linked with urban areas. Despite an emerging literature on these new commons and their connection to landscape management, more knowledge is needed. This study focuses on various forms of commons and their contribution to landscape management in Japan and Slovenia. The aim is to gain insights into the specificities of such commons, explore their evolutionary aspect, and to investigate their governance challenges. Empirical analysis was based on literature, web search and in-depth interviews. The study reveals 1) a great diversity of commons related to landscapes, 2) the evolution of some traditional commons into so-called 'transforming commons', whose main characteristics are the greater involvement of non-owners and the linking of rural–urban areas, 3) new types of commons developed with different resources, mainly in urban areas, and 4) in addition to material benefits these commons also provide non-material aspects and social benefits. The analysis also shows that all commons face governance and social challenges due to ageing of participants, challenging legal procedures, and difficulties in participating in collective actions.

1. Introduction

The term 'commons' originates in conventional English as a legal term for common property. It refers to the way communities in medieval Europe managed land and other resources essential for the survival of local communities that were 'held in common', and how this use of common property was regulated. Traditional commons are based on commoners, i.e. people jointly using local resource(s) in long-term continuity over many generations (Petek and Urbanc 2007; Haller et al. 2021). Although commons are still preserved in some countries (e. g. for the European Alps, see Kissling-Näf et al. 2002; Gatto and Bogataj 2015; Haller et al. 2021; for Norway, see Berge 2003; for Scotland, see Callander, 2003; for Switzerland and Kenya, see Baumgärtner et al. 2010; for Tanzania, see Fisher et al. 2010; for Kenya, see Kaye-Zwiebel and King 2014; Mulatu et al. 2014; for Japan, see Shimada 2014; for Nepal, see Chand et al. 2015; for Indonesia, see Dunning 2015; for India, see Unnikrishnan and Nagendra 2015; for Mexico, see Monroy-Sais et al. 2016), many have been lost or exist under severe pressure due to economic restructuring, socio-cultural recomposition (Myrvang Brown 2006), evolving policy frameworks and administrative regulations

(Premrl et al. 2015).

The meaning of the term commons has evolved, and today "it can be used to refer to a broad set of resources, natural and cultural, that is shared by many people" (Anderies and Janssen 2013, 3). In addition to commons, other terms with subtle differences in meaning include 'common property regime' and 'common-pool resources' (hereafter CPRs) (McKean 2000; Hirokawa 2013). The latter term typically stands for natural resources with two basic characteristics, namely subtractability and non-excludability (McKean 2000; Ostrom et al. 2002; Ostrom 2005). This makes CPRs prone to degradation, therefore they need to be governed if they are to be sustained. On the other hand, McKean (2000, 30), referring to previous research (Bromley 1992) points out that the common property regime refers to a form of shared private property with "access limited to a specific group of users who hold their rights in common". Rights, and more specifically a reduction in rights, have triggered research based on new aspects of commons, such as commoning and anticapitalist commons (Fournier 2013; Caffentzis and Federici 2014; Berlant 2016), following de Angelis (2007) Linebaugh (2009) and Bollier and Helfrich (2012).

Numerous examples from various parts of the world state that

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communities through **collective action** can govern CPRs without resulting in their degradation (e.g. Ostrom 1990, 2010; Bromley 1992). Collective actions “occur when a number of people work together to achieve some common objective” (Dowding 2013). The types of activities include governing common forests, pastures and water resources, tending community gardens, and planting trees. The discourse on commons became permeated by the notion of collective actions advocated by two influential scholars who emphasised the contrasting roles of collective actions in resource management. Hardin (1968) puts the blame squarely on individual overuse for the *tragedy of the commons*, while Ostrom (1990) argued convincingly that proper governance can prevent resource depletion. However, although many CPRs are governed as commons, not all CPRs are commons and not all commons are CPRs (Šmid Hribar et al. 2018). In this study, we understand **commons both as shared resources and also as an institution/a governance regime** behind the collective use of resources.

In the past, the benefits of commons were of key economic importance for entire communities, whereas today their contribution is seen as more diverse. Collective use that has been practised on a limited scale has shaped certain parts of rural landscapes (e.g. mountain pastures). In addition to direct material benefits, today greater importance is placed on the contribution of such landscapes to wellbeing and the provision of non-material benefits, such as recreational opportunities, biodiversity preservation and identity creation (Šmid Hribar et al. 2018). In addition, commoner organisations can be crucial for the sustainable use of natural resources, the provision of ecosystem services/nature contribution to people (hereafter: NCP) and the management of cultural landscapes (e.g. Duraiappah et al. 2014; Haller et al. 2021). Ecosystem services are understood as benefits which people receive from ecosystems that contribute to human well-being (Millennium Ecosystem Assessment, 2005) while NCP are “all the contributions, both positive and negative, of living nature ... to people’s quality of life” (Díaz et al. 2018, 270). Thus, it is not surprising that the concept of commons has recently been expanded and transformed in order to include these multiple contributions (e.g. Berge 2003; Jones 2006; Hess 2008; Takeuchi 2010; Woestenburg 2018; Haller et al. 2021).

In this study we precisely focused on **commons related to landscapes and landscape management**. We were not interested in new commons *per se* (e.g. Hess 2008), but in rare studies that examine the potentials of commons on landscape management. In this regard, the following terms emerged: ‘urban commons’ (e.g. Hess 2008; Feinberg et al. 2021), ‘new commons’ (e.g. Berge 2003; Duraiappah et al. 2014), ‘mixed commons regime’ (e.g. Galappaththi and Nayak 2017) and ‘transforming commons’ (e.g. Haller et al. 2021). According to Duraiappah et al. (2014, 95), **new commons** related to landscape management “are understood both as a system of co-management of ecosystem services and biodiversity within private and public land and as a single system to produce a bundle of ecosystem services for direct and indirect use by society”. Based on literature, new commons differ from traditional commons in several aspects. First, several types of resources are shared at multiple levels (in contrast to a single resource or single level) or have a variety of owners and beneficiaries who have responsibility for them (Berge 2003; Hess 2008; Pieraccini 2015). Second, new commons tend to exist on a much larger, often global level, while at the same time, there is a growing sense of commons at the local level (Hess 2008). Another difference lies in the ownership of resources. The ground (soil) and the natural resources provided there (e.g. grass, trees, minerals, water, game animals) are owned separately in some cases (Berge and McKean 2015), in contrast to traditional commons where the local community owns both ground and resources. However, the commonalities between traditional commons and new commons can be seen within collective action (Jones 2006). Some examples of new commons related to landscapes could be environmental protection, goods and services provided by nature such as watershed protection and disaster mitigation (Berge 2003), or the ‘Heathland Farm’ which is a combination of nature conservation and food production in the

Netherlands (Woestenburg 2018). According to Feinberg et al. (2021, 2) new commons are closely related to **urban commons** and urban context encompassing a typical ‘complex ecosystem of places, people and machinery, bound by institutions’. In Japan, new commons have been recognised and broadly defined as a novel, shared management system (Takeuchi 2010, 891).

The ‘**mixed commons regime**’ refers to regimes (e.g. under private, communal and state ownership) and property (mixed commons property), and ‘**transforming commons**’ refers to the institutional transformation related to the adaptation of the Swiss commons to state changes in the nineteenth century (Haller et al. 2021). It is important to distinguish ‘transforming commons’ from the term ‘transformed commons’, as the latter refers to a transformation of the resource (e.g. Unnikrishnan and Nagendra, 2015). When examining urban agriculture as commons in Berlin, Clausen (2015, 5) used the term transforming commons to explain ‘the process of transforming commons into commodities, alternatives into lifestyles and poor neighbourhoods into gentrified areas’ through experimental activities of converting vacant land into an urban garden.

Despite their evident and proven importance, commons and the traditional landscapes they have shaped are rapidly disappearing, resulting in loss of their numerous benefits (Shimada, 2015; Woestenburg 2018; Baur and Nax 2021). On the other hand, we are witnessing the seeds of transformation and new forms of commons related to landscape management including management of ecosystem services/NCP (e.g. Duraiappah et al. 2014; Rodela et al., 2019). However, the issue of how commons can affect landscapes is still under-researched and under-theorised (e.g. Woestenburg 2018; Hirahara 2020). Consequently, the new terms mentioned above that have emerged recently are still abstract and used inconsistently. Our study aims to fill this gap by analysing Japanese and Slovenian commons related to landscape management in order to gain new insights into the specificities of such commons, to explore their evolutionary aspect, and to investigate their governance challenges. Considering our previous research on commons (Petek and Urbanc 2007; Duraiappah et al. 2014; Saito and Ichikawa 2014; Šmid Hribar et al. 2015; Šmid Hribar et al. 2018; Rodela et al. 2019; Saito et al. 2020; Urbanc and Šmid Hribar 2021; Chien et al. 2022), we are aware that in both countries there are different types/forms of commons so our aim was to carry out an overview of existing commons related to landscape management. Furthermore, we use case studies to provide a better understanding of how local knowledge and expertise can be integrated in community-based landscape management. Lessons learned have the potential to be transferable to other areas and could contribute to alternatives for landscape management, especially for the management of traditional landscapes with diverse land uses currently facing various challenges (ESF 2010). Specifically, the study aims to:

Specific Objective SO1: Identify various forms of commons associated with landscape management in Japan and Slovenia.

Specific Objective SO2: Investigate similarities and differences between Japanese and Slovenian commons by reviewing the components, ecosystem types, spatial and temporal level of landscapes, benefits and beneficiaries (consumers), owners (suppliers), and other stakeholders.

Specific Objective SO3: Explore governance challenges of selected commons.

2. Materials and methods

2.1. Study area

The study looks at commons in Japan and Slovenia. **Japan** lies on the eastern edge of the Eurasian continent and is an arc-shaped archipelago stretching some 3,000 km from north to south (Ministry of the Environment, Japan: MOEJ 1997). The terrain is rugged, about three-quarters of the country is mountainous, and one-third of the country is forested. Most of Japan has a warm and humid climate with four distinct

seasons; however, there is a significant difference in climate between the north and the south. These climatic and topographical conditions shape the natural environment in Japan and provide rich biodiversity. **Slovenia** is located in the heart of Europe at the intersection of the Alps, the Pannonian Basin, the Dinaric mountains and the Mediterranean. It is not surprising that the most important geographical feature of Slovenia is its rich landscape diversity (Perko and Ciglić 2020). One of the most significant elements is forest, which covers 58 % of the country (SiStat 2021) and is often associated with mountain and hilly landscapes, which make up 62 % of Slovenia (Perko and Ciglić 2020).

The two countries are located on different continents (Asia, Europe) and differ in size (in terms of territory (19 (Japan) vs 1 (Slovenia)), population (60 vs 1), population density (3.2 vs 1) and economic power (GDP total: 90 vs 1) (The World Factbook 2021)) and socio-cultural-political aspects (long vs short statehood traditions, Shinto and Buddhism vs Christianity, distinct vs eclectic cultures). In both countries, however, traditional landscapes are currently under threat due to modern processes (e.g. depopulation of rural areas, intensification of agriculture, urbanisation) (Duraiappah et al., 2012; Saito and Ichikawa 2014; Gabrovec and Kumer 2019; Ribeiro and Šmid Hribar 2019; Gabrovec et al. 2020; Horvat and Žiberna 2020; Ribeiro et al., 2021).

2.2. A general overview of the situation of commons and collective actions in Japan and Slovenia

Japan and Slovenia are known to have a rich tradition of commons and collective actions for governing common-pool resources (Petek and Urbanc 2007; Sarker 2013; Sarker et al. 2015; Šmid Hribar et al. 2018).

In rural **Japan**, people have collectively managed local forest and (semi-natural) grassland resources using the traditional 'iriai' (communal) system (Shimada 2014; Muroi 2021). Iriai can be used collectively by the local inhabitants who have specific rights to procure timber, firewood and other natural products. Iriai institutions were largely established during the Edo Era (1603–1867) (Furushima 1956). Their distinctive feature was that the residents themselves established detailed rules about the ways, dynamics and quantities of harvesting for each product and each household (McKean 1992). The iriai system was also applied to sea and river fisheries (Akimichi 2014). Collectively managed and utilised iriai forests, grasslands, rivers and seas were significant components of Japanese cultural landscapes comprising a mosaic of different ecosystem types and human settlements (Duraiappah and Nakamura, 2010; Akimichi 2014).

After World War II, the demand for firewood and grasses declined with economic growth, and there was a shift to a modern lifestyle and imported timber, thus diminishing the incentive to maintain management of iriai forests and grasslands (Shimada 2014). In addition, there was a decline in iriai that had been generated by interpersonal alliances and collaborative bonds to support local autonomy due to the depopulation of rural areas in line with economic growth and urban development (Murota 2009; Takeuchi et al. 2012). Iriai forests and fields were estimated to account for 8.6 % of the total forest area in 1980 (Kobayashi 1989). Recently, there has been a movement to revitalise the commons and an increasing importance attached to multi-level benefits from natural resources (Shimada 2015). This is leading to the emergence of various new commons for landscapes rich in natural resources (see Yamamoto 2013).

In **Slovenia**, commons as a formal entity have their origins in common lands that were formed as part of land reform of the mid-nineteenth century, when less favourable land, especially less accessible forests and mountain pastures, especially in the alpine and karst areas (Petek and Urbanc 2007; Premrl et al. 2015), remained undivided (Petek and Urbanc 2007). However, as an informal practice, commons have a much longer tradition. Common lands used to be managed jointly through collective actions of agrarian communities (hereafter: ACs). The ACs (about 1000, unofficially up to 1500 (Cerar et al. 2011)) were abolished in 1947 with the introduction of the socialist system, and all property

was nationalised (Agricultural Communities Act 1947). The size of the affected land area is unknown. The Denationalization Act (1991) after the collapse of the socialist system allowed for the restitution of common land and formed the basis for The Act on Reestablishment of Agricultural Communities and Restitution of their Property and Rights (1994) which returned the property to former ACs members under joint ownership or common property. In 2013, 638 ACs were registered (Premrl 2013), of which 48 had pending restitution procedures. At that time, ACs managed 3.67 % of the territory of Slovenia.

Recently, both countries have witnessed a new trend of transforming traditional commons, as well as the emergence of new forms of commons and collective actions (Duraiappah et al., 2014; Kamiyama et al., 2016; Takeuchi et al., 2016; Urbanc and Šmid Hribar, 2021; Poljak Istenič et al., 2023; Saito, 2019).

In light of the above, these two countries have been deemed suitable as case studies for gaining new insights into how commons and collective actions can contribute to landscape management. Comparative analysis can also help us by explaining differences and similarities, allowing us to gain a better understanding of a problem, establish relationships between phenomena, provide valid reasons and subsequently respond to relevant questions.

2.3. Research design and selection criteria for case studies

This study was carried out in two phases (Fig. 1). In the first phase, we conducted a literature and web search to find existing commons and collective actions in both countries. Both research literature and grey literature were included. The selection criteria included land-related and ocean/sea-related commons and collective actions that have implications for **natural resources and landscapes**. This phase ended with documentation and selection of a total of 49 commons, including 29 cases in Japan, and 20 in Slovenia (see Appendices A.1 and A.2). We tried to find as many different types of commons as possible in order to gain comprehensive and widely relevant results. If a significant number of cases occur within a type (e.g. SI1 Traditional agrarian communities in Slovenia), we consider all of them as a general case. However, if we discovered a specific case based on our prior knowledge that stood out thanks to the proactivity of its members, we listed it separately (e.g. SI3).

Given the lack of data available (especially on the challenges, benefits and roles of governance in a landscape), we explored four cases in more detail in the second phase of the analysis, which aimed to explore the primary governance challenges of commons in specific contexts. Initially we attempted to select one traditional case and one non-traditional case in both Japan and Slovenia at the second phase of analysis, regardless of location. Since the first phase analysis showed many urban–rural interaction cases in Japan, we selected one case (JP26) which originated from traditional commons, but has evolved as 'transforming commons' (explained in the following section) in collaboration with volunteers from neighbouring urban areas.

2.4. Conceptual framework, variables and data collection

The study focuses on both traditional commons and emerging new forms of commons and also tracks them by their location (i.e., rural or urban). **Traditional** types were associated with transmission through time and continuity. We followed the definition of Poljak Istenič (2012, 77): "... tradition [...] usually denoting a phenomenon or a set of phenomena that have been passed on from generation to generation and finally settled in the life of a community". In the case of Japan, those that have been handed down for hundreds of years were denoted as 'traditional', while others that arose after the rapid economic development in the 1960s and 1970 s were designated as 'non-traditional'. Similarly, in Slovenia, cases with long-term continuity without further change were indicated as 'traditional'. The dimension 'non-traditional' is associated with new forms of organisations that do not adhere to past practices or conventions. Furthermore, the category '**transforming commons**' was

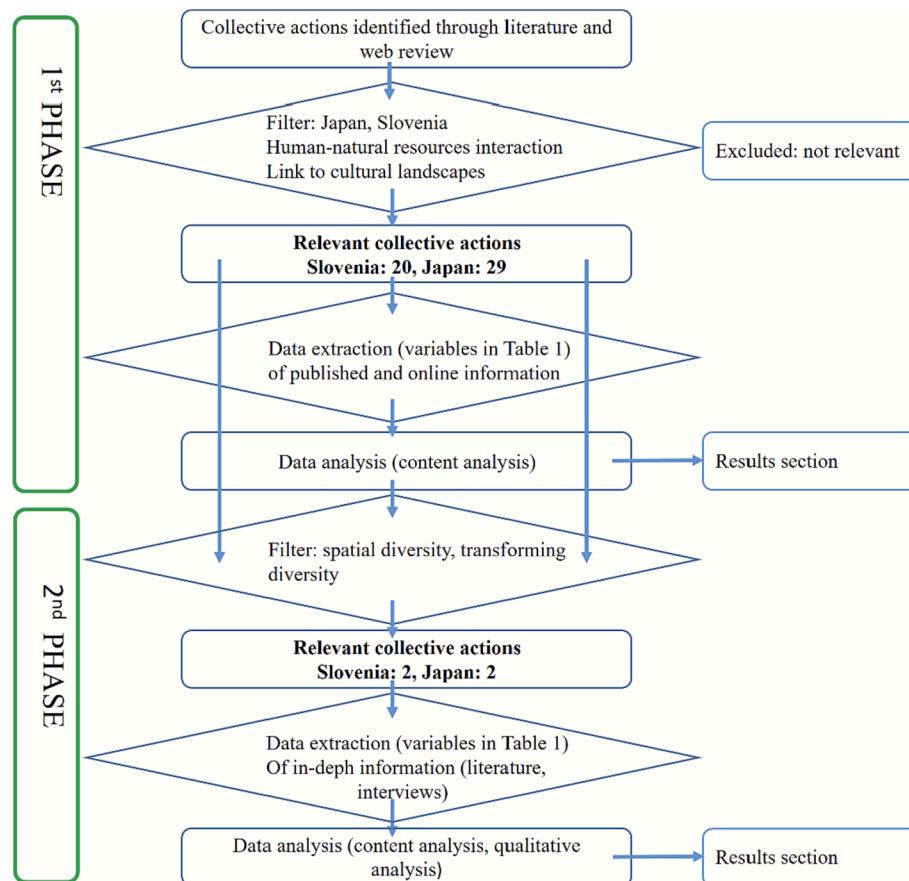


Fig. 1. A flow diagram of case study selection in phases 1 and 2.

introduced. By this, we mean commons that have a clear origin in traditional commons but have evolved in some aspects and embraced new practices, for example of benefit distribution or governance models.

Cases were also categorised according to their location in **rural** or **urban areas**. A rural area is a geographical area outside of towns and cities (WorldNet Search 2021), while an urban area is defined as “a human settlement with a high population density and infrastructure of the built environment. Urban areas are created through urbanisation and are categorised by urban morphology as cities, towns, conurbations, or suburbs” (Urban Area, 2021). In addition, material and non-material dimensions of commons were analysed by using concepts of tangible and intangible elements as seen in literature discussing urban commons (Feinberg et al. 2021).

In order to capture a more comprehensive perspective on benefits provided by commons we applied principles from NCP. We relied on IPBES classification (Díaz et al., 2015; Díaz et al. 2018) which is considered more holistic than the conventional concept of ecosystem services. Based on a survey of researchers and practitioners carried out in Latin America in 2018, quantitative researchers tend to use ecosystem services whereas qualitative approaches prefer NCP (Pires et al. 2020). We make no distinction and both terms can be used in a complementary way. Since our research mainly applies qualitative methods, we use the term NCP. Finally, we also considered the **social aspects** of the benefits which commons can provide to people. As an essential form of capital for long-term protection of ecosystems and human well-being, Brondízio et al., 2009) focused on social capital by reviewing the conceptual discussion and argued that it can facilitate individual and group cooperation on shared interests and the organisation of social institutions. The popularised definition of social capital by Putnam et al. (1993) is “features of social organisation, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions.” As

Brondízio et al., 2009) indicated, social capital does not wear out with use but rather improves with proper use, it can be said that the social capital and cooperative activities enhance each other. Our study used the three aspects of social capital by Putnam, i.e. trust, norms and networks, and surveyed whether those participating in the commons had a sense of these aspects.

An extensive set of **27 variables** (see abbreviated version in Table 1 and full version in Appendix B) was used for data extraction. We commenced with the Social-Ecological System (hereafter: SES framework; Ostrom 2009) for comparing commons, but we did not completely follow its linearity. Our interest went beyond commons only; we strived to identify conceptual overlaps with NCP. Further, addressing the specific objectives did not require all aspects of the SES framework to be covered; rather, the focus was on resource systems and governance systems. By drawing on practices of several studies (Bevir, 2013; McGinnis, 2011; Rodela et al., 2019; Tucker et al., 2023) we also introduced variables related to NCP and social capital. The variables were formulated as questions of two basic types: (i) open-ended questions and (ii) closed-ended questions.

Data collection was done using Excel spreadsheets based on the variables in Table 1 (for details, see Appendix B). Four categories (i.e. basic information, resource outline, contributions to people, beneficiaries/users) were applied in both phases. Data extraction for the first phase was conducted by reviewing published and online materials (especially in Slovenia, collective actions are mainly presented online and not yet documented in scientific articles). In the second phase, we conducted semi-structured online interviews with representatives of the commons. Each national team conducted the data collection for its respective national case studies after thorough joint discussions in workshops and via regular online meetings. Pursuing a solid central framework and intercoding agreement, the team worked in an

Table 1

Variables and phases of data acquisition (linkages to Social-Ecological System (Ostrom 2009) are added in brackets in *italic*). For details, see Appendix B.

Indicators	
Phase 1	A. Basic information: Geographical location (country) (<i>RS9 Location</i>)*; Geographical level (<i>RS9 Location</i>)*; Level of preservation transformation (traditional, non-traditional, transforming); Urban/rural character (urban, rural)
	B. Resource outline: Material/non-material; Type of environment (refers to source/production place, for instance coastal, forest, grassland) (<i>RS1 Sector</i>)*; Resource sector (refers to a sector which manages a resource, for instance fishery)
	C. Contributions/benefits: Nature's contribution to people (material, non-material, regulating); Social capital/relational values (for instance social networks, trust, values) (<i>Related to U6 Norms/Social capital</i>)*; Multiple benefits
	D. Beneficiaries/users: Types of beneficiaries/users (<i>U1 Number of users</i>)*
Phase 2	A. Basic information: Origin/foundation (year); Actual size (geographical extent or number of owners/funders/users; mid-2020) (<i>RS3 Size of resource system</i>)*; Ideology and motivation; Aspirations, orientation and plans; Challenges and stability (<i>Related to GS, I, O</i>)*
	B. Resource outline: (verification of the phase 1 data)
	C. Contributions/benefits to people: (verification of the phase 1 data)
	D. Beneficiaries/users: (verification of the phase 1 data)
	E. Ownership situation: Type of owner(s) by law (<i>Related to GS4 Property-rights system</i>)*; Are the owners local?
	F. Use rights: The right to use the resources (<i>GS4 Property-rights system</i>)*; Formality level (formal or informal) (<i>GS4 Property-rights system</i>)*; Duty to manage the resources (<i>GS4 Property-rights system</i>)*; Formality level (formal or informal) (<i>GS4 Property-rights system</i>)*
	G. Governance: Governance, ownership and/or formal or informal rights issues (<i>GS1 Government organisations</i>)*; Governance problems (<i>GS1 Government organisations</i>)*; Rules (<i>GS5 Operational rules</i>)*; Compliance with the rules (<i>GS8 Monitoring and sanctioning processes</i>)*; Sanctions (<i>GS8 Monitoring and sanctioning processes</i>)*; Problems of governance (<i>related to GS</i>)*; Actors in governance processes (<i>related to GS</i>)*; Governance challenges (<i>related to GS generally and specifically to O1 Social performance measures, O2 Ecological performance measures</i>)*
	H. Conflicts: Conflicts in resource use; Conflict resolution mechanisms (<i>14 Conflicts among users</i>)*

*Linkage to Social-Ecological System framework (Ostrom 2009): Resource System (RS), Governance system (GS), Interactions (I), Outcomes (O), Users (U).

integrated way.

2.5. Data analysis

The basics of the sample, the patterns in the variables and the relationships between them were examined using Excel descriptive statistics tools. Comparison between two variables was carried out via cross-tabulation. The open-ended questions in the second phase yielded qualitative results and these were analysed qualitatively using the inductive grounded theory approach (Strauss and Corbin 1998). We expected both similar and distinct results; similar in terms of processes and outcomes of those processes, and distinct regarding driving forces and context.

2.6. Limitations

Some limitations merit acknowledgement. First, tracking diversity in different types of commons led to considerable variety in the selected cases and was most pronounced in Japan. The selection of case studies reflects the contextual differences between the two countries. Second, in the first phase of the analyses, the main limitation was a large quantitative and qualitative difference in the published literature between Japan and Slovenia, with much more scientific literature available for Japan. In contrast, most Slovenian cases had only a brief description on the Internet. However, although there was a difference in the published research literature and grey literature available in both countries, the quantitative analysis was conducted to reveal the degree of written explicit recognition of the types of commons and their contribution on

the premise that the amount of literature reflects the recognition level. All this could, to some extent, influence the differences in the diversification of the commons in the two countries. However, awareness of this gap is an important step toward addressing the need for further research and knowledge creation.

Third, we found only a limited number of relevant studies on new and transforming commons, limiting our ability to draw possible parallels and build an explanatory framework of analyses. Our literature search was limited to the languages (English, Slovene and Japanese) which we were familiar with and to the items listed in Scopus. We are aware of knowledge in non-Western countries and non-English language research.

3. Results

3.1. Results of first phase analysis

This study revealed that non-traditional commons are more diverse than traditional ones (which have only slightly evolved), and they occur within either rural or urban areas, or through interactions between rural and urban areas (Fig. 2).

We have distributed the cases according to three axes (Fig. 2): x is from material to non-material, y is from urban to rural, and z is from non-traditional to traditional. In Japan, the highly noticeable cases are new commons that cross both urban and rural areas ($F = 8$ and $H = 9$ cases), including the cases involving urban residents that manage natural landscapes in rural areas. In Slovenia, the rural cases stand out ($E = 3$ and $G = 7$). Generally, all cases show a prevalence towards material resources.

Fig. 3 shows the proportion of cases covering different types of environments, broken down by spatial level. It should be noted that multiple environments could be chosen, thus 100 % refers to all cases of each country covering the environment. The aggregated results (Fig. 3) of the spatial data show that in Japan, about half of the cases involve actors or beneficiaries from across the country (national = 52 %) and one-third involve locals. In Slovenia, on the other hand, the vast majority of cases are small-scale actions involving local residents (local = 80 %), and only one is extended to the national level. The regional level (i.e. subnational such as province or prefecture) is presented in similar numbers in both countries, more precisely 17 % in Japan and 15 % in Slovenia.

The analysis of the resource systems (Fig. 4) shows that 70 % of Slovenian cases target a single environment type, on average a case includes 1.4 environmental types. About half of the Japanese cases target multiple environmental types with an average of 3.3. The difference between the two countries is most pronounced in water-related environments. In Japan, open ocean, coastal and freshwater environments are highly represented; however, due to geographical features in Slovenia, aquatic environments represent few cases. Forests and grasslands also occur more frequently in Japan than in Slovenia. The greatest similarities are found in cropland (e.g. common gardens) and built infrastructure, with the latter being the only type of environment that is more common in Slovenia than in Japan.

In Slovenia, 80 % of cases resources are managed within a single sector with an average of 1.2 sectors per case. In contrast, resources in more than 70 % of Japanese cases are managed by multiple sectors, with an average of 2.8 sectors per case (Fig. 4). Except for the food and forestry sectors, which are prevalent in both countries, fishery and conservation stand out in Japan and energy stands out in Slovenia; the latter is the only sector, in addition to the food sector, in which Slovenian cases are more common than Japanese. Japanese cases represented in 'Others' include religious, welfare and household sectors.

The analysis of NCP depending on location (rural, urban or cross) (Fig. 5) suggests that each Slovenian case brings an average of 3.1 types of contributions, while in Japan, each case represents about 7.2 contributions (this finding is based on available material). The most

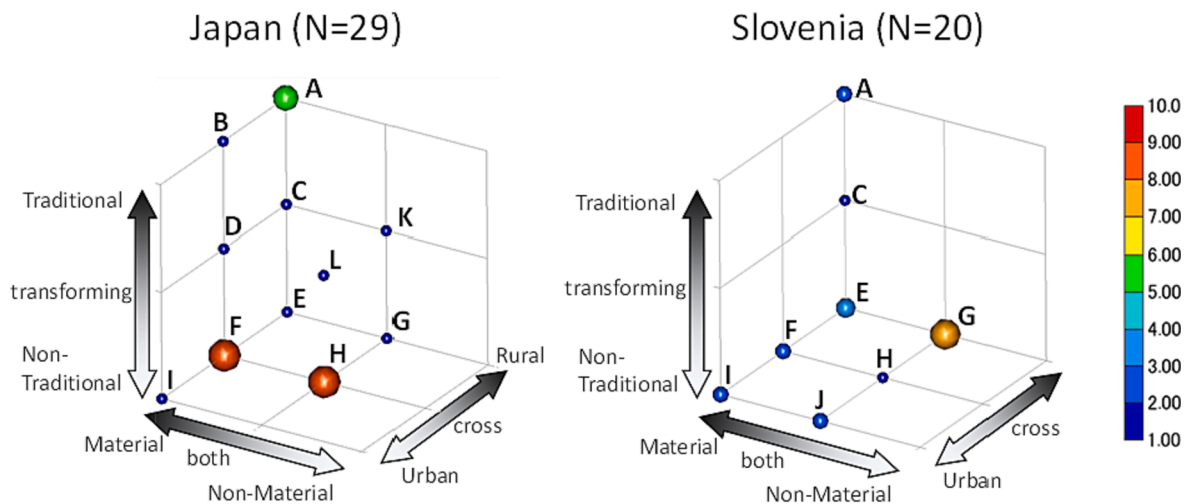


Fig. 2. The overview of cases in Japan and Slovenia (bubble size represents the number of cases).

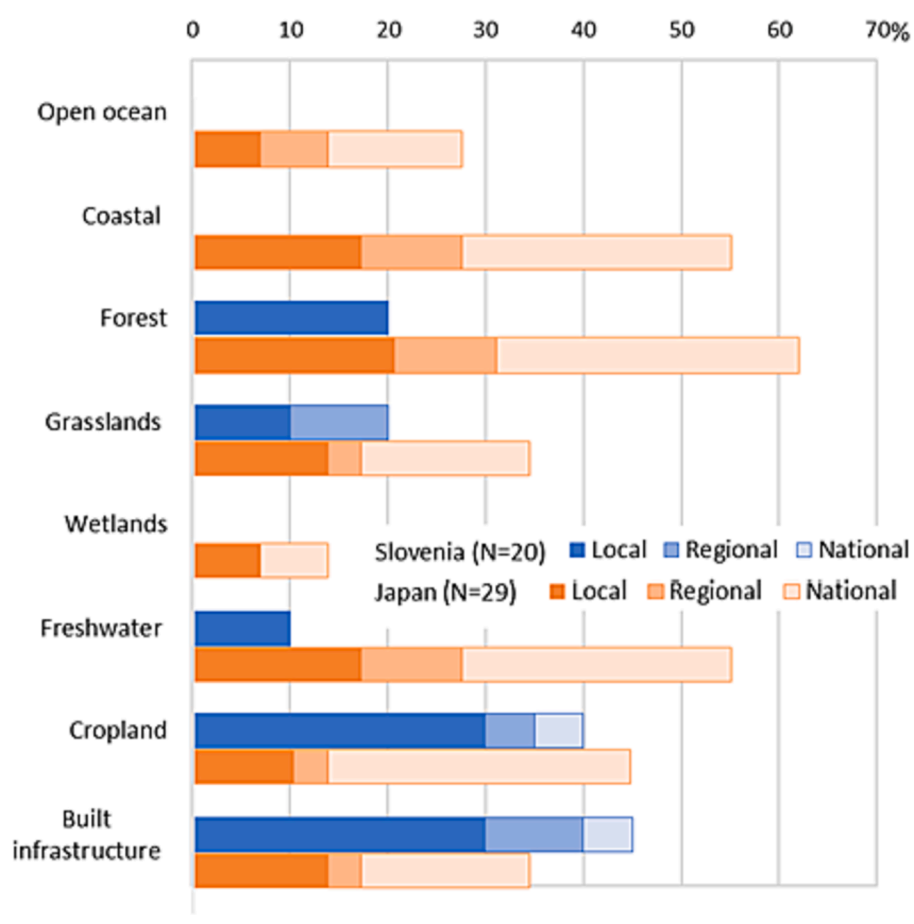


Fig. 3. Types of shared environment (multiple choice per case) across spatial level.

significant difference is in regulating NCP which, apart from habitat generation, benefit people at a broader spatial level. Regulation of the climate, regulation of freshwater quality, and regulation of hazards and extreme events are explicitly recognised and announced through collective actions in Japan. Such NCP are more commonly observed in Japan, with a greater number of cases crossing urban and rural areas. The material NCP of energy, food and feed; the non-material NCP of learning and inspiration, identity support social networks; and shared

norms and values included in social capital were pronounced as benefits for many cases in both countries.

The beneficiaries of the commons in the Slovenian cases primarily belong to a single category, whereas, in Japan, there were only two such cases (Fig. 6). Accordingly, the average per case differs between Slovenia (1.6) and Japan (3.6) beneficiaries. Another difference is that the categories of 'government administrative body' and 'society in general' are common in Japan, unlike Slovenia, where 'society in

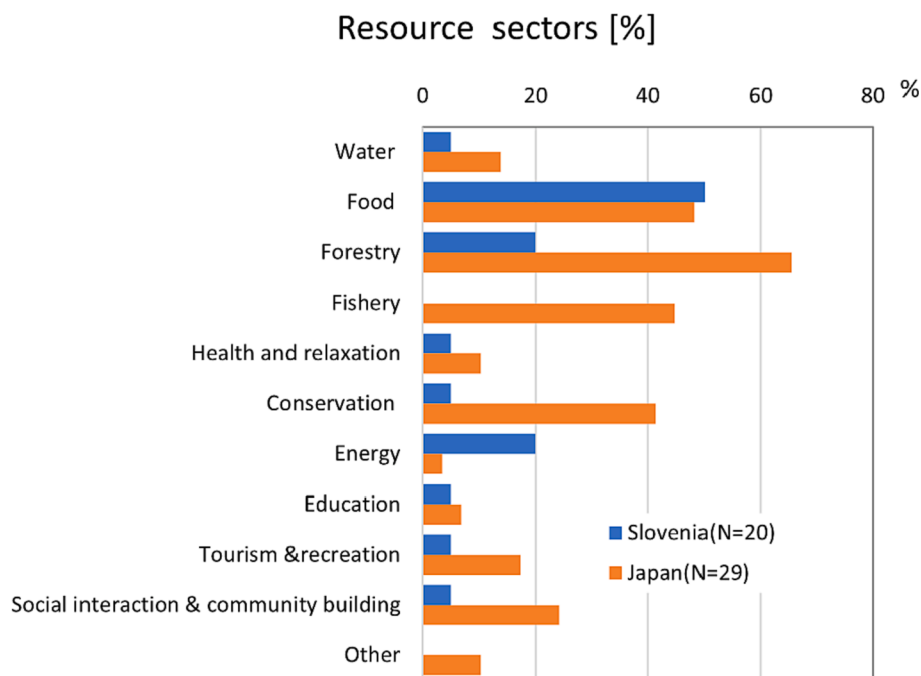


Fig. 4. Sectors which manage resources (multiple choice per case).

general' is completely absent. Local residents, organised groups and owners were the actors that were highly acknowledged as beneficiaries in both countries.

3.2. Result from the second phase analysis

Following the selection approach described in Section 2.3, we then focused on the transforming traditional commons and new commons. We selected two transforming commons from rural Japan and Slovenia. In Japan, the majority of cases had interaction between urban and rural areas. Therefore, a transforming commons that originated from purely traditional commons but that had evolved as a case crossing urban and rural areas, was selected as the second Japanese case. In contrast, the second case in Slovenia was purely new commons in an urban area. The four cases that were selected for in-depth analysis are *JP24 Shiretoko approach* and *JP26 Rural traditional commons in Ishikawa* from Japan and *SI3 Livek agrarian community* and *SI6 Community garden 'Beyond the construction site'* from Slovenia (Table 2 and Fig. 7).

JP24 The Shiretoko approach is a co-management system that involves autonomous co-management measures by local fishery operators where their traditional knowledge to balance marine biodiversity conservation with fisheries and tourism is utilised (Makino et al. 2009). The movement to introduce the co-management system was initiated in 2004, when the Shiretoko Peninsula was designated a World Natural Heritage Site. The system was a response to the decline in fisheries products after the 1990s and relied on fishermen who were motivated to sustain marine resources. Local fisheries, tourism stakeholders, scientists, environmental activists, the local nature foundation, and local and national administrative bodies created an integrated system for discussion, decision-making and feedback to enable adaptive management and determine the appropriate use of the Shiretoko seascape.

The integrated system functions to make new inclusive collective actions by using the traditional co-management of marine resources. Moreover, this is the reason it is categorised as transforming traditional commons. The goal of establishing this commons was to ensure both marine ecosystem conservation and stable fisheries through the sustainable use of living marine resources in the Marine Natural Heritage Area.

JP26 Rural traditional commons in Ishikawa have been

supported by a volunteer matchmaking system organised by Ishikawa prefectural government. The prefectural government recruits companies, university students and individuals from inside and outside the prefecture to volunteer in rural villages (Ishikawa Prefecture 2022) facing common rural challenges, i.e. severe labour shortages resulting from depopulation, and an ageing population. Residents of rural communities that request to host volunteers work with them on activities to maintain the community and its natural resources. Since 2010, when Ishikawa Prefecture launched this system, 35 communities and 500–600 volunteers per year (cumulative total per year, more than 80 % are repeat volunteers) have been involved. Normally, the collective activities are held about 30 times per year, but in 2020 and 2021 this was reduced to 10 times due to the COVID-19 pandemic. The matchmaking system enables people to carry out community activities that were previously impossible due to the severe shortage of human resources, despite the financial resources available to support natural resources. Volunteer activities have become popular in Japan, especially following the Great East Japan Earthquake in 2011 (Japanese Council of Social Welfare 2021). The retired baby boomer generation and students living in urban areas are increasingly interested in making contributions to regional communities, and companies commonly mobilise their workers for volunteer activities as part of 'corporate social responsibility'. Ishikawa prefectural government was tasked with determining where these volunteers could provide the greatest benefits, catalysing the creation of this system. Overall, the goal is to dispatch volunteers from cities to rural communities to assist in maintaining traditional rural commons including farmlands, farm roads, waterways, landscapes and culture.

SI3 Livek agrarian community is a Slovenian agrarian community based on land ownership and traditional knowledge that also contains modern elements which classify it as a transforming commons. This community consists of 96 members, and the forest is its primary natural resource. Similar to other agrarian communities, it was abolished in 1947, and its property was nationalised. The Livek agrarian community was re-established in 1996. The core activity is forest management and, to a lesser extent, grazing. Faced with possible difficulties in distributing the income from logging among the owners, some of whom had been living abroad for decades, and the limited benefits to the local community, the Board of the Agrarian Community decided to extend the circle of beneficiaries from the owners to all members of the local

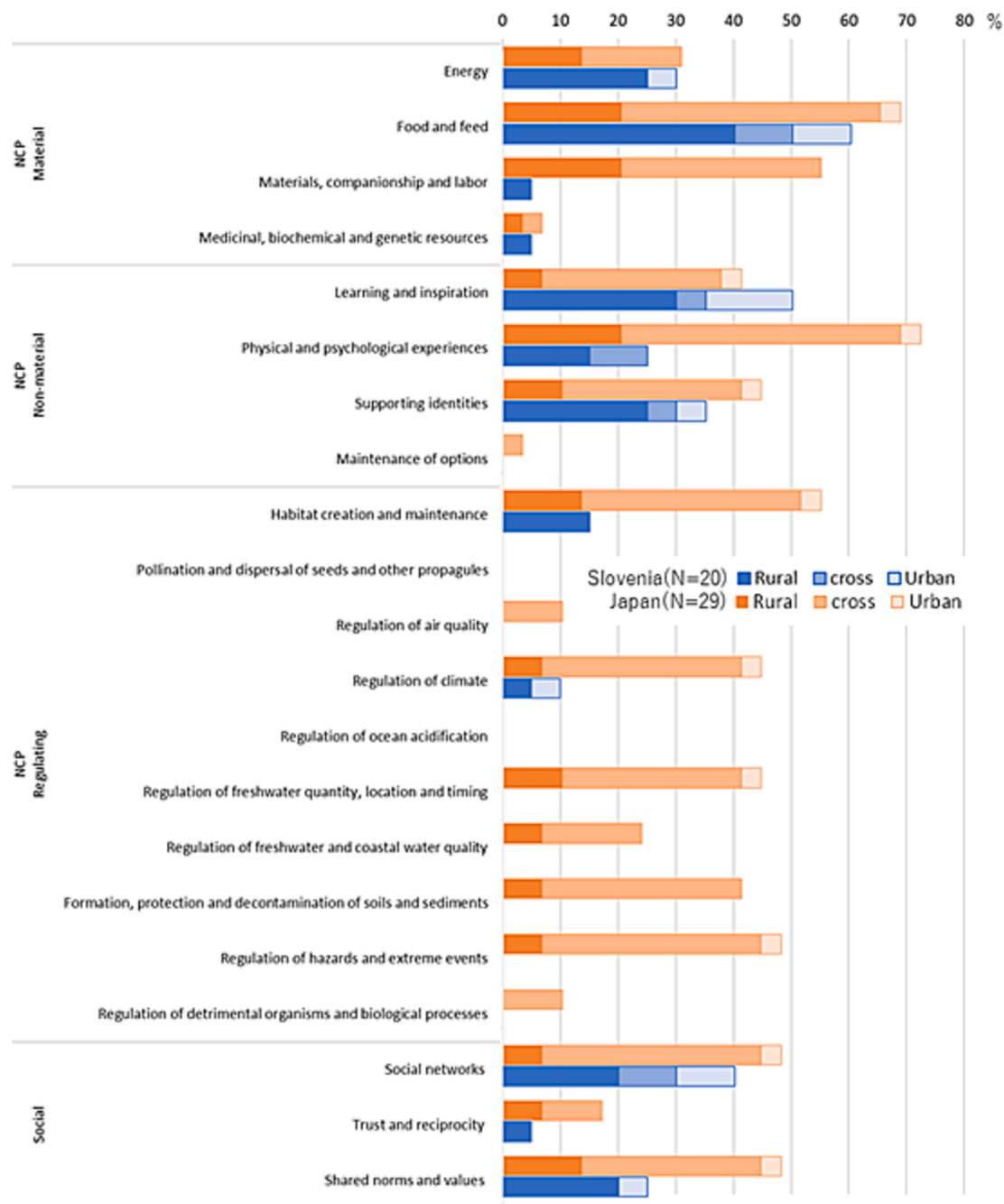


Fig. 5. Nature contribution and social capital of commons (multiple choice per case was possible).

community and provide financial support for various initiatives. Some of the recent investments have benefited small-scale infrastructure projects, sports fields, forest work training and similar. The decision, probably unique in Slovenia, to distribute the income of co-owners among the entire local community contributes enormously to community building and cohesion (Urbanc and Šmid Hribar 2021).

SI6 A Community garden 'Beyond the Construction Site' is located in a former industrial and working-class neighbourhood called Tabor in downtown Ljubljana. About 80 people take care of 40 garden beds and engage in common activities, organise events, socialise and help one another. This community garden was launched in August 2010 by the NGO Obrat (Cultural and Art Association), whose members are part of the neighbourhood. Besides being upset by the brownfield area in their vicinity, they also wanted to experiment with participation and community initiatives in planning, architecture and urbanism. During

several participatory meetings, local residents expressed the need for a green recreational space, and, together, the NGO members and residents decided to create a community garden. They reclaimed a prior construction site, cleaned the site, brought in soil and arranged garden beds, laid paths and designed a community space with a sitting area, common compost heaps and a tool shed to complement the garden beds. The motives of initiators and gardeners often differ. The latter mainly want to grow vegetables, while the initiators are more interested in creating an open space for performing different activities and experiments. This community garden represents a classroom where people can learn about gardening and ecology, as well as about the management of community spaces and their procedural and participatory development.

3.2.1. Contributions of commons

The second phase of the analysis revealed the selected four cases

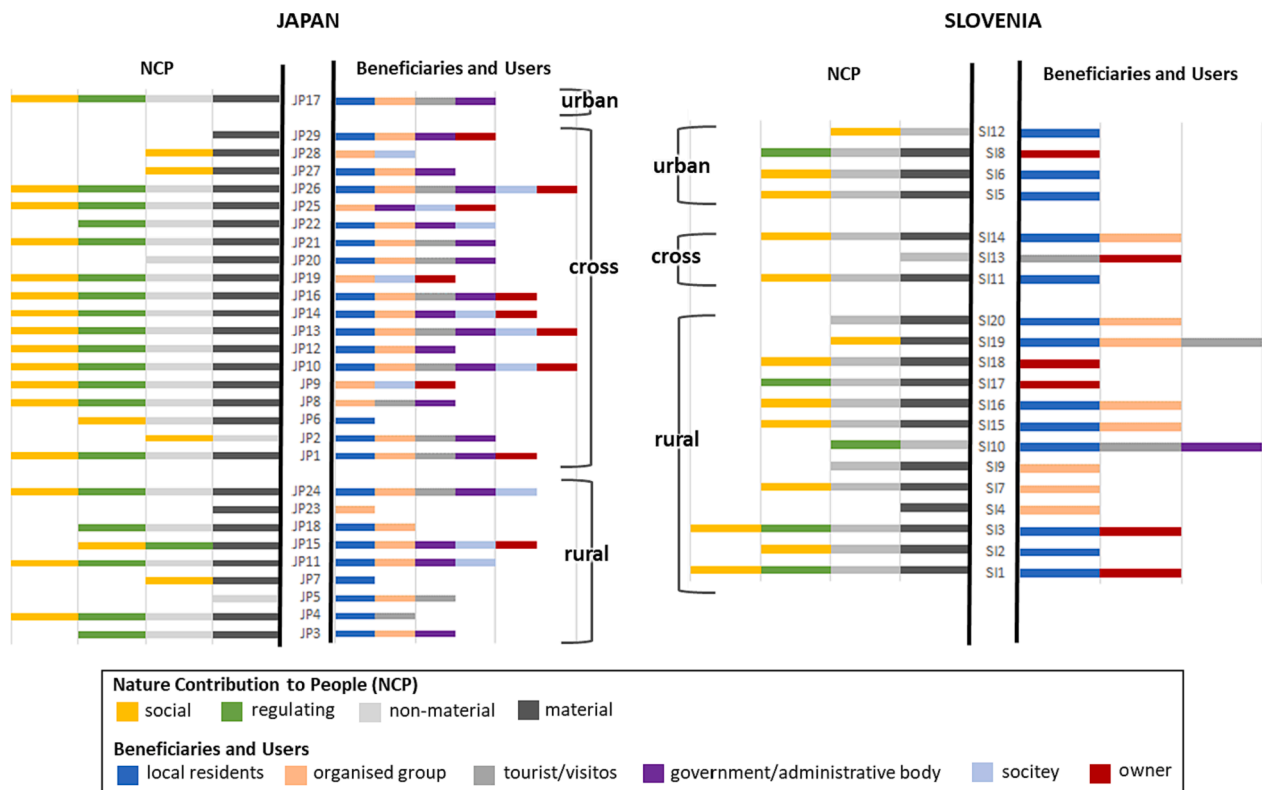


Fig. 6. Beneficiaries and users of commons (multiple choice per case).

Table 2

Basic information on the four selected case studies in second phase analysis.

	JAPAN		SLOVENIA	
Name	JP24 Shiretoko Approach	JP26 Rural traditions commons in Ishikawa	SI3 Livek agrarian community	SI6 Common garden 'Beyond construction site'
Year of emergence	2005	2010	Nineteenth century, re-established 1996	2010
Type of commons	Transforming commons	Transforming commons	Transforming commons	New commons
Area	Rural	Cross rural and urban	Rural	Urban
Size and type of resource (s) (RS Resource systems, RS3 Size of resource system;)*	22,400 ha of sea area (within the World Natural Heritage area up to 3 km from the coastline) and connected freshwater	35 communities (approximately 0.3–1.5 km ² /community) and surrounding farmlands, grasslands, forests, coastal areas, rivers and waterfronts, roads and thatched roofs	600 ha of mostly forest, but also pastures and orchards	0.1 ha of garden
Number and type of members/participants (U1 Number of users)*	3 local fishery cooperatives, 2 administrative bodies of local municipalities, local tourism companies, the local nature foundation and others	~500 to 600 volunteers per year (more than 80 % are repeat volunteers)	96 members, owners	80 members of local citizens (including children)
Type of sector(s) (RS1 Sector)*	Fishery, conservation, tourism/recreation	Water, food, forestry, fishery, conservation, tourism and recreation, social activity	Forestry	Social activity
Role in a cultural landscape	Balanced conservation and utilisation of seascape	Maintenance of various natural resources and inheritance of cultures in rural communities	Maintenance of mountain forests and pastures	Provision/maintenance of urban green areas

*Linkage to Social-Ecological System framework (Ostrom 2009): Resource System (RS) and Users (U).

provide a wide range of NCP and social capital through collective action by various benefit providers (Fig. 8). Although there are more benefit providers in Japan than in Slovenia, beneficiaries are numerous in all cases. The most common beneficiaries are local residents and governmental bodies (although they do not always take care of ecosystems providing NCP), followed by organised groups (which are most often benefit providers), tourists, visitors, and finally society in general.

The semi-structured interviews in Slovenia revealed more perceived contributions than previously found in the literature and via online research. Specifically, the following benefits were identified as the most

important in all four cases: (1) regulation of climate, (2) food and feed provision, and (3) enabling physical and psychological experience. Social capital such as maintaining trust and reciprocity, and creating shared values and norms also appear to be of immense value. A closer look at the benefits reveals that among the NCP, regulating and non-material benefits in Japan were more often mentioned by the interviewees than material ones, while in Slovenia material benefits predominated.



Fig. 7. Second phase analysis of case studies in (1) Japan: JP24 *Shiretoko approach* (Photo and copyright by Mitsutako Makino) and JP26 *Rural traditional commons in Ishikawa* (Photo by Osamu Saito) and (2) Slovenia: SI3 *Livek agrarian community* (Photo by Boris Drešček) and SI6 *Community garden 'Beyond the construction site'* (Photo by Uroš Hočevár).

3.2.2. Governance and challenges of commons

Governance issues were the main challenges found in the second stage analysis and are summarised in Table 3. In two selected cases (JP24, SI3), commoners own the natural resources, while in all four cases, commoners follow use rights with formal obligations (duties) and rules for their use. However, only one case (JP26) has a formal monitoring system while the others use informal monitoring (e.g. SI3 and SI6 follow the plan). Sanctioning for rule violations was partially introduced in JP26 and SI6. Although conflicts are presented in all four cases, conflict resolution mechanisms were only specified in two cases (JP24, SI6).

Among the many challenges to these commons, it is issues related to governance that predominate. In Japan, governance challenges are related to the operational system, fisheries, and the withholding of collective activities because of COVID-19 from 2020, while in Slovenia, the challenges are related to legal procedures and implementation of common agreements. Social challenges are related to ageing of the community, lower investment from younger generations, urban development pressure and the spread of tourism.

4. Discussion

4.1. Framing the commons in Japan and Slovenia

Although commons—irrespective of their location—share general similarities, in detail, they disclose peculiar nuances that distinguish each commons from all others. Furthermore, considering the unique national context, there are expected, but significant differences between

Japanese and Slovenian commons. Probably the most significant difference is the level of **diversity** in terms of the combination of geographic location, natural resources, NCPs providers and beneficiaries, resulting in greater complexity of Japanese commons. Unlike the Slovenian cases that tend to be less multiplex, the Japanese commons show considerable diversity in the aspects assessed, confirming the findings of Hirahara (2020) when examining the collective action in regenerating underused semi-natural grasslands. Diversification of collective actions that surpass their initial objectives was also reported in the UK (e.g. Mills et al. 2011). Differences in diversification between Japan and Slovenia likely originate from different levels of **urbanisation** of both countries. As noted by Feinberg et al. (2021), it is likely that the complex urban system produces diverse urban commons. Urban commons tend to be produced and reproduced through the encounter of the city ecosystem's elements (Borch and Kornberger 2015). Such encounters contribute to the creation of new shared understanding and collective actions (Wessendorf, 2014). While Japan is one of the most urbanised countries in the world with a 92 % urban population, Slovenia has a distinctly rural character with a 55 % urban population (The World Factbook - CIA 2021). The countryside is deeply embedded in the geographical imagination of Slovenians (Urbanc et al. 2016; Urbanc et al. 2021).

In addition, in Japan the rural population has shrunk, leading to a decrease in those engaged in primary industries (agriculture, forestry and fishery). The subsequent land abandonment has led to tourism, including eco-tourism, playing an increasingly important role for rural commons management (Hori et al. 2020). In this regard, Japan has experienced a new phenomenon of a 'related population' who

Table 3

Governance issues and main challenges for the four selected case studies in second stage analysis.

Name	JAPAN		SLOVENIA	
	JP24 Shiretoko Approach	JP26 Rural traditional commons in Ishikawa	SI3 Livek agrarian community	SI6 Common garden 'Beyond construction site'
Ownership (related to GS4 Property-rights system)*	Co-ownership of fisheries rights (use right) are given to local fisheries cooperative	Individual private owners, communities, administrative bodies (roads and water channels)	Non-profit organisation (agrarian community based on individual private owners)	Municipality
Use rights (related to GS4 Property-rights system)*	Formal (fisheries rights)	Formal (under the permission of the host community)	Formal (to buy fuelwood; 5–6 members have a right to graze in the common pastures around settlements; some members have a right to have gardens and orchards close to their homes)	Formal (temporary use of the previously degraded land)
Duties (related to GS4 Property-rights system)*	Formal (the detailed management practices decided by internal discussion among fisheries as the self-directed management)	Formal (members have to participate in the activities, following the instructions of the host community)	Formal (members have to participate in joint activities, 6 h twice a year. If they do not have time, they can make a financial contribution instead (8 € per hour))	Formal (written agreement with the municipality of Ljubljana)
Rules in use (GS5 Operational rules)*	Formal and informal	Formal	Formal and informal	Formal and informal
Monitoring system for following the rules (GS8 Monitoring and sanctioning processes)*	Informal monitoring system –Autonomous (mutual) monitoring within cooperatives	Formal system; one staff from the Ishikawa Agriculture and Forestry General Office (branch of Ishikawa Prefecture) always participates in the activity, and a report is submitted to the prefectural office organising this system after the activity is completed	They follow the plan but without a formalised monitoring system	They follow the plan but without formalised monitoring system
Sanctioning rules' violation (GS8 Monitoring and sanctioning processes)*	Not available	Slightly (although there is no explicit violation, warnings have been issued to volunteer participants when complaints were received from the host community)	Not available	Slightly (try not to sanction unless it is really necessary; so far, they have only sanctioned one violation where garden beds were taken for not tending them).
Making decisions	Dialogue/discussion-based bottom-up approach The rules were adopted by stakeholders based on advice from the science council and the regular report on the outcome of the rules	Top-down The Prefectural Office is a fundamental decision-maker in this system, and the host communities decide on their participation and activities within the scope of this system. Volunteers join by following the activity plan made by the host communities.	Mixed approach (first bottom-up, then top-down) The board has the authority to make decisions based on the annual plan adopted by all the members	Bottom-up Decisions are made through dialogue at the joint meetings (2 per year) –every-one is allowed to participate in the decision-making process.
Governance challenges (related to GS Governance systems generally)*	Cooperation with Russian researchers and fishers who share the same sea area.	Increased workload of the prefectural office organising this system (As the age of participants rises, not email but letters must be mailed, it also makes urgent notices problematic) Under the state of emergency and pre-emergency measures for COVID-19, the prefectural office cannot permit to hold the activities even if they are requested by rural communities	Regulating legal procedures, and entry in the land register (e.g. quorum of 100 % is required for the sale of land, but some members are absent and some inactive). Achieving greater community participation.	Implementing commons agreement and achieving greater participation. The initial agreement with the local government; if the Municipality of Ljubljana sees any necessity to use the site, members must immediately turn it over.
Social challenges (related to O1 Social performance measures)*	Increasing spread of tourism (e.g. the growing risk of encountering a brown bear)	Ageing among both the hosting communities and participating volunteers	Member are ageing, and it is difficult to attract young people	Urban development pressure could lead to a loss of land; e.g. the land is owned by the municipality of Ljubljana, which has plans for the development of new residential areas).
Conflict resolution mechanism (I4 Conflicts among users)*	Implementation of the new rules	No formalised mechanism (When the request from host communities did not match the policy of the prefectural office, the latter policy had taken precedence)	Not available (members do not want to confront rule-breakers as many are neighbours, and they wish to maintain polite relations).	Negotiation, sometimes consensus is sought, sometimes the majority prevails.

*Linkage to Social-Ecological System framework (Ostrom 2009): Governance system (GS), Interactions (I), Outcomes (O).

repeatedly visit or temporarily stay in the same rural area(s) and establish close relationships with them (Naito et al. 2019). Such examples are the remote owners of rice terraces ownership systems (JP16) and the non-local participants of volunteer coordination systems (JP26). The related population is a subset of visitors or tourists and refers to those who contribute to the stewardship of landscape management and nurture relational values, e.g. values that do not emanate directly from nature but are derived from our relationships with it and our responsibilities towards it (Pascual et al. 2017). The related population can also be seen as a kind of 'new public' that includes decentralised,

regional and local initiatives involving governmental, private sector groups (e.g. volunteers) and NGOs (Duraiappah et al. 2012). This **interactive urban–rural model** contributes to 'trans-scaling' commons and provides numerous material, non-material and regulating NCP to diverse beneficiaries. In other words, in Japan, some commons function throughout the entire country. It seems that this type of commons in Japan triggers more heterogeneous beneficiaries. Such a 'trans-scaling' diversified model could play a vital role in future landscape management in highly urbanised countries that are struggling with heavy overgrowth due to land abandonment in rural areas.

On the other hand, Slovenian commons typically do not extend beyond the local level, providing material and non-material NCP for its members and, in some cases, the whole community. Recently, energy communities installing solar power plants are becoming popular (SI8, SI17). However, we have not observed any urban–rural interaction in Slovenia except for commons related to food distribution (e.g. exchanging or trading vegetables and fruits) and a scattered hotel.

Considerable differences between both countries are also noticeable in the types of environmental sources, sectors and contributions to people. Differences in resources are especially obvious in marine commons, which is linked to the Japanese coast being more than 600 times longer than the coastline of Slovenia. The higher share of single sectors involved and a low number of regulating NCP in Slovenia identified in the first phase of analysis might be a consequence of less existing research on Slovenian cases, as compared to Japan. The identified Slovenian cases typically had short descriptions on web pages and were not featured in the scientific literature. However, this gap was filled in the second phase analysis in which many more NCP and social capital were observed in the selected cases (Fig. 8).

Based on our research, we can highlight that the key benefits of commons are enhancement of social capital, such as the cultivation of shared norms, values and social networks. In this respect, commons in both countries do share similarities. In fact, the significance of this type of contribution implies that it could be added to the NCP concept, especially in cases involving collective action related to natural resources. Among the mentioned social capital, particularly the **networking mechanism** (and also the **ability to collaborate** with individuals or organisations) seems to be crucial for improving social resilience (Vogel et al. 2007; Antwi et al. 2014) to mitigate and adapt to environmental changes. This contribution should not be overlooked in creating future environmental and climate policies since, as Granovetter (1985) and Robins (2015) noted, social networks are important because they serve as avenues for the exchange of information and goods. Based on three collective agri-environmental initiatives in Quebec (Canada), Zaga-Mendez et al. (2021) revealed that intermediaries (e.g. agronomists, environmental coordinators, NGOs) play a critical role by enhancing social networks or opening opportunities for new social connections, which is congruent with our findings, particularly the ones based on transforming and new commons.

As explained in 2.4, due to specific objectives, we did not strictly follow the SES framework. However, we considered it attentively enough to recommend that NCP (i.e. benefits) should be integrated into the SES variables: Outcomes (O). Knowing benefits and understanding the relationships between users as benefit providers and other beneficiaries, can have significant implications for governance of landscape commons. In fact, landscape commons could be the subject of future studies that would address the relationship between both concepts i.e. ES/NCP and commons related to landscapes. A rare example of such interactive recognition between both concepts has already been observed and presented by Rodela et al. (2019) and our study also clearly confirms this.

4.2. Governance challenges and potentials of commons

Evaluation of the four selected cases allowed us to deepen our understanding of governance challenges and potentials, particularly those related to transforming and new commons.

JP24, JP26 and SI3 cases stemmed from traditional commons but evolved into new forms of commons management by extending the boundaries of beneficiaries and collective action. It is precisely this evolution that makes them **transforming commons**. However, this is not the same transformation that Haller et al. (2021) understood as the response of the commons to state changes but rather refers to management and governing processes of commons. Hess (2008) introduced six ‘entry points’ that can catalyse changing one’s conception of a resource as a private, government-owned, or open access resource into a

commons. The entry points include the identification of new or evolving types of commons within traditional commons (Hess 2008, 6). Based on our research findings and Hess’s six entry points, we can identify the following **key characteristics of transforming commons**: (1) evolve from traditional commons, (2) expand organisational/institutional aspects to be more inclusive which consequently influences benefit sharing, and (3) build civic education, capacity development and knowledge sharing that transfer via real and virtual interaction platforms. These characteristics have functioned to sustain multiple-use and integrated landscape management (Makino et al. 2009) or enhance local development as shown by Urbanc and Šmid Hribar (2021). These findings could be useful for revitalising other traditional commons worldwide, enhancing their role in contemporary societies, and expanding and diversifying the beneficiaries and NCPs they receive.

In contrast, the SI16 community-based garden is a **new commons** that has been initiated by new actors including urban residents, NGOs and researchers around 2010 as pointed out by Clausen (2015). The main feature of such commons is that commoners in urban areas usually rent someone else’s resources or just participate in their management, while on the other hand they can engage with different benefit providers which affect the governance challenges as will be explained below. However, in cases where commoners do not own the resources (e.g. land), this can make governance difficult, posing a serious threat to the future of individual commons. This is particularly evident in the SI6 case when the future of the garden is at stake. In this case, the landowner, the municipality of Ljubljana, intended to sell it due to its value in a central location, even though this commons contribute a variety of benefits to numerous stakeholders.

When different stakeholders (benefits providers and beneficiaries) with complex use rights are involved, the governance of commons in selected cases poses significant challenges. They can be classified as governance and social challenges (Table 3). **Governance challenges** are the most diverse and include international cooperation (e.g. Russian researchers and fishermen in JP24), increased workload of the organiser (in JP26, due to ageing participants), puzzling legal procedures, land registration and rigid institutions (SI3) and achieving greater participation in collective actions (SI3 and SI6).

Another point we would like to highlight is adaptive management, which is considered a crucial tool to steer social-ecological systems through uncertainty and change (Holling 1978; Gunderson and Holling 2002; Tompkins and Adger 2004). Research on both collective actions and adaptive management have emphasised a few key enabling conditions: (1) property rights systems that can exclude ‘outsiders’ at relatively low costs; (2) flexible and polycentric institutions that facilitate participation and experimentation; (3) strong social networks that support dialogue, learning and information sharing; (4) monitoring of resources; and (5) users support for enforcement (Folke et al. 2005; Sun et al. 2012; Ostrom 1990). However, in only one of the selected cases (JP26) is there an explicit monitoring system to check whether members/participants are following the rules. This is mainly because participants follow the rules voluntarily, as rule-breaking is easily visible to others and, overall, does not benefit those who violate the established rules. In addition, as we showed that there are many cases with interaction between urban and rural actors, how to share benefits from collective action by new actors or outsiders is one of the important challenges for adaptive management.

Social challenges are noted in all cases, including an ageing population presented in JP26 and SI3. The SI3 case shows that the membership composition of transforming commons tends to be older and more fixed, which often jeopardises the continuation of collective actions. This problem of obsolescence has already been noted in other Slovenian and Japanese traditional agrarian communities (Bogataj and Krč 2014; Hori et al. 2021). Another challenge that is difficult to solve is ‘urban development pressure’ (i.e. SI6). The municipality of Ljubljana prefers new residential areas, with economic benefits, instead of the current community garden or similar urban green space which mainly

Country		Japan		Slovenia		
Selected cases		JP24 Shiretoko approach	JP26 Rural traditional commons in Ishikawa system	SI3 Livek Agrarian Community	SI6 Common garden »Beyond const. site«	
Type of commons	Traditional					
	Transforming	x	x	x		
	New				x	
Geographical area	Rural	x	x	x		
	Urban		x		x	
Benefits providers (U Users)*	Local residents				x	
	Private individual owner(s)		x			
	Organised groups (e.g. NGOs)	x	x	x	x	
	Government administrative bodies	x	x			
	Tourists/visitors		x			
	Researchers					
Beneficiaries/users (U Users)*	Local residents	x	x	x	x	
	Private individual owner(s)		x			
	Organised groups (e.g. NGOs)	x	x	x	x	
	Government administrative bodies	x	x	x	x	
	Tourists/visitors	x	x	x		
	Society	x	x	x	x	
	Researchers					
Nature's contribution to people (NCP)	Regulating	Habitat creation and maintenance	x	x		x
		Pollination ...				x
		Regulation of air quality			x	x
		Regulation of climate	x	x	x	x
		Regulation of ocean acidification				
		Regulation of freshwater quantity ...		x	x	
		Regulation of freshwater ... Quality	x			
		Formation, ... of soils and sediments		x	x	
		Regulation of hazards ...		x		
		Regulation of detrimental ...		x		x
	Material	Energy			x	
		Food and feed	x	x	x	x
		Materials, companionship and labour		x	x	x
		Medicinal, biochemical and ...				x
	Non-material	Learning and inspiration		x	x	x
		Physical and psychological experiences	x	x	x	x
		Supporting identities		x	x	x
		Maintenance of options				x
Social capital	Social networks			x	x	x
	Trust and reciprocity		x	x	x	x
	Shared norms and values		x	x	x	x

Fig. 8. Nature contribution to people and social capital provided by different types of commons and benefits providers. * Linkage to Social-Ecological System framework (Ostrom 2009): Users (U). * Linkage to Social-Ecological System framework (Ostrom 2009): Users (U).

provides regulating, non-material and social benefits for the local community.

Finally, we would like to emphasise here that this study focused on the governance challenges of selected commons associated with landscapes (as expressed in specific objective 3). However, further exploration of the implications of such commons for landscape governance and management went beyond the bounds of this study but certainly could be a topic for further research.

5. Conclusions

Our study identified 49 cases of commons related to cultural landscapes in Japan and Slovenia. The following points were revealed: (1) there is a great diversity of commons in all aspects, (2) some traditional commons have evolved into so-called ‘transforming commons’ whose main characteristics are to be more inclusive to non-owners, and in some cases connecting rural and urban areas, (3) there are new types of commons found mainly in urban areas, and (4) commons not only provide material benefits but are also important for their non-material and regulative NCPs and even more for their social capital, especially for building networking mechanisms and facilitating collaboration. The major difference observed between the two countries is the higher complexity of the Japanese commons and the greater number of commons crossing rural and urban areas in Japan. We attribute this to the high degree of urbanisation in Japanese society. There is almost no similarity except that landscape commons in both countries significantly contribute to social capital.

In terms of governance issues, the selected cases show a lack of formalised monitoring systems for rule enforcement, and a tendency to separate ownership of resources and use rights, especially in urban areas. Governance and social challenges are noticeable; however, conflicts between owners and users seem to be a serious threat in only one case (SI16). Stakeholder expansion and the separation of owners and users represent an evolution of commons in response to population ageing and urbanisation. Considering the interests of stakeholders and engaging them in a decision-making process is critical to sustaining new types of commons. To address these aspects, various ‘bundle of rights’ could be applied. The term denotes a spectrum of rights from minimal right of access to possessing full ownership rights (Schlager and Ostrom

1992).

Last but not least, our study revealed that 1) due to the significant importance of social capital of landscape commons we suggest that NCP should be extended to include these aspects, and 2) NCP should be integrated into the SES framework in variables related to Outcomes (O).

This research approach could easily be applied to other countries as a way to explore the development of commons related to landscapes. Our study is especially suitable for comparing developed countries with different levels of urbanisation. However, a knowledge gap remains for future studies on whether commons, especially transforming and new commons, have the potential to contribute to sustainable landscape management.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendices

Appendix A.1: 20 commons cases of Slovenia

(M: material, NM: non-material, T: traditional, NT: non-traditional, R: rural, U: urban)

No.	Name	Explanation	M	NM	T	NT	R	U
SI1	Traditional agrarian communities	Traditional agrarian communities re-established after Independence of Slovenia in 1991. About one-third of previous AC were revitalised. They are mainly governing and managing common pastures and forests.	+		+		+	
SI2	Čadrg water cooperative	The water committee manages the village water distribution network, maintains it and ensures appropriate water treatment. The village community has rich experience in community organisation and governing of commons such as mountain pastures and forests.	+			+	+	
SI3	Livek agrarian community	Livek agrarian community is based on traditional forest and pasture commons, but its distribution of economic profits is novel. Income gained by lodging is invested back in the local community to support local initiatives and contribute to infrastructure in nearby settlements.	+		+	+	+	
SI4	Collective farming	Collective farming in the Kozjansko region (SE part of Slovenia).	+			+	+	
SI5	Urban agriculture (gardens)	Small-scale agriculture in urban areas that include multiple functions and involves many diverse stakeholders. In Slovenia, majority of urban gardens are allotment gardens, but there are also social and educational (school) gardens.	+			+		+
SI6	Common garden ‘Beyond construction site’	A community-based garden in the inner-city district of Ljubljana. Around 100 people take care of the 40 beds and engage in common actions, organise events, socialise and help each other.	+	+		+		+
SI7	A permaculture association Sorsko polje		+	+		+	+	

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No.	Name	Explanation	M	NM	T	NT	R	U
SI8	Community solar power plant	The association seeks to assist farmers from the Sorsko polje in the transformation to organic/eco-farming, while also trying to ensure the sustainable purchase of locally produced food at the local level. It was created in 2011 and relies entirely on volunteer work. It includes 11 local communities with over 20,000 inhabitants. The first solar power plant in Slovenia is located on a multi-dwelling building in Jesenice. It includes 23 apartments (about 55 members). Their main goal was to reduce the monthly costs for electricity.	+	+		+		+
SI9	Organic village cheese factory in Čadrg	A common place for making autochthonous cheese, Tolminc.	+		+		+	
SI10	Partnership for safeguarding and popularisation of dry stone wall in Karst	Active partnership engaging local communities in the Karst area for safeguarding dry stone walls. Know-how of dry stone walling in Slovenia, Cyprus, Greece, Bulgaria, Croatia, Italy, Switzerland, France and Spain was inscribed in the UNESCO List of Intangible Cultural Heritage of humanity in 2018. Although the know-how and technique are not new, the novel aspect is safeguarding and rebuilding dry stone walls, stone houses by empowered locals in several Karst villages.	+	+		+	+	
SI11	Zelemenjava - exchanging of green goods and wise thoughts	Virtual community with meetings and exchanges in the real world, several locations around Slovenia. Based on community exchange economy - exchanging of vegetables, fruits, seeds, recipes, plants, also clothes.	+	+		+	+	+
SI12	Community revitalisation of urban centres, parks, streets, etc.	Several local projects across Slovenia in which locals contribute to revitalisation of their living or working environment (e.g. Krizevniška street ('Knights of the Cross Street', Park Tabor, etc.)	+			+		+
SI13	Scattered hotel	A modern form of business cooperation that connects a large number of individuals (owners or property managers) who jointly manage a scattered hotel offering accommodation and other tourism programmes. This business model has a common marketing and management and is suitable for rural areas as well as for old city centres.	+			+	+	+
SI14	A cooperative Dobrina	A cooperative established on the principle of social entrepreneurship. Their main aim is to develop small family farms, establish fair trade and connect rural areas to urban centres.	+			+	+	+
SI15	Planika Dairy	By buying milk from local farmers, Planika Dairy contributes to the existence of livestock, cultivation of agricultural land, family income and the employment of workers in the Soca Valley. Planika Dairy is the fourth largest dairy in Slovenia and the only one that is 100 % owned by farmers.	+			+	+	
SI16	A cooperative Konopko	A cooperative-social enterprise for the sustainable development of producing and processing hemp as well as to set up a fair trade of hemp products	+	+		+	+	
SI17	Local and self-sufficient energy community in Luče	The first Slovenian energy community in the village of Luče. Using innovative technical solutions on the electricity grid, integrating renewable energy sources and testing systemic changes. This initiative has been implemented by the local community and research team of the H2020 COMPILE project.	+	+		+	+	
SI18	From 'inception to Euro' (a specific example of study circle)	This commons collects and exchanges knowledge on mountain wood. They have been active since 2004, members are only men, and the main aim is to learn how to manage and use mountain wood, evaluate its quality and to determine how to bring added values; in the modern era, most of wood in Slovenia has been exported without transforming it into valuable products.	+	+		+	+	
SI19	Development cooperative Soča-Trenta	An energetic cooperative in the remote depopulated alpine part of Slovenia, also part of the Triglav National Park. Locals from three neighbouring villages recognised the importance of local renewable energy resources. They organised themselves (in 1992) and in 1996 constructed a small hydroelectric power plant. Economic profits are invested in development projects, whose main purpose is to raise the quality of life in the valley (e.g. they established 2 permanent + 3 travelling shops and a restaurant).	+	+		+	+	
SI20	Loški Potok Wood Cooperative	An energetic cooperative in the remote southern part of Slovenia. Established in 2016, mostly to fulfil two tasks: production of thermal energy from local wood biomass and implementation of the concession contracts for their local forest workers. Economic profits are invested in development projects, whose main purpose is to raise the quality of life in the valley (e.g. they managed to maintain a shop and a post office).	+	+		+	+	

Appendix A.2: 29 commons cases of Japan

(M: material, NM: non-material, T: traditional, NT: non-traditional, R: rural, U: urban)

No.	Name	Explanation	M	NM	T	NT	R	U
JP1	Allotment gardens, Experiential farming	Small farmland provided for urban residents or non-farmers to develop products themselves, including, rental farmland and open farmland for temporal experience, education and ecological tourism.	+			+	+	+
JP2	Footpath	A path where people have the right to walk for recreational purposes regardless of land ownership (i.e. footpath based on an old forest path, promenade in the meadow).	+			+	+	+
JP3	School forest	Forest owned by neighbouring schools as an asset of schools for educational purposes (some school forests are shared national forest by co-ownership).	+		+		+	
JP4	'Inoo'	A shallow calm sea between the shore and the coral reef off the shore. It was traditionally used as commons by neighbouring residents to obtain marine products. The custom is declining and was partly replaced by formal fishery rights, and currently, outsiders utilise the area for leisure.	+		+		+	
JP5	Common hot-spring	Shared bathhouses of hot-springs to local residents and visitors from outside at a low fee or free of charge. They are managed and operated by local residents.	+		+		+	
JP6	Communal sharing	Informal sharing of food without market transaction within and beyond communities.	+		+		+	+

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No.	Name	Explanation	M	NM	T	NT	R	U
JP7	'Moyai', 'Yui' (cooperative work)	A traditional practice in rural societies (Moyai was common in fishing villages, and Yui was relatively common in agricultural villages). A cooperative work (for management of shared natural resources, roofing, agricultural and fishery works) that is carried out in mutual assistance based on labour exchange and sharing between houses.	+		+		+	
JP8	Cooperative planting for marine organism	Coral conservation and plantation activities by local governments, local residents, volunteer divers and private companies. Divers who visit from all over Japan plant corals under the cooperation of local fishery cooperatives and support from private companies.	+	+		+	+	+
JP9	Support by consuming sustainable products	The proceeds of products from sustainably managed environments (forest, sea, etc.) and the donation from consumers are used as funds for management. Metropolitan consumer cooperatives are mediated via agreement with local producers and sale at their system as 'local-direct delivery'. It allows visiting the production site.	+	+		+	+	+
JP10	Forest volunteer	Volunteer activities in which forest works, such as afforestation and silviculture, are conducted with the participation of citizens. There are three types: contract-based, voluntary, and self-management.	+			+	+	+
JP11	Fishermen's Forest	Maintained forest in the upstream region of river basin by the fishery community in the downstream region (e.g. reforestation activities by fishery cooperatives).	+			+	+	
JP12	Foster parent/care of plants	The seedlings are temporarily raised by companies or schools and used for plantation and forestation. After the Great East Japan Earthquake, the activity was implemented as reconstruction of forest in the damaged areas.	+			+	+	+
JP13	Model forest program	An initiative that aims for sustainable forest management and community development with all actors receiving benefits from forests by working together. It has established several projects such as forest management with private companies, calling for donations or volunteers for forest management, and supporting events with invited citizens to enjoy the forest.	+	+		+	+	+
JP14	'Initiative to construct houses with nearby trees'	A campaign to promote the direct supply of houses using local timber. Associations are coordinating both the city side (construction and design companies, consumers) and the rural side (forestry managers and workers).	+	+		+	+	+
JP15	Wood station (Kino-eki) project	A community activity in which small forest owners sell logging residues they have collected. The community currencies are used for the payment, which can contribute to revitalisation of the local economy.	+	+		+	+	
JP16	Rice terraces ownership system	Ownership system of rice terraces, where non-residents rent and maintain a field on an annual basis. Some types of systems include experimental farming.	+			+	+	+
JP17	Collective management of traditional gardens	Collective management of traditional Japanese gardens in Kanazawa city as urban green spaces. The citizens and local students participate in the volunteer work to clean up and maintain the gardens.	+			+		+
JP18	'Iriai'	A system or organisation in which residents of the area cooperatively use and manage resources there such as mountains, rivers, sea and land.	+		+		+	
JP19	Certification and labelling	The sustainable primary and industrial products and methods for the production and distribution are certificated and labelled to be supported by consumption.	+	+		+	+	+
JP20	Forest therapy	To utilise forests for health and treatment.	+			+	+	+
JP21	Nature schools	The bodies provide organised opportunities for nature experience, learning, instructors and providing educational materials.	+			+	+	+
JP22	Modernshared local resources	As inheritors of iriai, shared and collectively managed resources under modern schemes such as community forest or property ward (legal entities established so that government can allow communities to continue to own their traditional commons).	+		+	+	+	+
JP23	Common Fishery Right	Fishing rights given to a fisheries cooperative. A legal scheme to guarantee the rights of iriai fishery.	+		+	+	+	
JP24	Shiretoko Approach	A management style of the World Heritage property incorporating 'voluntary restrictions by fishery operators' to balance between maintaining marine biodiversity and fishing.	+	+	+	+	+	
JP25	Forest owner/supporter system	A system provided by the Forestry Agency to promote opportunities for public participation in forestation and recreation in forest.	+	+		+	+	+
JP26	<i>Rural traditional commons in Ishikawa system</i>	Systems that prefectural organisations or private companies call for registration of volunteers for forest management or agricultural works and then places volunteers as needed to coordinate and arrange the implementation of volunteer activities.	+	+	+	+	+	+
JP27	Foodbank	Organisations and activities that receive donations of surplus foods or non-standard foods and provide them to people and facilities which need them.	+			+	+	+
JP28	ICT-mediated food sharing	Mechanisms for matchmaking and sharing food surplus and losses between companies or consumers via Internet-based platforms.	+	+		+	+	+
JP29	Farmland bank (Agricultural land use promotion business)	Programmes to facilitate better matchmaking for farmland leasing. The programme intends to pool the needs and expectations of both potential renters and lenders rather than promoting direct negotiations/transactions between two parties.	+	+		+	+	+

Appendix B. A code book for data extraction

Category	No	Indicators	1st phase	2nd phase	Linkage to Social-Ecological System framework (Ostrom 2009)
A. BASIC INFO	1	GEOGRAPHICAL LOCATION (COUNTRY)	Y		Resource System (RS): RS9 Location
	2	GEOGRAPHICAL LEVEL	Y		
		1. Local (local community, municipality)			
		2. Regional			
		3. National (the whole country)			
	3	ORIGIN/FOUNDATION (year)		Y	
	4	LEVEL OF PRESERVATION/TRANSFORMATION	Y		
		1. Traditional			

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Category	No	Indicators	1st phase	2nd phase	Linkage to Social-Ecological System framework (Ostrom 2009)
B. MATERIAL/NON-MATERIAL TYPE OF ENVIRONMENT, RESOURCE SECTORS	5	2. Non-traditional 3. Transforming ¹ URBAN/RURAL CHARACTER 1. Urban 2. Rural	Y		
	6	ACTUAL SIZE (either in geographical coverage or in number of owners/funders/users in 2020)		Y	Resource System (RS): RS3 Size of resource system
	7	IDEOLOGY AND MOTIVATION: What is the basic idea behind it? Who was the promotor of it? Has it expanded since its inception? What was the size when established? Has the motivation changed over the years?		Y	
	8	ASPIRATIONS, ORIENTATION, AND PLANS: What aspirations does a collective action have? Has it already put its ideas into practice? Are any changes foreseen (in geographical coverage, number of people, change of orientation)?		Y	
	9	CHALLENGES AND STABILITY: What is the major challenge? Is the action stable, or does it face serious problems threatening its functioning?		Y	Related to Governance system (GS), Interactions (I), and Outcomes (O)
	10	MATERIAL/NON-MATERIAL ² 1. Material 2. Non-material 3. Both	Y		
	11	TYPE OF ENVIRONMENT (source/place of production) ³ Marine 1. Open ocean 2. Coastal (estuaries, seagrass, coral reefs, shelf) Terrestrial 1. Forest 2. Grasslands and rangelands (including savannahs) 3. Wetlands (tidal marsh, mangroves, swamps, floodplains) 4. Freshwater (lakes, rivers) 5. Desert 6. Tundra 7. Ice/rock (including glaciers) 8. Cropland (e.g. orchards, vineyards, fields) 9. Built-up (for instance, surplus food) 10. Multiple (Go to 11b) 11. Other (Go to 11c)	Y		Resource system (RS): RS1 Sector
	11b	If Multiple is the answer, list numbers. For example, if wetlands and shorelines are mentioned, list 5, 2.	Y		
	11c	Explain Others:	Y		
	12	RESOURCE SECTOR (sector which uses or manage a resource) ⁴ 1. Water 2. Agriculture (food) 3. Forestry 4. Fishery 5. Health & relaxation 6. Conservation (nature protection/care for nature, cultural heritage protection) 7. Energy 8. Education 9. Tourism & recreation 10. Social activity (interaction & community building, revitalisation of areas) 11. Multiple (Go to 12b to specify the sectors) 12. Other (for instance religion; Go to 12c)	Y		
	12b	If Multiple is the answer, list numbers. For example, if water and conservation sectors are discussed, list 1, 6.	Y		
	12c	Explain Other Sectors:	Y		
C. NATURE'S CONTRIBUTIONS TO PEOPLE	13	WHAT BENEFITS/ CONTRIBUTIONS ARE PRESENT: <u>A) NATURE'S CONTRIBUTION TO PEOPLE</u> ⁵ <u>i. Material</u> 11. Energy; 12. Food and feed; 13. Materials, companionship and labour; 14. Medicinal, biochemical and genetic resources) <u>ii. Non-material</u> 15. Learning and inspiration; 16. Physical and psychological experiences; 17. Supporting identities; 18. Maintenance of options <u>iii. Regulating</u> 1. Habitat creation and maintenance; 2. Pollination and dispersal of seeds and other propagules; 3. Regulation of air quality; 4. Regulation of climate; 5. Regulation of ocean acidification; 6. Regulation of freshwater quantity, location and timing; 7. Regulation of freshwater and coastal water quality; 8. Formation, protection and decontamination of soils and sediments; 9. Regulation of hazards and extreme events; 10. Regulation of detrimental organisms and biological processes	Y	Y6	

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Category	No	Indicators	1st phase	2nd phase	Linkage to Social-Ecological System framework (Ostrom 2009)
D. BENEFICIARIES/USERS		B) SOCIAL CAPITAL/RELATIONAL VALUES⁷	Y	Y	Related to Users (U): U6 Norms/ Social capital
		1. Social networks (interactions and relationships between individuals or organisations)			
		2. Trust and reciprocity (quality of relationships, rather than the number of connections; this includes helping families in need)			
		3. Shared norms and values (common expectations which make interactions more productive.)			
		C) MULTIPLE BENEFITS/ contributions (Go to 13b)	Y	Y	
	13b	List multiple benefits/contributions using codes from 13 (e.g. i.13. for fuelwood)	Y	Y	
	13c	If A.i. Material is the answer, specify what material benefits/ contributions are identified?	Y	Y	
		Name precisely what (for instance, timber/wood for firewood, wild fruits, wild herbs, game, fish, grasses, water) ⁸			
	13d	If A.ii. Non-Material is the answer, specify what non-material benefits/ contributions are identified?	Y	Y	
		Name precisely what (for instance, rituals, myths, recipes, group identity, recreation, sacredness/spirituality of a space, silence, nature appreciation, social inclusion, social cohesion, social network, intergenerational dialogue) ⁹			
	13e	If A.iii. Regulating is the answer, specify what? ¹⁰	Y	Y	
	13f	If B. social capital is the answer, specify what?	Y	Y	
	14	Are you taking any action to manage regulating NCPs, such as managing forests, planting trees, planting honey plants, etc.?	Y	Y	Users (U): U1 Number of users
	15	TYPES OF BENEFICIARIES/USERS	Y	Y	
E. SITUATION OWNERSHIP		1. Not known			
		2. Local residents (unorganised) (residents of an unorganised community or a region)			
		3. Organised group(s) (e.g. church, land trust, NGO managing a conservation area, etc.)			
		4. Tourists/visitors			
		5. Government Administrative Body (municipality, county, state/province, national government; an official institution to conduct some measures)			
		6. Society (any or all levels regional to global)			
		7. Owners			
		8. Multiple: Go to 15b to explain which types of actors are beneficiaries			
		9. Other: Go to 15c			Related to Governance system (GS): GS4 Property-rights system
	15b	If the answer is Multiple, list relevant types of beneficiaries. For example, if beneficiaries are tourists and society list 4, 6	Y	Y	
	15c	If Other is answered, explain: _____	Y	Y	
	16	TYPE OF OWNER(S) OF THE GOOD, RESOURCE OR RESOURCE SYSTEM BY LAW (OWNERS): Owners according to the legal definition, including owners granted rights to specific goods (like timber or fish) even if they do not have ownership rights to the resource system itself, as for fishermen with Individual Transferable Quotas		Y	
F. USE RIGHTS		1. Not defined/unknown/not relevant			
		2. Individual/Private owner: Non-farmer, Farmer, Non-resident owner, or other types of a private owner			
		3. Government: Township, Municipality, State, National, also communities that own titles to common lands and resources.			
		4. Church			
		5. Land Trust			
		6. For-Profit organisation: for-profit association, cooperative, business/enterprise, corporation, etc.			
		7. Other Non-Profit: any non-profit owner that is not a church or land trust, such as a non-profit cooperative, non-profit environmental organisation, etc.			
		8. Multiple: Go to 16b to list using the relevant numbers			
		9. Other: Go to 16c			Governance system (GS): GS4 Property-rights system
	16b	If Multiple is the answer, list each type of owner. For example, if private, church, and for-profit organisations are discussed, list 1, 3, 5. Include 99 if relevant.		Y	
	16c	Type of owner: include any owner type not encompassed by the above categories. Be sure to include communal owners/communal rights holders and Indigenous groups that do not otherwise fit in the above definitions.		Y	
	16d	Are the owners local?		Y	
	17	DO MEMBERS HAVE THE RIGHT TO USE THE RESOURCES?		y	
		1. Yes (go to 17b)			
		2. No			
	17b			y	

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Category	No	Indicators	1st phase	2nd phase	Linkage to Social-Ecological System framework (Ostrom 2009)
G. GOVERNANCE ISSUE/ GOVERNANCE PROBLEMS, ACTORS		If yes, what is the formality level 1. Formal 2. Informal			
	18	DO MEMBERS HAVE ANY DUTY TO MANAGE THE RESOURCES? 1. Yes (go to 18b) 2. No		y	
	186b	If yes, what is the formality level 1. Formal 2. Informal		y	
	19	IS THERE A GOVERNANCE ¹¹ , OWNERSHIP, AND/OR FORMAL OR INFORMAL RIGHTS ISSUE? 1. Yes (go to 19b) 2. No		Y	Governance system (GS): GS1 Government organisations
	19b	If yes, what kind of governance issue is it?		Y	
	20	PROBLEMS OF GOVERNANCE 1. Yes 2. No		Y	
	21	DESCRIBE THE RULES Do you follow any rules?; Are rules formal and written, or informal/tacit?; Who has the authority to make decisions, and about what?; How decisions are made?		Y	Governance system (GS): GS5 Operational rules
	22	IS COMPLIANCE WITH THE RULES MONITORED? 1. Yes 2. No (skip 21)		Y	GS8 Monitoring and sanctioning processes
	23	IS RULE VIOLATION SANCTIONED?		Y	
	24	PROBLEMS OF GOVERNANCE 1. Difficulties in society/community: a). Structural (scale misfit, land tenure, legislative/ institutional conflict) b). Functional (adaptation of rules, distribution of benefits, inequality, increased environmental values) 2. Resource decline or abandonment, (in)efficiency of management/ institutions, endangered sustainability, land use effects, PES 3. Governance model change (privatisation or nationalisation, balance between the economy and conservation of resources/ES, combined problem (e.g. 1 + 2, ...)) 4. Other (ethical issues, perceptions & understanding)		Y	Related to Governance system (GS)
	25	ACTORS WHO PARTICIPATE IN GOVERNANCE PROCESSES 1. Individual/private actor/households Local community/local government (agrarian community, ejido, settlement, agrarian village, town, city, municipality, county) 2. Higher-level government (non-local, e.g. national, international, global) 3. Organisation or group that is not part of formal government structure (church, for-profit institutions, non-profit organisations, non-governmental organisations, environmental groups, etc. at any level, local or non-local) 4. 1 + 2 Individual entity + Local government 5. Individual + any combination of government +/- or organization/s (except 1 + 2) 6. 2 + 3 (one or multiple levels) + 4 (any government and organization/s, but not individuals)		Y	Related to Governance system (GS)
	26	CHALLENGES FOR GOVERNANCE What is/are the major challenge(s) you are facing now or is/are expected in the near future? 1. Environmental (e.g. environmental degradation, loss of biodiversity, climate change, intensification of land use +/- or urbanisation, etc.) 2. Socio-economic factors (e.g. poverty, inequitable access to resources, hunger and malnutrition, social class differences, religious and ethnic issues, declines in livelihood options, loss of traditions, migration linked to social disruptions, identity issues, equity, etc.) 3. The governance factors (internal and external aspects on governance issues, not following the rules, etc.)		Y	Related to Governance system (GS) on general and Outcomes (O): O1 Social performance measures, O2 Ecological performance measures
	27	IS/ARE THERE ANY CONFLICT(S) IN RESOURCE USE AMONG PEOPLE RELATED TO THIS COLLECTIVE ACTION? 1. Yes (there are conflicts) 2. No (no conflict detected) (skip 26 and 27) 3. Other, unclear		Y	Interactions (I): I4 Conflicts among users
	28			Y	
H. CONFLICTS					

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Category	No	Indicators	1st phase	2nd phase	Linkage to Social-Ecological System framework (Ostrom 2009)
		HOW DO YOU ATTEMPT TO SOLVE CONFLICTS? Do you use any mechanism or strategy for solving a conflict (e.g. negotiation, seeking a win-win situation, being prepared to compromise, finding common ground, mediation, arbitration, litigation)?			
	29	IF NO, WHY NOT? IS THERE ANY SPECIFIC REASON?		Y	

1 At the first phase we distinguished only between two categories, yet we noticed trends of transformations and we consider it in the second phase.

2 Material contributions are substances, objects or other material elements from nature that directly support human well-being through various forms of assets, such as food, energy or materials for ornamental purposes. Non-material contributions are, conversely, the effects of nature on subjective or psychological aspects that underpin people's quality of life, both individually and collectively (Díaz et al. 2018).

3 Modified from Costanza, R., R. D. et al. 1997a. The value of the world's ecosystem services and natural capital. *Nature* 6630: 253–260.

4 Adopted from Rodela et al. 2019.

5 <https://science.sciencemag.org/content/sci/suppl/2018/01/18/359.6373.270.DC1/aap8826-Diaz-SM.pdf> (supplementary material, Fig S3).

6 Some variables were applied in both the first and the second stages. Data extraction for the 1st stage was done through review of published literature and online sources. In the 2nd stage, we went deeper into each selected case study. Not only was the 1st stage information verified, but also upgraded by insights from an in-depth study (mainly via interviews with informants).

7 Social capital refers to relationships between individuals or groups and the resulting ability to secure or obtain resources, knowledge or information. These relationships exist inside an organisation (e.g. among employees) and outside an organisation (e.g. between the organisation and external stakeholders such as communities, consumers and regulators). Reference: Network for Business Sustainability South Africa. 2014. Measuring and Valuing Social Capital: A Guide for Executives. Network for Business Sustainability South Africa. Retrieved from: <https://www.nbs.net/knowledgehttps://www.nbs.net/articles/the-main-report-measuring-and-valuing-social-capital>.

8 For more examples, see <https://science.sciencemag.org/content/sci/suppl/2018/01/18/359.6373.270.DC1/aap8826-Diaz-SM.pdf> (supplementary material, TABLE S1).

9 For more examples, see <https://science.sciencemag.org/content/sci/suppl/2018/01/18/359.6373.270.DC1/aap8826-Diaz-SM.pdf> (supplementary material, TABLE S1).

10 For more examples, see <https://science.sciencemag.org/content/sci/suppl/2018/01/18/359.6373.270.DC1/aap8826-Diaz-SM.pdf> (supplementary material, TABLE S1).

11 Governance (includes policies, process, rights, property, actors and governance issues, challenges or conflicts). Two guiding definitions of governance (two ways of defining the same concept); the first is broad enough to encompass non-state and informal governance situations, while the second is especially suited to situations involving formal government hierarchies such as nation-states.

Governance refers to all the processes and arrangements of governing, whether involving a government, market, network or other entity, and whether over territory/location, population, family, tribe, formal or informal organization, or other entity, and, whether through norms, laws, policies, power or language (paraphrase of Bevir, Mark. 2013. *Governance: A Very Short Introduction*. Oxford University Press.).

'Governance is a process by which the repertoire of rules, norms, and strategies that guide behaviour within a given realm of policy interactions are formed, applied, interpreted, and reformed. A useful shorthand... is that governance determines who can do what to whom, and on whose authority'. (McGinnis, M. 2011. *Policy Studies Journal* 39(1):169–183).

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