



## CLIMATE JUSTICE AND PARTICIPATORY RESEARCH: BUILDING CLIMATE-RESILIENT COMMONS

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# Common-Pool Resources and the Governance of Community Gardens: Experimenting with Participatory Research in São Paulo, Brazil

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## *Introduction*

While the definition of *commons* can include different philosophical, political, economic, and legal conceptualizations according to each field of knowledge (Ruschel, 2018), in this chapter we associate the term with the concept of common-pool goods or natural resources. These include different natural elements, such as seas, lakes, rivers, forests and animals, among others, and they may be used in different forms, including in a communal manner (Dietz et al., 2002).

Due to their physical nature, common-pool natural resources basically present two characteristics: (i) shared use, which allows each individual to benefit from natural resources that are also used by others; and (ii) difficulty in restricting access by different users (Ostrom, 1990; Berkes, 2005). Because of these characteristics, their use can generate opportunistic behaviours in the users, especially when they extract more resources than they need and/or use them predatorily (Dietz et al., 2002). This generally occurs when the natural resources are migratory and/or cover large areas.<sup>2</sup>

The governance (public, private, or communal) of these natural resources is quite complex, and for this reason different governing mechanisms have been considered and created to deal with the difficulties imposed by each context. One of the main challenges of natural resource governance is related to property regimes, since the inadequate and unsustainable use of these resources is directly linked to the manner of their access-regulation and control.

Bearing in mind that public and private property regimes are not the only possible modalities of natural resource management, this chapter gives an account of the results of a research study that involved urban farm growers from the outskirts of the city of São Paulo (Brazil; see Map 2, page 30), and presents some difficulties related to the access rights and communal governance of the land and natural resources of a communal garden. As discussed below, the questions of land use and governance are central.

This chapter is the result of a research process that made possible learning with local individuals and groups, from the perspective of the local community's technical and scientific knowledge of the area. It can be framed as community-based participatory research since it blended an academic process with the practice of observing and learning from local knowledge, focused on climate justice and common-pool resources.

In a broad sense, the study addresses the need for new research focused on rebuilding means of access and governance for common-pool natural resources, taking into consideration the social, cultural, and biological needs and peculiarities of each context. Furthermore, this communal garden study discusses how to empower the most vulnerable to better resist climate change, as it is the urban poor who face the greatest risks due to the lack of infrastructure that could allow them to adapt to climate-related impacts (Dubbeling, 2014). For example, informal dwellings located in low-lying and flood-prone areas or on steep and unstable slopes subject to landslides are those most affected by heavy rains, but which tend to be available as occupation sites for the most vulnerable populations.

The implementation of urban gardens is a strategy capable of bringing several interrelated benefits to address the effects of climate change. First, creating more open spaces reduces the impacts of high rainfall due to greater storage of excess water, more interception and infiltration in green areas, reduction of runoff and related flood risks, and better replacement of groundwater. Besides reducing flooding, the more porous soil caused by gardens

favours the recharge of groundwater and reinforces groundwater flows. When associated with large plants and trees, urban gardens can reduce heat island effects by providing more shade and enhancing evapotranspiration. Producing food in and around the city, by requiring less energy to transport, refrigerate, store and package food products, can contribute to reducing urban energy consumption and greenhouse gas emissions. Agriculture also allows for the productive reuse of organic waste, reducing methane emissions from landfills and energy consumption in the production of synthetic fertilizers. Decentralized urban recycling of organic waste reduces the need for transportation, energy, and emissions to get it to landfill. The reuse of wastewater from cities in urban agriculture frees up fresh water for higher-value uses and reduces the emissions generated in water treatment (Dubbeling, 2014).

Vegetable gardens in urban areas can also play an important role in generating climate solutions for poor and vulnerable communities, by contributing to the reduction of hunger through the production of healthy and nutritious foods that improve local food security. However, for urban agriculture to be effectively practiced, it is necessary to plan and invest financial resources so that people can develop and maintain community gardens in cities, where land is often in short supply. Making this happen, by participating in the process of finding and developing solutions for socio-environmental vulnerabilities, promotes the social inclusion of people who are all too often marginalized and silenced.

In the city of São Paulo, there is significant urban poverty, and there are also many abandoned or underused public and privately owned areas that could be used by different social groups to plant community gardens. Nevertheless, measures of this kind are often impeded, for various reasons (Carolino, 2021).

Most of the time, the implantation of a community garden requires collective efforts—of the community, associations, non-governmental organizations (NGOs), and public authorities—not only with the intent of finding appropriate land for the implementation of the community garden but also in the sense of enabling adequate communal/collective governance of the area. Our study of a community garden in São Paulo explores how this process can take place.

Because we believe that property and governance regimes are crucially important to such a project's success, we take time here to outline the

theoretical literature on commons governance before recounting the São Paulo community garden story in detail.

## *Theoretical Framework*

A number of empirical studies have demonstrated that in addition to public and private property, there are other forms of managing common-pool natural resources. The literature identifies four categories: (i) open access, (ii) private property, (iii) public or state property, and (iv) common property. Feeny et al. (2001) note that, in practice, there is overlap and even conflict among these regimes. These four categories are explained in more depth in the following sections.

### *1) Open Access*

An open access situation was set out in Garret Hardin's article "The Tragedy of the Commons," published in *Science* in 1968. Considered one of the most-cited scientific articles in the second half of the twentieth century, this article stimulated ample debate and a new interdisciplinary research field on common-pool resources.

Although "The Tragedy of the Commons" reinforces the arguments that open access permits greater degradation of common-pool resources than private property, the author equated the concept of communal ownership with the conditions of open access, meaning no rules to limit the use of commons (Dietz et al., 2002). Furthermore, the author ignored that in many cases, the "tragedy" only occurred after open-access conditions were created, as a consequence of the destruction of pre-existing, communal systems limiting access rights to land and marine areas (Feeny et al., 2001).

In this context, users who depended on common-pool resources for their subsistence were forcibly removed from their territories, thus provoking what McCay and Acheson (1987, as cited in Diegues & Moreira, 2001) call "The Tragedy of the Community." As a solution for avoiding this tragedy of community governance and livelihoods, the authors proposed that common-pool resources be privatized or defined as public (state) property (Feeny et al., 2001).

## 2) *Private Property*

Under private property regimes, only the title holders may access and use a natural resource. Therefore, this type of ownership differs from the other forms of access rights, since the rights to the natural resources are exclusive and non-transferable. In other words, on private property, the owner is at liberty to decide how to use a natural resource and who shall have access to it, albeit limited somewhat by legal norms and state control. In Brazil this may involve, for example, regulations regarding Permanent Preservation Areas and legal reserves, among others.

Exclusive use and access, seen from the logic of profit, allows owners to sell and degrade natural resources on their property. This leads to exploitation to the detriment of environmental protection (Feeny et al., 2001), and privatizes many resources that are inappropriate for private ownership (e.g., aquifers/watershed recharge areas, marine resources, corridors used by migratory species, etc.).

Although state regulation and control are relevant, they neither provide a sufficiently adequate mechanism for solving the problem of overexploitation of natural resources, nor address the problem of unjust exclusion from private areas, since the command-and-control mechanisms employed by the state are not always sufficient to monitor and control these uses. Regarding the overexploitation of natural resources, the government often lacks the will, resources, or both to adequately supervise private areas. For example, although Brazilian legislation establishes rules for the use of pesticides, lack of inspection on most Brazilian agricultural properties effectively allows the indiscriminate use of these products. As a consequence, water tables are contaminated, which in turn affects the common use of water by urban populations that depend on this water for basic sanitation. Effective inspection of these areas and/or legal compliance by the property owners would make it possible to control and avoid this environmental degradation.

The Brazilian constitution allows the state to expropriate underutilized/unproductive private property (providing compensation to the owners in the form of government bonds) on the basis of judgements about the best “social function,” and reserve it for environmental reasons or make land available to people who need land to farm. However, implementation of this provision has been inconsistent for a variety of reasons; land ownership in Brazil remains highly concentrated (Ondetti, 2021).

Within this context of ineffective government controls, it is the urban poor who arguably face the greatest risks, as most live in informal settlements located in low-lying and floodable areas, or on steep and unstable slopes, subject to landslides caused by increasingly intense rains. Thus, cities have an important role to play in mitigating and adapting to climate change and in strengthening the resilience of the most vulnerable residents. Urban agriculture can be considered an adaptation strategy capable of mobilizing several benefits in this effort.

### 3) *Public or State Property*

Natural resources on public or state property are protected by the state, and individuals and groups only make use of them when authorized by representative agencies of a state entity. Moreover, the state, through its legislative bodies, sets the standards that define the property regimes among sub-jurisdictions, which in turn directly manage the natural resources on behalf of the public interest.

The same standards of protection for natural resources that apply to private property also apply to public property. However, the mere existence of these standards does not necessarily guarantee the protection of natural resources, even under public ownership, since the state may not have effective control over their use. As an example, Dietz et al. (2002) explain that many state areas have been transformed into open-access areas due to the lack of inspections, associated with corruption on the part of public officials who, in turn, may receive payoffs from users wishing to exploit government-owned resources. According to Dietz et al. (2002), case studies in Africa, Latin America, Asia, and the United States indicate that policies which transform the common-pool resources of local communities into state property favour an increase in the degradation of natural resources.

In this regard, for Feeny et al. (2001), successful resource management in less developed countries is rarely associated with state ownership. According to them, the professional infrastructure responsible for the management of resources in state organizational charts is normally not well developed, and the imposition of norms is problematic. Even so, for Berkes (2005), a state ownership regime performs a key function in situations in which the resources require multiple integrated mechanisms of governance in order to be protected: for example, trans-jurisdictional hydrographic basins.

#### 4) *Common Property*

Since the publication of Hardin's "The Tragedy of the Commons" article in 1968, common-property regimes have been associated with environmental degradation, especially when many individuals use a scarce resource communally. This generally occurs because the common property regime is confused with open access (Ostrom, 1990).

For Bromley and Cernea (1989), "this inadequate diagnosis is very serious in its consequences since it further invites inappropriate policy recommendations and misguided operational decisions." They point out:

By confusing an open access regime (a free-for-all) with a common property regime (in which group size and behavioral rules are specified) the metaphor denies the very possibility for resource users to act together and institute checks and balances, rules and sanctions, for their own interaction within a given environment.

The Hardin metaphor is not only socially and culturally simplistic, it is historically false. In practice, it deflects analytical attention away from the actual socioorganizational arrangements able to overcome resource degradation and make common property regimes viable (Bromley & Cernea, 1989, 6–7).

Even though Hardin concluded that only public or private governance is able to avoid the depletion of common-pool resources, empirical and theoretical studies demonstrate that evidence contrary to "The Tragedy of the Commons" exists in abundance; rather, there are alternatives to protecting natural resources—such as common property—that go beyond the public or private ownership dichotomy presented by the author.

One such study is by Elinor Ostrom, who proves in her field studies that "The Tragedy of the Commons" is mistaken. In her book *Governing the Commons*, published in 1990, she presents an alternative for natural resource protection, one that is different from those presented by the theoreticians of state or privatization since, on communal property, resources are divided in an egalitarian manner among community members (though external individuals are excluded from access) (Ostrom, 1990).



According to Ostrom, commons governance refers to the self-organization of communities which, to some extent, do not need (but do not exclude) private and state interventions. Furthermore, in cases where the governance of common-pool resources was successful, the author identified that the users built relationships of trust, cooperation, and collective action, essential for the imposition of resource use limits and maintenance responsibilities.

In this sense, communal ownership of natural resources is directly related to the concept of resilience, a concept closely related to “adaptive capacity” that in the social sciences is associated with the way people are affected by and respond to changes. According to Cinner and Barnes (2019), there are six broad social factors that create resilience. These are: 1) assets that people can draw upon, 2) flexibility to change strategies, 3) ability to organize and act collectively, 4) learning to recognize and respond to change. 5) socio-cognitive constructs that enable or constrain human behaviour, and 6) agency to determine whether to change or not.

This set of principles, created by the community and for the community, stimulates confidence and reciprocity and also encourages more cooperative conduct among the community members.

Our participatory research study based on the lived experience of a community of residents in a peri-urban neighbourhood in the East Zone of São Paulo showed us that community governance is able to reorganize spaces forgotten by the government and generate forms of collaborative work, based on personal relationships of trust and mutual aid.

## *Methodological Path*

We gathered background information to carry out this study using primary and secondary sources as well as documentary and bibliographic research. The secondary sources included books, scientific articles, dissertations, theses, and information collected from official websites, while the primary sources comprised official documents (laws, decrees, ordinances, and policies) related to the research. We also relied on information gathered through community-based participatory research with residents of the area, interviews with community members, and participant observation.

According to Holkup, Tripp-Reimer, Salois, and Weinert (2004, 2), community-based participatory research “... provides an alternative to traditional research approaches that assume a phenomenon may be separated from its

context for purposes of study.” Moreover, considering that the research process should be a means of facilitating change, community-based participatory research is important because it recognizes the need to involve members of the community as active participants in every phase of the research project—crucial since after all, community gardens depend on local engagement for their maintenance into the future.

Within the scope of this research, we can highlight the roles of three specific sets of actors—community members, civil society organizations, and environmental educators in addition to other partner-collaborators—who participated in activities such as the creation of different low-cost “social technologies,”<sup>3</sup> including cisterns to capture rainwater, a solar dehydrator for fruits and vegetables, vertical vegetable gardens in PET bottles, earthworms in buckets, and bioconstruction techniques.

These activities allowed environmental educators and researchers to support and engage with members of the community, mainly women and young people, who together sought strategies based on the participation of all in building activities to address existing problems in their surroundings. Through discussions in community meetings and workshops, and informal conversations during garden-planting and parties, local residents shared their current and future concerns, livelihood responsibilities, and details of community dynamics. To protect everyone’s privacy, names and organizations remain confidential here. This privacy is important to ensure that community members feel confident in openly sharing their thoughts and experiences.

It is also worth mentioning that during the community meetings, concepts such as critical environmental education and permaculture were included in the group’s dialogues, and from their observations about their living space it was possible to build collective reflections relating social problems with regard to natural elements present in the surroundings such as trees, streams, weeds, hilltops, and types of buildings, among others.

We would like to note that, while the idea of participatory intervention is important, especially for environmental educators within the Freirean tradition (Ministério do Meio Ambiente & Ministério da Educação, 2005; Sorrentino, 2014), a valid question is whether actions carried out with the community are in fact transformative: that is, whether the actions developed have real impacts or effectively address community needs. To answer this would imply constant and consistent analysis with the community, in the context of an ongoing long-term relationship. Our relatively recent and

short-lived study cannot offer conclusive information in this regard. We base this chapter on community reports and interviews, which are relevant in the sense of noting the situation of vulnerability that affects the community as a whole, and their resilience and agency in addressing those challenges over the time period documented in this account.

## *Results: Participatory Research with Community Gardeners in the East Zone of São Paulo*

Here is the story that we were able to assemble through our documentary research, interviews, and participatory research with the community. The personal relationships built within the community began in 2002, when the Housing Company of the State of São Paulo (CDHU) created an urbanization project in the favelas of the East Zone, covering an area of approximately 980,000 m<sup>2</sup>, and made part of the area available to the local residents for a community garden.

The local residents united and initiated the process of creating the community garden. However, after four years of work, the CDHU identified that the lot they had provided was private property, and the local residents were asked to vacate the area. The community, undeterred, then decided to begin a new community garden in another location.

The new area that they found had been a dumping ground for construction waste. For two years, the residents worked arduously until the area was totally recovered and revitalized, and then they began to plant. The women who worked in the garden had no sources of income; their motivation to invest their time and work in the garden was for their own and their families' subsistence. On the weekends, those who had planted the food divided the harvest among themselves. The problem was that without any money, the community could not pay for seedlings, and at the end of the month, there were unpaid bills.

The situation began to change sometime around 2012 or 2013, when an NGO that was active in the East Zone requested authorization from the CDHU to implement a social project with these residents. This social project contributed a great deal to the collective organization of the people involved with the community garden. From then on, the local residents began to receive support and training in production planning, bioconstruction, and composting.

Later, the city of São Paulo, through the program called *Programa Operação Trabalho*, or Work Operation Program (POT), awarded ten grants worth two years of full-time minimum-wage payments, so that the grant recipients could receive agriculture training and dedicate some hours of paid work to the community garden.

The NGO's work combined with the grant payments allowed the people working there to strengthen the community garden space. However, with the approaching end of the NGO project and the grants, people feared that the relationships might weaken and undermine the collective actions that were being carried out. Therefore, they recognized the need to form a collective, which they did: It was made up of four men and six women, who then began to make natural cosmetics and sell the products from the community garden at organic farmers' markets.

Later on, with the goal of highlighting the importance of female representation and leadership, nine women of various ages formed a group that, in addition to the garden produce and the cosmetics, also sold vegan food with the slogan "from garden to table" ("da horta para a mesa"). Around 60 to 70 per cent of what is planted is destined for the kitchen, which transforms the produce into food that is served in companies. The rest is sold "at the door" or distributed to partner organizations such as the Center for Reference and Assistance to Women (*Centro de Referência de Atendimento à Mulher*, CRAM).

At the time our research took place (2019), 10 per cent of the total income received was reserved for the purchase of inputs and materials, while the rest was divided among the people involved. The CDHU, which had covered costs such as electricity and water, was dissolved by the São Paulo state government in 2020, and for this reason it is unknown if the incentives will continue. Before its dissolution the CDHU made a new area available to the collective so that they could increase the community garden's production, but this new area needs environmental restoration.

## Discussion

Hardin's 1968 article "The Tragedy of the Commons" points out the harms caused by open access, without, however, affirming that the problem is the absence of property rights or governance regimes, and not the shared use of common-pool resources (McKean & Ostrom, 2001). In other words, Hardin

ignored that in the regimes of communal use, there are also rules and principles designed to govern life in the community, as well as avoid the overuse of natural resources.

We identified an enormous capacity for organization and reorganization within the São Paulo community we studied—a community faced with different challenges imposed by the capitalist system, which favours private ownership to the detriment of collective ownership of the land, and by the state, which offers no guarantees of settlement for the group in the territory where they live.

It is evident within this context that the possibility of a communal form of urban land use and natural resources management still depends on public and private ownership regimes, since there is no recognition of common property in Brazil, except in a few situations.<sup>4</sup> Moreover, we observed that community governance in the implementation of the gardens involved the establishment of rules, with the provision of rights and sanctions that were regularly readjusted, sometimes with daily agreements. These daily agreements, important for group cohesion, were made through self-management processes involving decision-making negotiations within the group in relation to any problems that arose during the development of the work. At the end of each day, the group met to discuss the strengths and weaknesses of the decisions taken, and to re-establish updated agreements to define new responsibilities. These agreements were based on shared values such as cooperation and respect for others.

We also learned that the rules of land ownership and resource use are important for the group's cohesion, and that they allow the people to work collaboratively based on the common use of space and natural resources (earth, water, seeds, fertilizer) and other things (such as tools) that are used in the common area.

Regarding group cohesion, we observed the six social factors provide resilience, according to Cinner and Barnes (2019): the group's **flexibility** (to re-construct the garden after they were displaced), **organization** (the group's cohesion), **learning** (taking advantage of work and training programs to continually plan the garden and expand their products), **agency** (e.g., of women as members of the group and the group's ability to reach out and collaborate with the NGO and the CDHU), **socio-cognitive constructs** (these community members clearly grow up in an environment of adversity with a lack of basic human needs—which makes them very active fighters for their own

subsistence). The group worked to expand their **assets** such as tools and seedlings; securing the fundamental right to land to farm was the weakest link in this resilience chain.

All of their work has strengthened the community's right to permanence on the land, since in Brazil as everywhere, occupation builds usufruct rights (though as described, this is not inviolable). The community members' work contributes to the production of food for sustenance, promotes mutual aid in the commercialization of products, and even drives claims processes for other rights with the government. Most importantly, we realized from this community's experience that this strengthening is the result of a long process that involved a network of support with the shared goal of removing obstacles to the implementation of community gardens, occupying empty spaces in the city, and guaranteeing food and income for the portion of São Paulo's population that lives in a socially and environmentally vulnerable situation.

In other words, we came to understand that this group of urban farmers had begun to take an active role in society, in the sense of taking responsibility for local governance. In theory, this would be the responsibility of the state, represented by its administrative institutions which, while recognizing people's rights, in fact do nothing to contribute to the improvement of their quality of life. In this context, we believe that the initiatives of this group of farmers could be replicated in other areas, although there is a pressing need to strengthen the relationships among people and support special training and skills for communal local governance.

In reference to Armitage et al. (2007), Ostrom and Cox (2010) explain that local users have no personal stake in the success of a project in which they are not involved; they can even directly or indirectly undermine the project. When users are involved, however, they can use their local knowledge to make a governance regime more adaptative, using collaboration to promote systematic learning.

Thus, for natural resources and land to be protected, we see a need for the state to recognize and encourage new forms of governance that include the community, so that understanding and empowerment can take place, producing actions that bring local benefits while at the same time designing general guidelines with a view to protecting resources globally and/or regionally.

## *Final Considerations*

In this chapter, we have analyzed common-pool resources using the lens of property regimes, and described the results of a participatory research study involving urban farmers from the periphery of the city of São Paulo, with the objective of presenting some challenges for communal use and governance of land and natural resources.

We have reached the conclusion that in Brazil, public and private ownership regimes—as the predominant institutional forms of regulating access to the land and the natural resources within it—do not recognize the rights or the necessities of communities in situations of social and environmental vulnerability, and this is the reason that many communities have been adopting communal forms of territorial ownership and governance.

In contrast to Hardin's view (1968) that only public or private ownership would be able to protect common-pool resources, we have observed that local communities are capable of reclaiming, organizing, and administering the territories where they live, generating sustenance and income for the community, and even utilizing the resources in a sustainable manner.

Nevertheless, this does not mean that one single correct and successful formula exists. Communal ownership, just like private and public ownership, can be either a success or a failure. What we have tried to call attention to in this chapter is the necessity of reinforcing community values, cooperation, and mutual aid in order to promote territorial governance processes through the development of collective self-governance agreements that involve greater collaboration among the members of society in public affairs and decision-making.

We also draw attention to the need for communities to produce their own food, as changing rainfall patterns can affect agricultural productivity and food availability, and shorter supply chains reduce both uncertainty and carbon emissions. More diverse local food systems will be better able to respond to eventual emergencies, helping the poor population that will be most affected by increases in food prices.

In this sense, urban agriculture is an increasingly relevant strategy to tackle climate change and reduce disaster risks for low-income urban populations.

## NOTES

- 1 We are grateful to the Queen Elizabeth Scholars program, funded by the Social Science and Humanities Research Council and the International Development Research Centre, and the Coordination for the Improvement of Higher Education Personnel in Brazil for the doctoral scholarship.
- 2 For instance, water, as a common-pool natural resource, can suffer from overuse, as well as problems related to the dumping of pollutants, which consequently makes the resource unavailable and generate the need for costly treatment.
- 3 The term “social technology” as used in Brazil means a product, method, technique, or process designed to solve some kind of social problem while meeting the principles of simplicity, low cost, easy applicability, and proven social impact. See Bazely et al., 2015; Pozzebon et al., 2021.
- 4 In Brazil’s Federal Constitution of 1988 (unlike the legal documents of many countries), collective land ownership is allowed, but only in the following situations: Indigenous lands, *Quilombolas*, conservation areas in the forms of Extractive Reserves (*Reserva Extrativista* [Resex]) and Sustainable Development Reserves (*Reserva de Desenvolvimento Sustentável* [RDS]), as well as land reform settlements in the form of Sustainable Development Projects (*Projeto de Desenvolvimento Sustentável* [PDS]).

## Reference List

- Armitage, D., Berkes, F., & Doubleday, N. (Eds.). (2007). *Adaptive co-management: Collaboration, learning and multi-level governance*. University of British Columbia Press.
- Bazely, D., Perkins, P.E., Duailibi, M., & Klenk, N. (2015). Strengthening resilience by thinking of knowledge as a nutrient connecting the local person to global thinking: The case of social technology / tecnologia social. In S.A. Moore and R. Mitchell (Eds.), *Planetary Praxis and Pedagogy* (pp. 119–132). Brill.
- Berkes, F. (2005). Sistemas sociais, sistemas ecológicos e direitos de apropriação de recursos naturais. In Vieira, P.F., Berkes, F., & Seixas, C. *Gestão Integrada e participativa de recursos naturais*. Secco-APED.
- Bromley, D.W., & Cernea, M.M. (1989). *The management of common property natural resources: Some conceptual and operational fallacies* [Discussion Paper]. World Bank, WDP 57.
- Carolino, K. (2021). *Agricultura em São Paulo: Uma análise sobre os programas públicos instituídos no município* [Unpublished doctoral dissertation]. Universidade de São Paulo.
- Cinner, J.E., & Barnes, M.L. (2019, September 20). *Social dimensions of resilience in social-ecological systems*, 1(1). Elsevier.
- Diegues, A.C., & Moreira, A.C. (2001). *Espaços e recursos naturais de uso comum*. NUPAUB, USP.



- Dietz, T., Dolsak, N., Ostrom, E., & Stern, P.C. (2002). The drama of the commons. In E.E. Ostrom, T.E. Dietz, N.E. Dolšák, P.C. Stern, S.E. Stonich, & E.U. Weber (Eds.), *The drama of the commons* (pp. 1–36). National Academies Press.
- Dubbeling, M. (2014, March). A agricultura urbana como estratégia de redução de riscos e desastres diante da mudança climáticas. *Revista de Agricultura Urbana*, 27.
- Feeny, D., Berkes, F., Mccay, B.J., & Acheson, J.M. (2001). A tragédia dos comuns: Vinte e dois anos depois. In A.C. Diegues & A. Moreira (Eds.), *Espaços e recursos naturais de uso comum*. NUPAUB, University of São Paulo.
- Hardin, G. (1968). The tragedy of the commons. *Science*, 162(3859), 1243–1248.
- Holkup, P.A., Tripp-Reimer, T., Salois, E.M., & Weinert, C. (2004). Community-based participatory research. An approach to intervention research with a Native American community. *Advances in Nursing Science (ANS)*, 27(3), 162–175.
- McCay, B., & Acheson, J.M. (1987). *The question of the commons: The culture and ecology of communal resources*. University of Arizona Press.
- McKean, M.A., & Ostrom, E. (2001). Regimes de propriedade comum em florestas: Somente uma relíquia do passado? In A.C. Diegues, & A. Moreira (Eds.), *Espaços e recursos naturais de uso comum*. NUPAUB, University of São Paulo.
- Ministério do Meio Ambiente & Ministério da Educação. 2005. *Programa Nacional de Educação Ambiental—ProNEA* (3rd ed.). MMA Editions.
- Ondetti, G. (2021). Ideational bases of land reform in Brazil: 1910 to the present. In L. Leisering (Ed.), *One hundred years of social protection* (pp. 343–379). Palgrave Macmillan. [https://link.springer.com/chapter/10.1007/978-3-030-54959-6\\_10](https://link.springer.com/chapter/10.1007/978-3-030-54959-6_10)
- Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge University Press.
- Ostrom, E., & Cox, M. (2010). Moving beyond panaceas: A multi-tiered diagnostic approach for social-ecological analysis. *Environmental Conservation*, 37(04).
- Pozzebon, M., Tello-Rozas, S., & Heck, I. (2021). Nourishing the social innovation debate with the “social technology” South American research tradition. *Voluntas: International Journal of Voluntary and Nonprofit Organizations*, 32, 663–677.
- Ruschel, C.V. (2018). *Os limites do Direito Ambiental na preservação dos recursos naturais comuns: Epistemologia da sustentabilidade e estudos de caso* [Unpublished doctoral dissertation]. Universidade Federal de Santa Catarina.
- Sorrentino, M. (2014). Educador ambiental popular. In L.A. Ferraro Junior (Ed.), *Encontros e caminhos: Formação de educadoras(es) ambientais e coletivos educadores* (Vol. 3, pp. 141–154). MMA/DEA. <https://www.terrabrasil.org.br/ecotecadigital/index.php/estantes/educacao-ambiental/2515-encontros-e-caminhos-vol-3>