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Public action and cooperative intelligence for the development of healthy and sustainable territories in the Anthropocene

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Abstract

Social technologies have great transformative social power and can function as tools for empowering communities and as great allies in the territorial development strategy in the Anthropocene, in which the socio-natural relationship is inseparable, evidenced by the reflection of the environmental framework on social vulnerabilities. In this sense, we examined the application of the Territorial Future Intelligence Methodology (Territorial Ifuture) by the Territory Radar project in the territories of Sol Nascente and Pôr do Sol, communities with a high degree of inequality in the Brazilian Federal District, with the 2030 Agenda as a structuring element. Based on actor-network theory, we seek to answer how the social technologies produced could contribute to empowerment

and territorial development as a way of facing the problems of the Anthropocene. Based on a collective construction, social technologies were appropriated by communities, forming transversal and participatory public action instruments that strengthen actors integration and articulation, in addition to guiding decision-making processes in a collective way, enhancing the search for solutions to problems in promoting the development of healthy and sustainable territories in an inclusive, fair and democratic way.

Keywords: territorial development; anthropocene; health; 2030 Agenda; Federal District.

Introduction

The idea of a new geological era driven by human action on the Earth system – the Anthropocene (Crutzen & Stoermer, 2000; Crutzen, 2002) – has burst the bubble of natural sciences, serving as a key concept for understanding contemporary socio-natural relations (Arias-Maldonado, 2015). However, the Anthropocene era does not only imply the rapid destruction of biomes, extinction events of entire species and climate emergency. In addition to being an epistemic resource to name the great transformations of the planet, the Anthropocene reinforces the links that exist between environmental and social issues – such as poverty and inequality, with unequal distribution of their effects depending on the context analyzed, which represent different governance challenges, both at the microscale (local) and macroscale (national) (Biermann *et al*., 2016).

In Latin America, the concept of the Anthropocene undergoes interpretations and resignifications that are affected by the experiences of the problems it denounces. According to Svampa (2019), Latin American authors draw attention to the generalization and homogenization of the effects of human action on the planet. This results in a depoliticizing and irresponsible effect, as there is no equal responsibility among peoples, regions, genders, and social classes when it comes to environmental destruction, given that it is sustained by an economic model whose main actors are in the North of the globe and which generates the inequalities experienced in the global South. In this sense, the Latin American narrative of the Anthropocene places local processes and the multidimensionality of historical-territorial phenomena and scenarios at the center of the analysis and socio-environmental transformation.

In fact, contemporary times deal with the repercussions of the modern Anthropocene, of choices made, such as exclusive development models, and of policies that have failed to collaborate with an agenda committed to the planet and social well-being (Giatti & Maksud, 2023; Hirschfeld, 2020). As a counterpoint, local development initiatives contribute to establishing a more favorable framework for vulnerable communities and social groups. In this sense, territorial governance (Dallabrida, 2020) and community governance (Stoker, 2010) for the promotion of territorial and endogenous development (Vázquez-Barquero & Rodríguez-Cohard, 2015) have as a common purpose collective action and plurality of actors in the decision-making processes of public action as elements for the emancipation and social empowerment of territories. The empowerment of a community has the potential for transformation necessary for territorial development, that is, it is expressed in the quality of giving and/or conquering, so that a given individual or community is aware of their interests, even in participating in local decisions, providing support to groups

considered marginalized and powerless to understand the power dynamics in the systems that are involved in the development of new capacities and skills (McWhrirter, 1991).

In this article, community empowerment comes from the development of social technologies (Dagnino, 2010) conceived within the scope of the Territory Radar Network DF[1] – which will be referred to in this text simply as the Territory Radar project – in the territories of Sol Nascente and Pôr do Sol, both located in Brasília/DF, Brazil. The partnership aimed to activate a sociotechnical network established through cooperative intelligence (Martins, 2013), through the theoretical approach to health transversality and policy integration (Maia, 2021) focused on territorial development, having as a structuring category the 2030 Agenda of the United Nations (UN) and its Sustainable Development Goals (SDGs).

The socioeconomic and environmental problems of the new administrative region of the Sol Nascente and Pôr do Sol communities are historic. Since the construction of Brasília, the region has suffered the consequences of the lack of urban planning, resulted by disorderly growth. The result was the creation of the second largest favela in Brazil (Martins, 2024; IBGE, 2023).

In this study, we observed, from the perspective of Actor-Network Theory (ANT) (Latour, 2005, 2006), how actors (human and non-human) were mobilized and the scope of the social technologies developed, following the actor-network through Territorial Ifuture (Jesus *et al*., 2017) – part of the Territory Radar project of Picaps (Cooperative Intelligence Platform with Primary Health Care). The project and the application of Territorial Ifuture resulted in the creation of five main social technologies for territorial development. The question that guides this work is: how do these social technologies work towards the empowerment and development of healthy and sustainable territories as a way of facing the problems of the Anthropocene? Thus, this article aims to contextualize and list the social technologies that were conceived within the scope of the Territory Radar project as instruments of empowerment and territorial development.

Theoretical framework

The Anthropocene

The Anthropocene is a concept developed within the natural sciences that has gained prominence in the social sciences. The premise is simple: human action has transformed the Earth system so much that it is now possible to speak of a new geological era. Thus, the Anthropocene replaces the Holocene based on the colonization of nature by humans (Crutzen & Stoemer, 2000; Arias-Maldonado, 2015).

The Anthropocene began at the end of the 18th century, when higher concentrations of carbon monoxide and methane were found in the polar ice caps and greenhouse gases began to spread. These emissions coincided with the invention of the steam engine (Crutzen & Stoemer, 2000). However, industrialization was not the only cause of this drastic transformation: the uncontrolled use of natural resources and population growth also contributed to humanity becoming the 'main environmental force' of this era (Crutzen, 2002:23).

The transformation from the Holocene to the Anthropocene can be divided into three stages: pre-Anthropocene events, a period in which the socio-natural relationship is based on deforestation for agriculture, on a scale and with a much smaller impact than the industrial period; stage 1 of the

Anthropocene, or Industrial Era (1800–1945), with a significant increase in the use of fossil fuels by industrial society; and stage 2 of the Anthropocene, or Great Acceleration (1945–2015), when a rapid transformation occurs in the world after World War II, with the population doubling in size, increasing urbanization, fossil fuel-based vehicles, etc. In the last 50 years, humanity has modified the world's ecosystems more rapidly and more extensively than at any time in history (Steffen *et al.*, 2007). At the time, Steffen, Crutzen and McNeill (2007) predicted a third stage of the Anthropocene, called Earth System Stewards (2015-?), in which humanity understands its transformative role in the environment and works to create a sustainable Earth System for human life.

The main concern of this new geological era is certainly climate change. However, as Arias-Maldonado (2015, p. 74) highlights, the "disappearance of pristine land, urbanization, industrial farming, transportation infrastructure, mining activities, loss of biodiversity, organism modification, technological leaps, and growing hybridization are also on the list". The causes can be understood as an uncontrolled and inconsequential process of exploiting natural resources, altering the socio-natural relationship. The Anthropocene has been strengthened in two contexts: as a chronological element, demarcated by human action in the World System; and as an epistemic tool, which deals with the relationship between society and nature (Arias-Maldonado, 2015).

The influence of terminology has been growing in recent years. In a survey carried out on 11/07/2023, in the *Scopus* database, using the terms 'social' and 'Anthropocene' as search parameters [TITLE-ABS-KEY (anthropocene AND social)], a significant increase in academic production on the subject was observed. Of the 2,039 works surveyed, 1,746 (85.63%) were produced since 2017.

The growth of academic production on the subject can be attributed to the crisis of the traditional linear model of development, based on economic growth (Rostow, 1971), which marks the emergence of new forms of development, or post-development (Pieterse, 2010). The climate emergency is a reality, and an economic model of development based on infinite growth is incompatible with the existence of a finite world (Latouche, 2009). Thus, concern for environmental changes marks new social approaches, since society and nature become inseparable (Giddens, 1991).

According to Latour (2020), the denial of undeniable climate change began in the 1990s, with deregulation and alarming inequality. For the sociologist, the elites have already concluded that there is no room on the planet for everyone, so they no longer pretend that there is an idea of equality, a world common to all. Poverty and inequality are issues constructed in modern social relations based on different economic, political and power dynamics.

However, the Anthropocene should not be understood as an apolitical concept, nor should it be interpreted far from a political-economic perspective (Baskin, 2019). The Anthropocene develops in conjunction with capitalism (Moore, 2016) and is therefore a phenomenon that anthropocentrically produced the conditions of modern poverty and inequality. Colonialism is undoubtedly a determinant in the history of countries and their development conditions, establishing the modernization of Western civilizations as a parameter (Mignolo & Walsh, 2018). Thus, considering global inequalities, the Global South emerges as a political project (Ballestrin,

2020) to dissolve the idea of underdevelopment and allow for new logics that counter the neoliberal conception.

In the context of Latin America, the attempt to create an autonomous industrial park to develop was the precept of ECLAC, which encouraged a structuralist model of development back in the 1950s. Thus, the countries underwent a major urbanization process until the 1970s (Rodríguez, 2009). In the following decades, the introduction of neoliberal policies impacted the construction of more unequal scenarios, economically, socially and regionally. Currently, Latin America is still fighting for the eradication of hunger and poverty, for democratic strengthening, for the rights of historically marginalized communities, against high levels of inequality and, at the same time, against the global effects of climate change and the destruction of local biomes.

With the capitalist model – based on the unbridled exploitation of material, financial and intangible resources – still guiding global political and economic processes, no major changes are expected in the actions of the Global North. It is therefore up to the Global South to outline development strategies, primarily with a view to sustainability for human survival.

Public action and sociotechnical networks formation

State action is not a static model, having transformed and adapted, over time, to its new functions. Societies have become more complex, just as public problems have become *wicked problems* (Head, 2022), marked by complexity, uncertainty and divergence, and cannot be resolved based on the simplicity of the administrative structure (Brugué *et al*., 2015).

The State has made public management more flexible and stopped governing alone, moving towards an understanding of governance in which there are " governing efforts by all manner of social-political actors, public as well as private; occurring between them at different levels, in different governance modes and orders" (Kooiman, 2003, p. 3). The definition of the State as "State in action" (Jobert & Muller, 1987) promoted an important shift in the understanding of the role of the State and the constitution of public policy. The new dynamic is polycentric, and the State is one of the actors that make up action networks.

Consequently, the characteristic element of the contemporary State is the inclusion of new actors in the decision-making process, with society as a co-creator of policies. Thus, the concept of public policy can be expanded to take into account new dynamics of governance and their entangled hierarchies, observing public action, especially that operationalized in the form of instruments (Lascoumes & Le Galès, 2007; Aggeri & Labatut, 2011). “Each instrument is a condensed form of knowledge about social power and the ways of exercising it; each instrument has a history, and its properties are inseparable from the purposes attributed to it” (Halpern *et al* ., 2021, p. 34) and is constituted by both purposes and projects of actors. Therefore, the instruments of public action have both technical and political dimensions, as they are constituted by the interaction of several actors (among them, the State). The instruments are based on action, much more than on bureaucracy.

The centrality of instruments (Halpern *et al*., 2014) is supported by Michel Foucault's discussions of governmentality [2] and the sociology of science and technology. The instrumentation of public action, therefore, does not separate technological constructions from political and social

constructions, and focuses its studies on the analysis of the interactions of the multiple actors that constitute the networks. Instruments can be understood as specific types of technologies, as they establish a relationship between the State and society through a regulatory framework.

Considering these different inputs and the concern with the specificity of Brazilian democratization processes, Cruz (2020) understands transversal and participatory public action (TPPA) as dynamics that articulate institutional and non-institutional actors, from different origins and sectors, in interactive processes that take into account the possibility of dealing with complex public problems in spaces of high dialogicity, such as councils and conferences. In them, environments are established that are conducive to the creation of responsive and innovative public action instruments. So, TPPA instruments:

> organize and engage actors, resources and processes, expressing the coordinating meanings of their action references and the limits of the TPPA. In general, they constitute processes of standardization or socio-technical regulation that simultaneously articulate, qualify and democratize the state (Cruz, 2020:117).

These spaces can constitute, in a more or less formal way, interactive networks. In these networks, the State is responsible for creating dialogic arenas and structural and institutional conditions for change (Torfing *et al*., 2012). The interaction among actors is established in the form of sociotechnical networks, with actors acting in favor of their interests. Networks are associations among human and non-human actors (technologies, organizations, natures, etc.) where interests and technologies are in dispute and being constituted (Latour, 2005). Interests have both rational and strategic dimensions and are an expression of the identities of the actors, of the meanings and senses that they imprint on their representations and actions, as well as of the practices that they construct in their associations and of the context in which they are inserted and transform.

According to Venturini (2010a), networks are dynamic configurations in which actors forge new or rebuild old ties, and the emergence of new networks redefines the identity of actors. These mobilized forces lead to collective action, which cannot be understood as homogeneous social forces (Latour, 2012), but as an action that moves different types of forces united because they are different. Networks are, therefore, associations among humans and non-humans where interests are in dispute and constituted (Latour, 2005), as well as identities, representations, meanings, problems and solutions that materialize in technologies. From this perspective, sociotechnical networks dynamics are what constitute technologies.

Actor-Network Theory, technologies, and local transformations

In the Anthropocene, the relationship between the social and the natural intensifies, in a mutual process of transformation, which is mediated by technology, and which constitutes, at the same time, the cause and the solution to socio-natural problems, in a process of co-construction (Feenberg, 2010). The decision was therefore made to bring the ANT approach to the interpretation of socio-natural relations in the Anthropocene. “ANT is an argument not about the ‘social’ but about the *associations* which allow connections to be made among non-social elements” (Latour, 2003:35). The basic idea of ANT is the heterogeneity of the network, which groups elements of

different natures, focusing on the role of mediators, who "transform, translate, distort and modify the meaning or the elements they are supposed to carry" (Latour, 2012, p. 65). Thus, both humans and technologies act as mediators. Following the principle of symmetry that underpins ANT, the network and, therefore, collective action, is not constructed solely by human actors (individuals), but also by non-human actors (natural elements, technologies, routines, scientific concepts, laws, organizations, institutions, among others). In ANT, the core is to describe not what the actors are or mean, but what they do and how they influence the course of action (Fenwick & Edwards, 2011).

The dynamics of network constitution are, therefore, also a dynamic of technological constitution and transformation. Technological construction depends both on a translation process that involves heterogeneous actors in associative flows, and its process of use and diffusion through the network also causes displacements, modifications, arrangements, and translations (Callon, 1986). According to Oliveira and Daroit (2020), this creates a continuous movement of (re)construction, opening up possibilities for social transformation while the action is carried out collectively.

Technologies refer to how knowledge is applied for a given purpose, with more importance given to the system in which this technology is inserted (Street, 1992; Winner, 1986). In this way, technologies are endowed with politics and do not assume a passive role, acting as mediators and social transformers. This view of technology is compatible with both the public action approach, for which instruments are not neutral, and the ANT proposal, in which the process of technological construction is understood as political in its essence. Feenberg (1999) uses Dewey and Sclove's theories to defend the use of small-scale technologies as a means of democratically promoting communities and not societies in a macro approach. Social technologies are techniques, instruments, artifacts and methodologies developed with and for the benefit of communities to promote social transformation and emancipation (Pozzebon & Fontenelle, 2018).

Although a distinction is often not made among technologies and innovations, it is worth noting that innovations represent new technologies that arise from new problems or new interpretations of existing problems, as well as new solutions. In Latin America, social innovations are constructed as promoters of active citizenship, which is based on the premise of raising awareness among communities about their rights and social practices to promote their development. Social innovation is an "endogenous process of self-organization" (Rodríguez-Herrera & Alvarado-Ugarte, 2008, p. 24), which uses citizenship, based on individual and collective initiatives, to develop creative and innovative solutions to already established public problems, giving rise to other ways of developing (Brugué *et al*., 2014; Andion *et al*., 2017). The concept is heterogeneous, having as its core the application of knowledge aimed at solving a social demand based on the interaction and cooperation of the actors involved (Bignetti, 2022).

When a social innovation succeeds in fulfilling its purpose, that is, when social innovation is successful, it can be understood as a social technology. For Saldanha, Pozzebon and Delgado (2022), the development of the concept of social technology has a decolonial character, conceived in the Latin American context, as a critique of the emptying of the social innovation category in the global context. In the same sense, Dowbor (2014) highlights the effect of appropriation of technology by those who hold its benefits, evidencing how technology is incorporated into the community context, translating knowledge into social practice (Callon, 1986).

According to Valadão *et al*. (2019), the concept of social technology is linked to ANT, as it breaks with technological determinism and integrates political, social and cultural aspects into its theoretical approach. By conceiving that society and technology are intrinsically interconnected and mutually constitutive, ANT focuses on understanding how actors are mobilized in the sociotechnical network formed. This approach presupposes the existence of an interactive innovation process, in which the social actor is actively involved.

Community participation is consolidated as a fundamental element for a process of social transformation in the territory. It is the beginning of the process of community emancipation for the development of the territory, promoting collective and social empowerment. Although the term empowerment has been appropriated by the mercantile perspective as a way of highlighting and valuing the individual actions of collaborators, community empowerment is related to the notions of responsibility and social justice, built on dialogue.

The exercise of local power is consolidated together with territorial development, fostering territorial governance practices, in which horizontal and collaborative collective relations between territorial actors are considered a method of collective action (Dallabrida, 2020). Development is endogenous, promoted from the inside out, and not the other way around, and only exists if it can bring benefits to the territory and its population. Therefore, social technology can establish itself as a transformative element, promoting empowerment and territorial development.

Methodology

The objective of this research is to contextualize and list the social technologies that were generated within the scope of the Territory Radar project in Sol Nascente/Pôr do Sol, seeking to understand their importance in the construction of the notion of empowerment and territorial development in the Anthropocene. In this way, we seek to understand social technologies and their appropriation processes in favor of communities to promote transformation and social emancipation[3] based on the dynamics of interaction among human and non-human actors. Considering the constitution of networks as inseparable from the constitution of technologies, the method of this study is based on ANT.

According to Latour (2005), to understand the network it is necessary to follow the actors and their associations, that is, to follow the human and non-human actors in their connections and their arrangements. By following the actors, it is possible to understand the articulations and dynamics among them and, consequently, to learn and analyze how the network is configured. Thus, the first step is to define the actor(s) to be followed. To investigate the social technologies that emerged from the actions developed in the Territorial Radar project, the (non-human) actor followed was the Territorial Ifuture methodology itself, considering the participation of the Cooperative Intelligence Network 4 (RIC) in the actions carried out to build social technologies in a participatory manner.

The Territorial Ifuture mobilizes the RIC to involve and organize the experiences of the social representatives involved and promote agencies, helping to define roles and translate interests and meanings, directing collective action and contributing to the constitution of social technologies in the project. In this sense, it is a fundamental actor-network, since an 'actor', “(…) in an “actor-network”, is not an action source, but the moving target of a swarm of entities that descend upon

it (…)" (Latour, 2006, p. 67, own translation). In other words, the Territorial Ifuturo promotes the associations amid human and non-human actors (network) that build the social technologies investigated. However, it does not determine them, since the interactions among actors cannot be completely predicted or managed.

The ANT differs from other network theories because in it, the network defines its own parameters of action and, therefore, of analysis and understanding. For Latour (2006), ANT is a sociology of associations. The way in which associations amid actors are established occurs within the network and defines its scope and effects. There is no pre-established social order with categories whose functioning can be defined *a priori* or by the assumptions of analysts. In other words, the social (and its technologies) is shaped in the construction of the network by the agencies of the actors. It is worth remembering that the popular researchers, trained during the project, are also actors in the network, as they translate the method to the specific context of its application. In this sense, the categories of analysis of this study emerged from the interaction existing in the activities carried out jointly by the researchers and the representatives of the society of Sol Nascente and Pôr do Sol (human actors), as well as by the interactional possibilities provided by the application of the Territorial Future and by the social technologies constructed in the network (non-human actors).

Although ANT aims to encompass the complexity of interactions among actors who construct the social world and its technologies, the process of unfolding the complexity inherent in the social world cannot do without its organization (Venturini, 2010b). Therefore, categories were used to organize and analyze the data collected. These categories can answer how these social technologies help to solve the problems of the Anthropocene, as a cross-cutting issue that takes on unique proportions in the Latin American context, of a social, political and environmental nature in the territory. The 2030 Agenda functions as an instrument for evaluating the problems of the Anthropocene, a reason that is not configured in the categories of analysis.

At each stage of the application of the *Territorial IFuture*, associations amid human and non-human actors were observed that allowed the development of social technologies. Therefore, for each stage, the *human and non-human actors involved, and their relationships are described*, as well as the *developed social technologies.* These two categories constitute an important core in the analysis of the socio-technical network. The *objectives* and *results of the technologies* were also considered, which are fundamental to their understanding and scope, as well as to understanding shared interests and meanings. Two other categories relate to the uses of social technologies: *impact on the territory* of Sol Nascente and Pôr do Sol and their *capacity for re-application*. Considering that the Territorial IFuture and the social technologies derived from it aim to provoke social changes, the observation of their possible effects and the capacity for transposition, more precisely, translation, to other contexts and territories that face highly vulnerable realities are categories related to the observed processes, composing a framework of experiences with the potential for dissemination.

Finally, the essence of ANT, taken in its methodological components, consists of observing and describing associations, without considering researchers to be impartial or dissociated from the reality being constructed. Observation and description do not require specific theories or methods; they precede theorizing and the method (Venturini, 2010a). This is an important methodological point of the study: although the analysis arose from the Territorial IFuture methodology, whose

contributions come from a government research institution, what was observed and described was not an application of this method, but the network that was formed around it and the technological productions that derived from it in the specific context of the interactions existing amid actors investigated.

Between April and October 2022, four workshops were held with the participation of project partner institutions, community representatives, and members of *Rede Sol*, a pre-existing local sociotechnical network, analyzed based on participant observations (Marietto, 2018). The first workshop, with 80 participants, was about territorial investigation and construction of the territorial risks classification, based on factors originating from the 2030 Agenda. The second and third workshops, with 25 and 30 participants, respectively, were aimed at creating the digital risks map, with the identification and location of the previously selected factors in the territories. The fourth workshop, with 60-70 participants, was dedicated to the construction of future scenarios. Divided into working groups, the participants discussed the potential scenarios of the territory and the ways to develop the community, considering the relevant factors worked on. From the workshops, two other technologies were created: the Social Cooperation Room, a virtual space for interaction amid RIC actors for debate and collective construction, bringing together the other technologies developed as a public action process; and the territorial-based operational indicators, which are constituted from unstructured data (qualitative and quantitative) created and provided by workshop participants to evaluate critical factors longitudinally and which serve as a guide for popular researchers trained in the project.

Socioeconomic overview of Sol Nascente and Pôr do Sol

Given the context presented, it becomes relevant to explain the project's application territory, based on the details of the Sol Nascente and Pôr do Sol section within Brasília, Distrito Federal (DF), in Brazil.

Despite its planned creation, the population of Brasília underwent a significant and uncontrolled population increase, growing 285% between 1960 and 1970. During its expansion process, a campaign to eradicate invasions was created, displacing part of the population to the region that today forms Ceilândia. Thus, Ceilândia was born with 80,000 inhabitants. Sol Nascente and Pôr do Sol are territories derived from the division of two farms in Ceilândia, receiving the status of housing sectors of Ceilândia in 2008. In 2019, the administrative region Sol Nascente and Pôr do Sol was created, which today has 93,217 inhabitants, representing 3.1% of the total population of the Federal District, with a population density of 56,407.12 inhabitants/km2 and an estimated average household income of R$2,188.30 (Negret, 2018; Luiz & Kuyumijan, 2000; Pereira & Avena, 2018; Codeplan, 2022). Sol Nascente is considered the second largest favela in the country, behind only the Rocinha favela in Rio de Janeiro (IBGE, 2023; Martins, 2023). This situation contrasts with the pilot plan of Brasília, highlighting the serious scenario of poverty and vulnerability in the interior of the Brazilian capital. While the Federal District occupies the position of the Brazilian federative unit with the highest GDP *per capita* in the country (IBGE, 2023), Brasília was considered in 2018 the city with the greatest income segregation in the world (OECD, 2018).

In Sol Nascente and Pôr do Sol, almost all households are houses (97.2%), but few lots are regularized (8.5%). The biggest complaints made by residents of the territory, according to data from

Codeplan (2022), are problems with erosion, debris, open sewage, flooded streets and potholes. Sanitation is still precarious, with 30.4% of homes having septic tanks. Regarding urban infrastructure and public facilities around homes, there is a low structure of areas, community public spaces, alternative structures and spaces and equipment for sports practice. Regarding individual living conditions, 94% of residents do not have private health insurance, and only half of households are food secure. The level of education is not high, compared to the national average (Codeplan, 2022; IBGE, 2023).

Considering the territory of Sol Nascente and Pôr do Sol, with these sociodemographic characteristics that indicate high vulnerability, a joint action was carried out between the community and partner entities, as a result of the Territory Radar project, aimed at acting in these territories. The driving force for the development of the project is cooperative intelligence (Martins, 2013), a process of systematizing the interactions existing in a sociotechnical network that aims to enhance integrated collective action in solving problems that affect the network. Cooperative intelligence enables the network to seek joint responses that meet social needs, based on the connections that are established, supported by the exchange of knowledge among the actors who share objectives, goals and future visions, creating actions, projects and cooperation.

The project applied the Territorial Ifuture methodology in a territorial prospective activity focused on promoting the health and sustainability of the Sol Nascente and Pôr do Sol territories, which produced a set of social technologies to be used by the community as a way of addressing common problems worsened by the Anthropocene. In this article, we explore the creation and allocation of these social technologies for territorial development based on Territorial Ifuture as an actor-network. The methodology can be summarized in three stages – situational analysis, social cartography and territorial prospective – as a public action to develop the territories, taking advantage of the exchange of knowledge among social, governmental and academic representatives. In the project, the methodology was divided into four workshops, detailed in the methodological section, which generated five social technologies, which are the object of analysis in the research.

Results and discussion

Based on the methodological construction, the focus of the analysis of this study is on the construction of mechanisms for monitoring and assessing social and territorial vulnerabilities that were developed in the Territory Radar project. In short, the project uses the Territorial Ifuture methodology to design, with the population of the territory, possible scenarios that help visualize the need for joint action in the territory, which topics are addressed, based on the 2030 Agenda as a structuring element, and which possible solutions can be implemented. Within the Territory Radar project, the study focused on the creation of the RIC, whose focus would be the monitoring and assessment of the degree of social vulnerabilities existing in the territories related to the incidence of the Covid-19 pandemic and its consequences, based on the training of popular researchers to work in territorial governance, aiming at strengthening local governance regarding public policy for development (Maia *et al*., 2024; Sellera *et al*., 2019).

Relations among human and non-human actors and technologies developed in the territory radar project

Different products were collectively produced to contribute to the monitoring and evaluation of territorial indicators in Sol Nascente and Pôr do Sol, with a focus on promoting healthy and sustainable territories (Sellera *et al*., 2019; Maia *et al*., 2024). An important feature of this cooperative action was the integration between the construction of social technologies developed in this project together with society and their respective use by people, in the full sense of the use of transversal and participatory public action instruments through interactional characterization (Cruz, 2020). In addition, the interaction with the Territorial Ifuture methodology allowed its transformation and adaptation to the local reality, in accordance with Feenberg's (2013) idea of appropriate technologies, a path to produce social technologies. We highlight the production of five products: (1) territorial risk classification, (2) digital maps of territorial risks, (3) future scenarios, (4) Social Cooperation Room, and (5) operational indicators, which will be discussed in more detail in this section.

Classification of territorial risks

The first technology was developed in a workshop in the territory with the participation of approximately 80 people, including representatives from Sol Nascente and Pôr do Sol and technicians from Fiocruz and other entities, based on participatory actions of situational analysis for priority investigation of factors. The groups were divided into groups, with a facilitator in each to clarify concepts and a collaborator to record observations in a diary and later perform qualitative analysis (Jesus *et al*., 2017). The groups corresponded to conversation circles to promote reflections among the participants, using a quantitative instrument of consensual scoring for the themes considered relevant by the participants in the territory of Sol Nascente and Pôr do Sol.

As part of the methodology, the themes were structured according to the 17 SDGs of the 2030 Agenda and organized into threats, vulnerabilities and resiliencies. Threats correspond to external factors that produce negative effects in a given location, vulnerabilities refer to the situational conditions for the life of society, individually or collectively, with exposure to negative effects and, finally, resiliencies are the capacities identified at the individual or collective level to deal with adverse situations, finding ways to overcome, resist and start over (Maia *et al*., 2024).

During the workshop, it was possible to observe the first moment of interaction amid humans and non-humans: the Territorial Ifuture methodology and its arrangements and concepts needed to be understood by the participants. Some participants were able to translate the meaning of threats, vulnerabilities and resilience to others more effectively, promoting the apprehension and sharing of meanings.

The threats cited included topics such as unemployment, hunger, sexism, violence, and basic sanitation. The list of vulnerabilities included topics such as illiteracy, informal workers, non-political citizens, lack of basic education, low access to public services, and lack of local infrastructure. It can be seen that the threats and vulnerabilities only partially coincide with the elements previously mapped by Codeplan (2022) for Sol Nascente and Pôr do Sol and combine structural factors such as basic sanitation and low access to public services with sociopolitical factors such as sexism and low politicization. This particularization of the topics based on the SDGs and in comparison with the data

from Codeplan (2022) adds an important element to the constitution of the network: the territory and its specificities. Reading and translating the daily experiences of human actors to classify threats and vulnerabilities allows for a broader view of the specificities and constitutes a principle for the construction and appropriation of shared meanings.

The following themes were listed as resilience issues: solidarity against hunger, educational incentives, food production without pesticides and circular economy actions in the territory. The recognition of these experiences was only possible due to the heterogeneity of the actors present and who, in their work in associations, social movements or collectives existing in the territory, recognize the cooperative and participatory processes of facing problems by sharing technological solutions, such as organic food production and the circular economy.

During the workshop, it was possible to observe how participants expressed a sense of understanding regarding the interaction among the factors listed and how existing technologies in the territory aimed to respond to the threats and vulnerabilities listed. For example, unemployment (threat) was related to the existence of informal work (vulnerability) and circular economy actions in the territory (resilience). In this sense, human/non-human associations are present as ways of confronting problems through community actions (social technologies), expressing the transversality of action by expressing the reflexivity inherent to social actors in their daily activities.

The purpose of the classification into threats, vulnerabilities and resilience was to understand, based on the goals and objectives already outlined by the 2030 Agenda, what the biggest social bottlenecks are, understanding which are the points of greatest social and territorial vulnerability, understanding which elements require urgent action, which have the potential to intensify and require future action, and understanding in which issues society has already developed its capacities to deal with the problems. The classification can impact community life by encouraging structured debate, as food for collective actions to establish interactive dialogue among network members and integrate the different correlative themes of public policy, in order to raise the level of understanding, appropriation and deepening of the territorial reality (Maia, 2021).

Prior to the first territorial investigation workshop, the Picaps team of experts listed which 123 critical factors of the 17 SDGs and 169 targets were relevant to the territory, excluding those that did not apply, such as SDG 14 (marine life). These factors were discussed in the first workshop, in which social representatives of the territory classified the importance of the topic on a scale of 0 to 10, with a score of seven or above being considered relevant. Of the 123 factors that were identified by the community, 114 were considered relevant, and a systematization was carried out, generating the classification of territorial risks, the first social technology constructed, with 30 political folders (agendas) and classified into threats, vulnerabilities and resilience as categories of analysis (Maia *et al*., 2024).

Digital map of territorial risks

The categorized factors were used to generate the second technology, considering the geolocation of threats, vulnerabilities and resilience indicated by social representatives and the social cartography technique. The second and third workshops focused on creating the social cartography of the Sol Nascente and Pôr do Sol territory, using a plotted map to aid in visualization, where the themes classified in the first workshop are located.

The social cartography technique reflects the spatiality of sociopolitical problems existing in territories in a democratic and participatory way, respecting the knowledge of participants and generating data to allow the construction of cooperative intelligence within the local sociotechnical network to guide territorial governance actions, aiming to generate social transformation (Costa, 2010; Hoffman, 2010; Martins, 2013).

Thus, using instruments called territorial maps and iconography – visual representation of the listed factors –, participants proceeded to identify existing risks, which were subsequently georeferenced for digital mapping, resulting in a collective product constructed representative of the social problems of the Sol Nascente and Pôr do Sol territory (Maia *et al.*, 2024). The map is understood as an artifactualized social technology to promote social transformation (Acselrad, 2014). Its digital version is important because it highlights the dynamism of the territory, as problems worsen, are solved or are created, in addition to allowing the population itself to identify risks in the territory and monitor them. Thus, there can be a dynamic interaction between the population and the technology, not limited to its construction, characterization of Sol Nascente and Pôr do Sol, allowing its dissemination, transformation and expanded uses and/or taken to other contexts as a visualization tool.

Future scenarios

This third social technology is the generation of future scenarios, resulting from the fourth workshop, divided into eight working groups, each responsible for evaluating two SDGs. At the meeting, scenarios were generated based on hypotheses and the most likely scenarios for Sol Nascente and Pôr do Sol in 2030 were chosen in plenary. Based on the Territorial Future workshop, planning focuses on the issue of what could happen in the territory (Jesus *et al*., 2017), considering the uncertainties.

During the workshop, a list of risks identified for the territory was presented and, through group discussions and reflective processes, participants were asked to make connections among the different types of risks (threats and vulnerabilities) and actions already taken (resilience) or that could be taken, considering the existing community organization base, as well as capacities to be developed. The transversality perceived by human actors amid risks and how each one has the capacity to enhance others became evident. This complexity was understood based on the daily collective experiences and experiences of the actors in the territory, making explicit interactions between phenomena that were only partially known through literature and without specification for the context of Sol Nascente and Pôr do Sol. Thus, it was possible to observe, for example, how teenage pregnancy is related to mental health, how mental health is related to difficulty in accessing school (also due to the Covid-19 lockdown), how access to school depends on public transportation and urban infrastructure, and how infrastructure is related to violence. This expresses a chain of translation (non-linear or unidirectional), whose construction of meanings and solutions involves the interpretation of the participants, who are also community representatives, in interaction with the Territorial Ifuture methodology, but also with other human and non-human actors (such as schools, buses, street lighting, families and police officers) who are not present, but are felt by the reflection generated in the discussion. Thus, the network is not located in the workshop, but expands to encompass the territory. The mediation of the relationships among these actors is,

therefore, a technological mediation as much as a human one. In the case of Territorial Ifuture, even if the technologies have a script to be followed, this does not mean that their results are standardized and predictable. The network of actors is a space of uncertainties that are gradually reduced by the collective agreements that arise from the interactions among human and non-human actors (Latour, 2012).

In the plenary session, participants chose the most likely scenarios, and a tendency to outline positive scenarios for the future was observed. This can perhaps be explained by the profile of the participants, whose daily activities are to promote better living conditions for the population. In the words of one participating activist: "If we don't believe in our work, then who will?". Using the Territorial Ifuture methodology, it is possible to see that its characteristics are distinct from other traditional prospective tools that seek technical and often impartial analyses of possible future phenomena. This fact makes it relevant and distinct, as it allows its possible results to be used as a script for the community's future perception of life, allowing the expectations, desires, meanings and interpretations expressed by the participants to be rewritten and incorporated.

The possibilities worked on in the future scenarios designed led to the creation of a text that included the positive and negative situations that could happen. During the plenary session, the need to work together with the government to implement the possible scenarios became even more evident to the participants. Therefore, in addition to social action among community actors, public action, in conjunction with the State, appeared to be a necessity for developing solutions to the problems faced in the territory. Based on this perception, the action plan resulting from the Territorial Future Plan constituted an important community resource for working with other actors, serving as a tool for dialogue and bargaining with political authorities, for example, on strategies for improving the territory based on the construction of new horizontalities (Santos, 2005). In fact, this unforeseen use of the action plan was decided and mobilized by the workshop participants: upon understanding the objective of the plan, they asked the researchers to transcribe the results into a document to be delivered to Rede Sol, which would use the document as a source of characterization of the territory in dialogues with candidates for the Legislative Chamber of the Federal District in 2022.

Social Cooperation Room

The fourth social technology was not developed directly by the social representatives of Sol Nascente and Pôr do Sol, but by the team of researchers linked to Fiocruz. The Social Cooperation Room was designed based on the results of previous workshops and is characterized as a space that allows discussions to be promoted among the actors belonging to the network, with a focus on increasing the level of understanding of the territorial reality, allowing them to deepen their debates on public policy issues in the territory, culminating in the appropriation of the situation and the instruments previously developed. Therefore, the Social Cooperation Room can be considered a space for interaction among multiple actors, with the use of products generated cooperatively (unstructured data – primary source) and access to the large existing public databases (structured data – secondary source). The Social Cooperation Room allows the integration of the necessary data to contribute to the reduction of uncertainties in this complex environment, with a view to generating relevant information for cooperative intelligence from the people who experience these

territories of Sol Nascente and Pôr do Sol. Therefore, the Social Cooperation Room allows the search for the establishment of dialogues by the actors involved to promote territorial governance and its proper conduct to change social reality (Maia, 2021). The proposal is that the Social Cooperation Room constitutes itself as an actor-network in the territory.

Furthermore, the Social Cooperation Room, as a cooperative intelligence device, represents a social technology built for use by society as a way of providing feedback on project activities, with the aim of ensuring that the representatives present and the society of Sol Nascente and Pôr do Sol have full, fast, free and secure access to the products generated cooperatively, to facilitate discussions in the training of popular researchers, as well as in the *Rede Sol* (Sol Network) for representatives of local society (Maia *et al*., 2024). This space can contribute to the use of territorial data for more assertive risk monitoring, a fact that allows for quick and agile actions with society in crisis situations – such as the Covid-19 pandemic – in addition to the use of data linkage for integration in a systemic way (Martins *et al*., 2023). Such action allows the integration between structured and unstructured data in the construction of more effective public policy to address social problems in the country, resulting in a bottom-up formulation, based on epidemiological intelligence, popular surveillance on a territorial basis and public action in dynamics of cooperation between State and society (Martins *et al*., 2023).

Territorially based operational indicators

These are the fifth technology created in the application of the Territorial Ifuture methodology, constructed from unstructured data obtained in the territory during the workshops and which evaluate, based on the analysis of a short period, the classified risk factors. The indicators are initially measured considering the cartography generated in the workshops. The set of these indicators generates a basket of indicators, formed by unstructured data and secondary data, originating from Codeplan (2022) and other public databases, gathered in the Social Cooperation Room. The indicators are formulated based on the SDGs and the critical factors raised, generating elements that can be reused for monitoring, policing the resolution of local problems. With the indicators in hand, the popular researchers trained by the project are guided to continue the evaluation and monitoring of these threats, vulnerabilities and resilience in the territory, as a tool for social surveillance, by the network actors and by the public authorities. This continuous temporal assessment is also an important mechanism for the community to face the problems of the Anthropocene, since the critical factors based on the SDGs integrate issues closely linked to human action in the territory. Thus, the indicators interconnect public action and community performance with territorial development in an uninterrupted process of territorial development, encouraging local cooperation and monitoring of indicators.

Scope of technologies developed in the territory radar project

Once the human and non-human actors in their relationships and the construction of social technologies have been described, it is necessary to discuss the scope of an instrument that aims to promote these technologies, considering the intention of contributing to the transformation of the socioeconomic conditions of vulnerability in the territory of Sol Nascente and Pôr do Sol.

During the workshops, three questions were constantly asked, especially in the initial moments of the workshops: “what should we do?”, “why should we do this?” and “what is it for?” We understand that these questions constituted important clues about the parameters for constructing social technologies, but also about the expectations, interests and meanings expressed by the participants in their interactions on the network. These questions also showed that the starting point of any appropriation, transformation or technological construction is its understanding and the glimpse of its applications to the reality experienced by the participants. In addition to the facilitators’ explanations, we observed that some workshop participants translated the “language” of the Territorial Ifuture methodology for others who then began to discuss their activities and purposes.

The questions arose from the interactions among this methodological instrument and the participants and were translated by the research team into three categories for each of the project stages carried out in the workshops and for each social technology produced by the network: objectives and results of the technology and impacts on the territory. These three categories, unlike the relationships among human and non-human actors and social technologies discussed previously, which aimed to encompass the dynamics of interaction among actors and the construction of social technologies, aim to describe the possible effects of the technologies generated. The last category of analysis was defined by the research team, which is linked to the possibility of technological diffusion: the reapplicability of both the methodology and the social technologies generated. Reapplicability has two dimensions, since both the methodology can be reapplied in the same territory, contributing to the understanding of the risks by the community, and it can be reapplied in other territories that face similar conditions of vulnerability and require specific social technologies to address them. Reapplicability follows the logic expressed in discussions on social technologies, in which diffusion does not imply copying, but rather technological transformation, and in ANT, for which every shift involves transformations of both the technology and the actors and their interests (translation). Table 1 presents the characteristics and devices that make up the social technology that stimulates its reapplicability.

Table 1
Territorial Radar as a reusable social technology: characteristics and devices

	Objectives	**Results**	**Impacts**	**Reapplicability**
Classification of territorial risks	Classify risks based on SDG targets into threats, vulnerabilities and resilience	Discussion and prioritization of topics	Debate and understand the strengths and bottlenecks that exist in the territory	As new problems arise in the territory, it is possible to apply the same methodology
Digital map of territorial risks	Using social cartography, map risk points and their classification	Visual representation of territorial risks	Monitoring of territorial risks by the community itself.	Insert, remove and modify risks on the digital map over time

Future Scenarios	Debate and create future conjectures	Creation of possible scenarios for the territory and a text that consolidates these ideas	The text created is an important tool for negotiating with local and government authorities	Creating future scenarios is an important exercise that encourages understanding of the paths ahead for the territory
Social Cooperation Room	As new problems arise in the territory, it is possible to apply the same methodology	Space for interaction among social actors using cooperatively generated social data and existing large public databases	Possibility of understanding the social territorial reality, deepening public policy issues in the territory and appropriation of the situation and the instruments developed	The Social Cooperation Room can be a cooperative intelligence device to promote the reduction of social inequalities and improve people's quality of life
Territorially based operational indicators	Monitor public policy that impact the living and health conditions of territories, considering multiple risks (threats, vulnerabilities and resilience), using data from the community itself	Offer conditions for societies to monitor indicators and ensure better quality of life and health for populations	Using the tool, which allows popular territorial surveillance, contribute to the 2030 Agenda	Territorially based operational indicators are flexible, adaptable to local perception, which allow measuring multiple risks according to specificities

Source: Prepared by the authors.

At all stages, there was integration of actors from different social and governmental sectors, guided by Picaps. The Territory Radar project is one of the areas of activity of this platform, which aims at popular territorial-based surveillance as a strategy for building healthy and sustainable territories (Machado *et al*., 2017). Health, therefore, is configured as an integrative cross-cutting element of policies, guiding holistic and dynamic actions combined with the promotion of health in the territories (Maia, 2021; Martins *et al*., 2023).

Regarding the interaction among actors, it is worth noting that these relationships form a new sociotechnical network, composed of mobilized actors and technologies, in which the State is an actor, and not the owner of the network. Thus, this network operates, through these technologies constituted by their interactions, as instruments of public action, allowing government policies to be made viable, generating significant impacts on the allocation and use of resources (Halpern *et al*., 2014). Therefore, the instrument can help guide the participatory governance of public policy, focusing on issues that are priorities and defined by the local agenda, and not driven by political interests.

Regarding reapplicability, we reiterate the capacity of technologies to perpetuate themselves both in the territory itself, enabling the construction of a fruitful future scenario within the community itself, as well as allowing the reproduction of these technologies in other territorial contexts. This capacity for reapplicability develops what Dowbor (2007, 2014) considers appropriation and management of innovation, that is, the concern of those who appropriate social technologies, how they are managed and for what purpose. The products developed within the Territory Radar project's scope in Sol Nascente and Pôr do Sol can be reapplied by local leaders,

serving as elements of social transformation. This is also due to the maintenance of the project, which includes leadership training courses to continue planning, resulting in the construction of scenarios.

Appropriation is a concept strictly linked to local and endogenous development (Albuquerque *et al*., 2018), since resources are directed towards improving life in the territory. Appropriation for the social comes from the defense of the collective interest, benefiting society (Dardot & Laval, 2015). In this way, these social technologies explore the forms of appropriation as a Latin American emancipatory movement of hegemonic counterculture of modernity (Rueda, 2018). The analysis of this process allows us to understand that collective construction, together with the use of social technology, results in its appropriation, culminating in an important instrument of Transversal and Participatory Public Action (Cruz, 2020).

The Territory Radar project, as an instrument of transversal and participatory public action, enables the activation of networks with community leaders, instigating a complex and significant network of multiple actors guided by the 2030 Agenda, to deal with local demands. The meetings and plenary sessions are converted into hybrid forums for the collective construction of public action. Finally, the Cooperation Room device – as a virtual structure materialized by the logic and resources of the state – by the community gives permanence to the dialogic space created. Thus, thinking about the use of TPPA instruments in a way connected to the logic of cooperative intelligence allows for greater effectiveness in social solutions to address certain problems experienced in the territories and that require a systemic vision to act in complex environments. In this way, it is possible to encourage citizens in their respective networks to act in governance spaces to advocate for public policy that aid local development.

Bringing social technologies that can be reapplied, adapted and scaled and bringing them closer to people represent new strategies for the territory itself to claim ways of tackling complex problems, to contribute to collective construction processes in this context of the Anthropocene, considering the most diverse characteristics existing in the most distinct contexts and territories.

Therefore, these processes are unifying elements of social technology as instruments of public action, since the interaction of multiple actors in the sociotechnical network in which the technology is inserted is a dialogical process, in which the local actor or representative is the producer and the agent responsible for social transformation, and not an object of study or analysis in the production of information about their territory. This allows the appropriation of technology, in the sense that it is naturally claimed for the local community, promoting its empowerment, emancipation and development.

Conclusion

The socio-natural relationship deepens with human action on nature, generating already noticeable environmental and social consequences. The Anthropocene is the face of this interaction, proving that human decisions have effects, often not immediate. Since colonization, the exploitation of resources has caused structural problems that affect, unequally, the population of the Global South. As a result, the Anthropocene has revealed itself as a factor that goes beyond the natural sphere by implying social problems in a holistic way, affecting health conditions, housing, dignity,

access to resources, and interfering with the ability of communities to organize themselves to promote local and territorial development actions.

In this article, we analyze the case of the Territory Radar project in the territories of Sol Nascente and Pôr do Sol. The research was able to answer the research question – "how these social technologies act towards empowerment and territorial development as a way of facing the problems of the Anthropocene?" –, and the final perception is that the logic of using cooperative intelligence integrated with the proposal of TPPA instruments in the creation of such social technologies allows for strengthening the integration and articulation of actors, in addition to the proper guidance of the construction of decision-making processes in a collective way, resulting in the potentialization of action in the search for solutions to existing problems (Martins, 2013), a fact that contributes to more assertive actions, with a focus on sustainable territorial development.

Although the Anthropocene is an observation of the natural sciences, it is important to highlight that this new socio-natural relationship is symptomatic in other fields. The Anthropocene is the direct consequence of the capitalist model of production and exploitation of resources, which impedes territorial development. In addition to environmental problems, the Anthropocene leaves a legacy of inequality, which directly interferes with people's health and well-being.

Thus, threats and vulnerabilities, although they have specific characteristics in Sol Nascente and Pôr do Sol, are not exclusive to this territory and are representative of countless situations experienced in other parts of the country and the world. The exclusivity lies in the relationships established among human and non-human actors, which are local and influenced by the existing economic, political, cultural, historical, environmental and state context. Only by starting from these specificities is it possible to develop understandings and actions on local problems that, if not resolved, can be examples of action. The social technologies generated from the Territorial Ifuture methodology were examined from the perspective of ANT, seeking to understand how human and non-human actors are mobilized for the development of healthy and sustainable territories in the Anthropocene. We observed that cooperative intelligence, as a resource for collective action aimed at solving problems, mediated public action by generating new tools based on the understanding of social and local needs, from the perspective of the affected community itself, enabling collective efforts to combat the problems of the Anthropocene, strengthening local and territorial development. Based on the categories of analysis (objectives, results, impacts and re-applicability), the importance of introducing these technologies as an element of social transformation for territorial development and social empowerment was measured.

These social technologies were built together with society, through the actions of local representatives. In addition to being producers of primary data created from these technologies, the citizens of Sol Nascente and Pôr do Sol are holders of the social technology, which allows its perpetuation and future transformation. In this way, the technology was socially appropriated and adapted to the local reality, to stimulate territorial development. It was observed that the collective construction combined with the use of this technology results in its appropriation, transforming it into an instrument of transversal and participatory public action (Cruz, 2020). These instruments serve as guides for the actions and public policy promoted by the State for a development project (Lúcio *et al*., 2017), with the community as an actor, and not as a mere passive spectator of the public action.

It is also worth noting that the use of the 2030 Agenda as a structuring element, based on the use of the targets contained in the SDGs, brings an important advantage for the instrumentation of public action and for action within the sociotechnical network formed, which is the universalization of the debate. The targets are set as indicators that are internationally recognized, exploring the potential of civil society, the market and states to promote the proposed development. Thus, the classification of risks allowed the development of a scale of priorities and a better understanding of the threats, vulnerabilities and resilience existing in the territory. The digital risk map was consolidated into an artifact that allows the visualization of where the risks are located, allowing the population to monitor, create, extinguish and modify georeferenced events.

Future scenarios materialized in the construction of possible future scenarios for the territory, opening up space for debate to build solutions and anticipate problems that are expected to arise. Territorial-based operational indicators allow for the measurement of critical factors that affect the territory based on the creation of data provided by the community itself, which also monitors and evaluates the transformations. The Social Cooperation Room was configured as a space for interaction among social actors, in a dynamic way, so that they could use it to stimulate the appropriation of reality and encourage dialogue to promote the conduction of change in reality, based on emancipatory actions, along the lines of Demo (2000).

Collecting, classifying and structuring information from a local collaborative perspective proves to be a powerful element of social empowerment, important resources for the use of the Social Cooperation Room, which can generate engagement so that other community members mobilize and verbalize their needs and desires together with other actors who can assist in territorial development, based on the creation of spaces and mechanisms of local territorial governance following the discussion by Stoker (2010).

In this context, it is important to consider that the construction of contemporary public policy is considered a global requirement and is based on the existence of complex and multidimensional problems (Peters, 2017; Cruz, 2020; Daroit *et al*., 2023), requiring strategies that drive territorial development through instruments adapted to different realities. These strategies must be promoted jointly with society, through collective construction, and operationalized through public action instruments, developing technologies that aim at social transformation, as a way of dealing with the issues of the Anthropocene. Social technology can function as an emancipatory social instrument, promoting social empowerment and territorial development, a fact that redoubles its importance in the Anthropocene, by integrating the resolution of local problems for local social development and as a decolonial element, which emphasizes the production of Latin American social innovations.

Therefore, social technologies, constructed and appropriated socially, can be great allies in the strategy of promoting the development of healthy and sustainable territories, especially when it comes to having humans in the future. In this way, social technologies can contribute to achieving the survival of the current generation, but above all, of future generations in a sustainable, inclusive, fair and egalitarian way, essential assumptions for dealing with the issues of the Anthropocene.

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1. The project is the result of a partnership established by a formal agreement between the Oswaldo Cruz Foundation (Fiocruz) and the former Federal District Planning Company (Codeplan) – currently the Federal District Research and Statistics Institute (IPEDF) – and had contributions from the CoLaboratory of Science, Technology, Innovation and Society (CTIS) of Fiocruz, the Cooperative Intelligence Platform with Primary Health Care (Picaps) and the Public Action Laboratory for Democratic Development (LAP2D) of the University of Brasília (UnB).
2. The concept of governmentality refers to power in action, an action that conditions other actions, an **action of government**, which is shaped by considering networks of continuous and multiple relationships among population, territory and wealth. It corresponds to the political rationality that has as its purpose that which directs, organizes and produces for the population and reveals the relevance of instruments by understanding them in their tactics and devices beyond the laws. Governmentality and its approach to instruments points to strategic issues that make power relations unstable and reversible (Lascoumes, 2005). It also presents itself as a methodology for studying the State, valuing questions that begin with **how** to analyze the effects, configurations and articulations of power relations (Foucault, 2008).
3. Although for actor-network theory any technology is social, since it arises from associations between humans and non-humans, we maintained the expression social technology in order to

highlight the potentially emancipatory and empowering character of the community that participates in its construction/appropriation.

4. A Cooperative Intelligence Network (RIC) is a sociotechnical network formed from the dialogical and participatory production between actors and which is structured based on a common objective, being based on the exchange of knowledge and experiences among the various actors, in order to translate the knowledge contributed into action mechanisms for collective and community empowerment.

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The authors have stated that there is no conflict of interest.

Inclusive language

The authors use inclusive language that acknowledges diversity, conveys respect to all people, is sensitive to differences, and promotes equal opportunities.

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