Translating Transformative Innovation Framework in Colombia

Governance Implications for STI Policy

Nicolás Garzón Rodríguez[1] and Janaina Pamplona da Costa[2]

[1] Doctoral Program in Science and Technology, Universidade Estadual de Campinas (Unicamp), Brazil.
nikholas.garzon@gmail.com

[1] Department of Science and Technology Policy, Universidade Estadual de Campinas (Unicamp), Brazil.
jpcosta@unicamp.br

ABSTRACT

This article analyzes the transfer process of the transformative innovation policy (TIP) framework in Colombia and the translation process carried out by Science, Technology, and Innovation (STI) policy actors, emphasizing the implications of this process for governance. Using the Colombian Green Book 2030 case study and its regional implementation, the article examines how the TIP framework has been adopted by stakeholders and reinterpreted in peripheral contexts. A qualitative study with an interpretive approach was conducted based on 30 semi-structured interviews with individuals involved in the analyzed transfer process, as well as observations and document reviews. The findings suggest that institutional inertia has influenced the appropriation of the TIP framework in Colombia, leading to its association with prior social innovation experiences that align with some of the framework's characteristics. This includes participation and the inclusion of local actors. The framework was reinterpreted to address specific local issues through niche configurations rather than destabilizing socio-technical regimes. This frames transformative change within policy instruments designed under a bottom-up model. Nevertheless, the territorial level has emerged as a key space for TIP experimentation, offering opportunities to explore other STI applications oriented toward social concerns. The study concludes that transferring the transformative framework provides an opportunity to reconsider STI policy governance.

Keywords: Transformative Innovation; Governance; Policy Transfer; Regional Approach; Colombia.

Proposal Submitted 19 September 2024, Article Received 23 April 2025, Reviews Delivered 22 July 2025, Revised 15 September 2025, Accepted 1 October 2025, Available online 17 December 2025.

Acknowledgements: This study was financed by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brazil (CAPES) – Finance code 001. The authors thank the valuable contributions of the "Laboratorio de Papers" of Esocite.la in the preparation of this work.

INTRODUCTION

Science, Technology, and Innovation (STI) policy frameworks are the product of a simultaneous configuration between theory and practice (Smits *et al.*, 2010). Therefore, it is relevant to understand how conceptual models are translated into the design and implementation of policy instruments (Stone, 2012), as well as how these circulate in different social and institutional contexts (Peck, 2011). The study by Schot and Steinmueller (2018) proposes the emergence of a Transformative Innovation Policy (TIP) framework as an alternative to the dominant frameworks, namely, the linear and interactive innovation policy frameworks. The conception of innovation as a sequential process of activities over time is present in the linear model, while a systemic view of innovation highlights the interactions and relationships between actors and institutions (Godin, 2017). The interactive framework is associated with the concept of national innovation systems, oriented towards competitiveness (Chaminade *et al.*, 2018).

Multilateral organizations have played a relevant role in the diffusion of these dominant STI policy frameworks (e.g., OECD, UNESCO, OAS), influencing the design, implementation, and evaluation of policy instruments (Diercks, 2018; Nupia, 2013; Velho, 2011). Historically, the Science Policy Research Unit (SPRU) at the University of Sussex has participated in the creation and diffusion of innovation models. For example, the creation of the demand-pull model from the SAPPHO project (Godin, 2017) and the diffusion of STI policy instruments in developing countries through the STPI project (Sagasti, 1978) also transferred to the Colombian context (Nupia, 2013).

However, the limitations of these frameworks in addressing global crises such as climate change, inequality, and other problems manifested locally have motivated the emergence of alternative framework approaches (Table 1). In the last decade, a third generation of STI policy frameworks has gained space in the research agenda, characterized by its orientation towards solving social and environmental issues (Haddad *et al.*, 2022). Among these, the TIP framework stands out, which proposes the deliberate transformation of socio-technical systems through processes of experimentation, collective learning, and broad actor participation (Schot & Steinmueller, 2018). This framework was developed by researchers associated with SPRU articulated around five central principles: directionality, societal goals, systemic-level impact, learning and reflexivity, conflict management, and inclusiveness (Boni *et al.*, 2025).

Colombia constitutes an emblematic case of TIP framework transfer in Latin America. Since 2016, the country has actively participated in the Transformative Innovation Policy Consortium (TIPC), an initiative led by SPRU with agencies from Norway, Sweden, Finland, and South Africa. This participation responded to a long tradition of transferring science policy frameworks in the country, dating back to the STPI project in the 1970s (Nupia, 2013). As a result of this linkage, in 2018 the National Science and Innovation Policy for Sustainable Development (Green Book 2030) was published, a set of normative statements that sought to align Colombian STI policy with the sustainable development goals (SDGs) through the TIP framework (Colciencias, 2018).

The TIP framework transfer process in Colombia included explicit efforts for dissemination at the subnational level. During the construction of the Green Book 2030, the document *Guidelines for the Formulation of Regional Transformative Innovation Policies in Colombia* was developed (Colciencias & SPRU, 2018). This policy orientation aimed to disseminate the framework based on regional experiences identified in collaboration with academics who actively participated in the Departmental Councils of Science, Technology, and Innovation (CODECTI). These are an institution of subnational governance of the country's STI policy. This experience created a reference for the dissemination of the TIP framework for system actors, particularly in territorial levels characterized by high levels of poverty and historical exclusion from scientific and technological development.

This case of TIP framework transfer in Colombia is the unit of analysis of this research, in which we aim to answer the following questions: why was the transformative innovation framework transferred to STI policy in Colombia during the period 2016-2018? How did STI policy actors in Colombia translate the transformative framework in the Colombian context? What were the implications of this transfer for the governance of STI policy in that country?

Although previous studies on the TIP framework in Colombia exist (Ordóñez-Matamoros *et al.*, 2021; Pinzón-Camargo *et al.*, 2023), they associate *a priori* the characteristics of this framework with the national policy of social appropriation of science, technology, and innovation (SASTI), implemented since 2005, based on an inclusive innovation model (Daza-Caicedo & Lozano-Borda, 2013). Our study, on the contrary, seeks to empirically reconstruct the transfer process of the TIP framework through a qualitative case study of an interpretative type, based on 30 semi-structured interviews with key actors who participated in the formulation of the Green Book 2030 and its regional implementation. This is complemented by participant observation and documentary analysis. This analysis reveals that the translation of the TIP framework in Colombia was deeply influ-

enced by prior social innovation (SInn) experiences and by the need to respond to specific local problems. This re-signification led to emphasizing dimensions of the framework related to bottom-up participation and the protection of local niches, while central elements such as the destabilization of socio-technical regimes and the coordination of instruments for systemic transformations were neglected.

The article is structured into five sections. First, we present our analytical framework, integrating literature about emerging STI policy frameworks and policy transfer. Second, we describe our research methodology. Third, we empirically analyze the transfer process of the TIP framework in Colombia and the characteristics of its circulation in that context. Fourth, we discuss the implications of our findings for STI governance. Finally, we present conclusions that highlight the theoretical and policy contributions of our research.

1. THE TRANSFER OF EMERGING STI POLICY FRAMEWORKS IN PERIPHERAL COUNTRIES

We propose that the reconstruction of the TIP framework transfer process in the Colombian context is influenced by the dominant vision of science and its perceptions in local contexts (Velho, 2011). In that sense, we consider necessary to explore those STI policy frameworks that have positioned themselves as alternatives to a dominant vision oriented towards economic competitiveness (Schot & Steinmueller, 2018). This is a starting point to understand the transfer and adaptation process of the TIP framework in peripheral contexts. The proposed analytical framework is based on the intersection of three major themes in the study of STI policy: emerging policy frameworks, the transfer of these policies, and the peripheral context in which they are put into practice. With this, we seek to explore the movement, contextualization, and reinterpretation of models by actors embedded in a particular context (Peck, 2011).

In that sense, our analytical framework is based on the following assumptions:

1. The emergence of alternative innovation policy frameworks to the dominant ones is influenced by normative reorientations rather than by alternative STI policy models, in which a systemic vision of the innovation process dominates.

2. One of these emerging frameworks related to transition studies is transformative innovation, which proposes changing socio-technical systems through different interactions between three levels (landscape, regimes, and niches).

3. The transfer of policy frameworks in Latin America is a recurring behavior in the configuration of state institutions. In the Colombian case, the TIP framework is transferred and interpreted by actors as a reference for bottom-up STI policy actions through the formation or protection of niches in local contexts.

4. The transfer of the TIP framework in peripheral contexts through these interpretations has implications for STI policy governance, insofar as it limits the design of policy instruments that transcend the protection of local niches.

1.1. EMERGING POLICY FRAMEWORKS AND TRANSFORMATIVE INNOVATION

Emerging innovation policy frameworks are characterized by presenting alternatives to dominant visions focused on actor interaction for competitiveness (Schot & Steinmueller, 2018). Among these, the TIP framework, Mission-Oriented Policies (MOP), SInn, and Social Technology (ST) are representative. Table 1 presents a comparison of these emerging frameworks, exploring their similarities and differences through variables such as normative objectives, innovation model (Godin, 2017), central actors, governance structures, and policy instruments (Diercks, 2018).

Although the normative objectives share the purpose of providing alternatives to dominant frameworks, they present significant differences. The TIP framework and MOP focus on grand societal challenges as articulators of innovation policy; among these climate change, poverty, and inequality (Haddad *et al.*, 2022). Meanwhile, SInn and ST focus on problems presented by society that are not resolved by the capitalist system, although each in its own way: SInn seeks to solve problems without profit motives, while ST focuses on the solidarity economy through technologies that liberate society from the control of dominant institutions (Dagnino, 2014; Galego & Brans, 2023).

Regarding the innovation model, it is possible to observe that there is no alternative proposal to a systemic vision of innovation policy. The systemic perspective refers to the relationships between institutions and organizations (Godin, 2017). For example, transformative innovation emphasizes changing socio-technical systems, that is, the set of artifacts, infrastructures, practices, and social relations that structure the generation and use of technologies (Kanger & Schot, 2019). The idea of connecting actors to solve social or environmental problems is present in the other policy frameworks, although in Latin American practice, many SInn initiatives have reflected a continuation of the linear innovation framework (Mercado *et al.*, 2014).

A broadening of the actors considered within the innovation process is observed, compared to those traditionally institutionalized (government, university, and business). TIP is based on the participation of the actors that assemble the socio-technical system itself in order to modify the dominant rules and regimes (Haddad *et al.*, 2022; Kanger *et al.*, 2022). MOP involves multiple actors in the definition of missions and solutions while highlighting the role of the private sector (Mowery *et al.*, 2010). Both SInn and ST normatively defend innovations oriented towards solving social problems, but ST makes a more radical reinterpretation of the links between STI and economic production. In the ST frame, local actors build new forms of autonomous economic integration in the face of peripheral capitalism (Pozzebon *et al.*, 2023). This multiplicity of actors reflects a recognition of other forms of knowledge production not exclusive to academia (Gibbons *et al.*, 1994).

Governance structures, that is, the ways in which social actors (state, firms, civil society) solve collective problems (Kuhlmann *et al.*, 2019), are linked to the normative objectives of each framework. TIP highlights the role of institutional intermediaries for the coordination of experimentation and proposes formative evaluation as an instrument to generate learnings during experimentation (Molas-Gallart *et al.*, 2021). MOP focuses on the coordination of different public policy instruments linked to a portfolio of projects (Haddad *et al.*, 2022). Both SInn and ST emphasize forms of collaborative governance, although ST adds a strong component of community self-management and local empowerment in the control of technologies.

From the TIPC perspective, the TIP framework is articulated around five central characteristics: directionality towards societal goals, systemic impact, learning and reflexivity, conflict management, and inclusion of marginalized actors (Boni *et al.*, 2025). These characteristics are applied in experimentation processes in protected spaces where other forms of governance and collective visions of the future are structured (Engels *et al.*, 2019). In this context, interactions between the levels of the socio-technical system can generate four types of changes: i) technological substitution, resulting from a consolidated disruptive innovation; ii) transformation, induced by exogenous pressures that motivate incumbent actors to adjust the regime; iii) reconfiguration, where niches are integrated into the regime for mutual benefit; and iv) de-alignment and re-alignment, which occur when exogenous actors destabilize the regime to rebuild it around an emerging niche (Sovacool & Hess, 2017).

The Latin American and Caribbean Transformative Innovation Hub (HUBLAyCTIP) has operationalized the TIP framework in evaluations of experiments in agrifood systems in Chile, Colombia, and Mexico. These cases show initiatives that concentrate on building

niches that drive initial learnings and linkage of actors excluded from the dominant socio-technical regime. Examples include the construction of an agroecological niche for the lime production chain in Oaxaca (Mexico) that combined knowledge from indigenous communities with social economy (Bueno *et al.*, 2023); agroecological practices for cocoa production in Valle del Cauca (Colombia) through transformative networks among small producers, but without linkage to actors of the regional extractivist model (Osorio-García *et al.*, 2023); and making visible local practices of family farmers for water use and conservation in Chile as a response to the large-scale agricultural model (Albis *et al.*, 2023).

These analyses reveal a characteristic that has become generalized in peripheral contexts: the niche is understood mainly as a space of resistance for marginalized actors, without necessarily representing a broader regime change. This tendency contrasts with the original vision of the TIP framework and represents a conceptual challenge for transformative public action, specifically regarding the design of instruments that allow transcending the local scale towards systemic transformations.

Table 1. Emerging STI Policy Frameworks.

	Transformative Innovation Policy (TIP)	Mission-Oriented Policies (MOP)	Social innovation (SInn)	Social technology (ST)
Normative objectives	Transform socio-technical systems to address grand societal challenges through building directionality that modifies rules and regimes.	Articulating missions to mobilize actors for the development of multiple technologies or innovations that contribute to addressing the grand societal challenge.	STI are oriented to solving social problems and not for generating profits.	Make self-managed ventures economically viable. Technologies must be liberating and not subject to the control of capitalist techno-science.
Innovation Model	Systemic/Interactive. Multi-level perspective (niches, regime, landscape). Experimentation and transformation through incumbent actors or reconfiguration of regimes.	Systemic/Interactive. R&D for grand challenges. Top-down societal objective and bottom-up solutions.	Systemic/Interactive. Bottom-up. Social actors interact to find a collective solution to the problem.	Systemic/Interactive. Reorientation of the profit generation system appropriated by companies towards social/local problems.
Actors	State; Third Sector; Social organizations; Social movements; Firms; Universities.	State; Third Sector; Firms; Universities/R&D institutions.	State; Third Sector; Social movements; Firms; Universities.	State; Third Sector; Local Communities; Social movements; SMEs; Universities.
Governance Structures and Policy Instruments	Institutional intermediaries. Formative evaluation. Building a theory of change (ToC).	Policy mix (sectors). Portfolio of instruments. Centralized coordination and decentralization of R&D activities.	Collaborative governance Social actors develop actions and activities to respond to a social problem according to constraints and opportunities.	Self-empowerment and community management of technologies. Public policies based on social participation.

Source: Own elaboration based on (Diercks *et al.*, 2019; Doezema *et al.*, 2019; Galego & Brans, 2023; Haddad *et al.*, 2022; Mowery *et al.*, 2010).

1.2. THE TRANSFER OF INNOVATION POLICY FRAMEWORKS

The construction and diffusion of innovation policy models (i.e., linear innovation) are social processes that result from the interactions between various actors, who are typically bound to academic spheres. These actors advocate for the implementation of these models in the private and public sectors (Godin, 2017). In that sense, the diffusion of theoretical frameworks into policy models and instruments has been studied from two perspectives: i) policy transfer and ii) policy mobility.

Policy transfer is an area of political science that, under a positivist approach, seeks to explain how agents of a political system make the decision about the selection of a model (whether these are represented in objectives or ideas, institutions, or regulatory mechanisms) and put it into practice (Stone, 2012). Regarding innovation policies, international organizations and actors often play a role in the diffusion of models generally based on the dominant notion of science (Velho, 2011). Although in the Latin American case the transferred frameworks are not necessarily fully coherent with the formulation of plans or programs; these processes open windows of opportunity for new power relations among actors (Feld, 2014). In Colombia, the transfer and adaptation of the linear innovation framework directed the design of policy instruments from the 1960s (e.g., STPI Project, 1973) (Nupia, 2013). Mostly, policy model transfers are based on selecting the "best practices" that are socially valued as a success or a failure based on their results (Peck, 2011).

Meanwhile, policy mobility proposes a more constructivist approach in which models are studied as a process resulting from the interconnection of actors and continuous mutation, considering the context and valuing the construction of agents' capacities in the framework's circulation process (Peck, 2011). Thus, policies circulate in physical spaces (i.e., a territorial scale) or in cognitive spaces, such as networks between academics and public officials, where policies are assembled based on the local context. These physical and cognitive spaces can be constructed from a technocratic approach, that is, privileging linear direction from academia to society, or from a participatory approach where actors are considered in the construction of the model (Ramirez *et al.*, 2024).

Within this, the process of *translation* of concepts into policy instruments becomes relevant insofar as actors give new meanings to the concepts of a framework based on the context, which modifies both the framework and the institutional context in which it is put into practice (Doezema *et al.*, 2019). For example, the TIP framework translated by innovation policy actors in Sweden was based on prior experiences of mission-oriented policies in a context of institutional inertia such as bureaucratization and a parliamentary

political system that tends towards stability (Ulmanen *et al.*, 2022). In that sense, it becomes relevant to reconstruct how actors put the TIP framework into practice in the Colombian context; for example, a prior exploratory study showed that a translation associated with a smaller territorial scale can limit socio-technical transformations due to low innovation capacities in these territories (Garzón & da Costa, 2021).

2. METHODOLOGY: AN INTERPRETATIVE CASE STUDY OF THE TRANSFER PROCESS

This study adopts a qualitative case study design with an interpretative approach, apropriate for reconstructing social processes from the experience of the involved actors (Summer & Tribe, 2008), which for our purposes refers to the TIP framework transfer process in the Colombian context. Thus, a variety of methods were employed to gather information about the subject of the study, which were subject to triangulation: i) 30 semi-structured interviews with actors (government and university representatives) who took part in the development of the Green Book 2030 and its regional approach through transformative innovation mentorships (Table 2), conducted between 2019 and 2024; ii) participant observation records resulting from one of the researchers' involvement in Minciencias between 2020 and 2022; iii) documentary analysis (reports, minutes, presentations), and casual discussions with academics involved in the first phase of the transfer.

Data analysis was carried out through a process of coding and categorization, that is, the assignment of codes or labels to statements from an interviewed actor as a mechanism for reconstructing the meanings given by them. Categorization is an interpretative exercise that links the theoretical framework with the empirical results (Saldaña, 2016). For the analysis of qualitative data, a mixed inductive and deductive strategy was used. That is, the codes used for data analysis were proposed based on the literature on the TIP framework (deductive), being complemented by the interpretative process based on the data itself (inductive) (Summer & Tribe, 2008).

Table 2. Actors in the TIP framework transfer interviewed.

Type of Actor	Affiliated Organizations	Interviewee ID
Government representative	Minciencias, Misión de Sabios, Ruta N, CGR, DNP, OCyT Agrosavia	A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S.
University representative	ITM, PUJ, Unal, UNAB, Unibagué, Uniandes, URosario, Univalle, Universidad Eafit, Usalle	T, U, V, W, X, Y, Z, AA, AB, AC, AD, AE, AF, AG.

Source: Own elaboration.

3. THE TRANSFER OF THE TRANSFORMATIVE INNOVATION POLICY FRAMEWORK IN COLOMBIA: THE TRANSFER PROCESS IN ITS BEGINNINGS

3.1. COOPERATION AGREEMENT: MECHANISM FOR TRANSFERRING THE TRANSFORMATIVE FRAMEWORK

In the 2010s, STI policy in Colombia went through a process of institutional change characterized by a regionalization of public investment in R&D and innovation, funded with 10% of the royalties from hydrocarbon exploitation (Orozco *et al.*, 2019). This influenced the multilevel governance where regional governments acquired decision-making power in resource allocation (Interviewee G), while at the national level (Colciencias), territorial problems were addressed through inclusive innovation programs (e.g., *Ideas para el Cambio* in Spanish) (Interviewee C). Considerig these changes, demands for strengthening Colciencias' administrative capacities were addressed, among other actions. This occurred by the signing of a cooperation agreement with SPRU to improve the policy design and evaluation capacities of an internal working group created for that purpose (Congreso de Colombia, 2016).

As part of this agreement, in April 2016 researchers from SPRU and Ingenio at Universitat Politècnica de València (UPV) conducted a training program on STI policy evaluation, based on "frame 3" (TIP). This training disseminated a rationality focused on social problems and the use of participatory methods (SPRU & Ingenio, 2016a). In a second training conducted in November of the same year, this approach was implemented in pilot evaluation projects of STI programs developed by Colciencias (*Empresa Altamente Innovadoras, Alianzas por la innovación, Colombia Científica*, in Spanish) (SPRU & Ingenio, 2016b). However, initial questioning of the TIP framework by national government officials of these programs led to rethinking the agreement's strategy towards actors at the regional level; this was through *mentorships* that aimed to disseminate the notions of the transformative framework to university actors linked to the CODECTI, which were considered a more participatory and inclusive governance instance (Interviewees C, X, AA, AD).

3.2. TIP FRAMEWORK MOBILITY: TRANSLATION AND RE-SIGNIFICATIONS THROUGH THE CONVERGENCE OF EMERGING FRAMEWORKS

During 2017, the cooperation focused on the regional level, a more flexible space to experiment with policy instruments outside traditional visions (Interviewees X, AA). In that sense, representatives from universities and other CODECTI members were initially brought together to disseminate ideas of the framework that represented more of an

expectation and not consolidated policy models (Interviewee X). In these spaces, the idea emerged to conduct regional mentorships for the identification of experiences that were already being implemented at the regional level beyond traditional policy frameworks (Interviewees C, X, AA, AD). Table 3 classifies these experiences according to the regional context in which they were developed, that is, large urban centers or rural regions. Although each experience is diverse in its context and local problems, as a result of the analysis, we found in common a translation of the TIP framework. Its rationality is justified by placing empowered society at the center of STI policy.

Table 3. Transformative Innovation Mentorships (2017).

Regional classification	Mentorship	Region
Large urban centers	Institutionalization of the TIP Framework in governance instances	Cali, Valle del Cauca
	Digital Labs "Vive Lab"	Bogotá
	Evaluation based on TIP Framework	Medellín, Antioquia
	Co-creation of regional STI policies	Medellín Antioquia
	Changes in food production and consumption as a transformative niche	Barranquilla, Atlántico
Dispersed settlement	Creativity labs in rural schools	Tolima
	Coffee agro-chain within peace agreement	Cauca

Source: Own elaboration based on Colciencias and SPRU (2018).

Society at the center of policy has several meanings according to the interviewed actors. On one hand, it represents the citizens who directly or indirectly benefit from policy action (Interviewees A, E). On the other hand, the vision of empowered citizens, traditionally neglected by STI policy, is more recurrent (Interviewees N, X, Y, AG); although prior SInn experiences where these actors have been institutionalized (i.e., organized communities, social movements, cooperatives) became a reference for the translation of the TIP framework (Interviewees A, AB, AC, AD, AE). In each mentorship, this implied that the TIP framework was applicable when using design or evaluation instruments from a *bottom-up model*, which guaranteed broad actor participation and referred to problems posed by them (Interviewees H, AG, Q, R, AA). In this way, a discourse of the TIP framework as a model for experimenting with social organizations was constructed, which became institutionalized in the imagination of Colciencias officials some time later on (Interviewees F, M).

3.3. IMPLICATIONS OF THE TRANSFER FOR STI POLICY GOVERNANCE IN COLOMBIA

We found that the translation of the TIP framework in its beginnings had a normative implication, insofar as it was oriented towards an approach typical of SInn. According to the institutional tradition of STI policy, it had been implemented in regional contexts (Interviewees X, Y, AA, AG). The actors who participated in the mentorships re-defined the focus of this policy framework in Colombia as one that, by transcending traditional visions of innovation (supply-side or for competitiveness), enables a variety of actors (e.g., ethnic communities, peasants, students) to participate in SInn programs or in regional STI policy governance instances (Interviewees A, F, N, O, S, X, AG). Once translated, this transfer mechanism of the framework laid an interpretative base influencing STI policy governance in Colombia until recently.

This transfer process coincided with the creation of the Ministry of STI (2017-2019) which was based on the Second Misión de Sabios. The TIP framework was regarded as relevant for bringing STI policy to peripheral regions characterized by high levels of poverty (Interviewees Q,R). In fact, the National STI Policy 2022-2031 (CONPES, 4069) contemplates an experimentation program to promote STI projects with a transformative focus, which at a strategic level contributes to a more inclusive appropriation policy (CONPES, 2022). Likewise, the organizational structure of the Ministry of STI was designed under two vice-ministries (knowledge, innovation, and productivity) focused on instruments to promote research and business productivity, and on the other hand, (talent and appropriation), which focused on social appropriation policy with an inclusive focus.

SASTI thus became, at the institutional level, the form of translation and implementation of the TIP framework, specifically, through a deeper linkage of its programs with TIPC (Interviewees K, X, AB, AG). For instance, the program *A Ciencia Cierta* was the object of experimentation using the methodology developed by that consortium (ToC) (TIPC, 2021), partly due to a greater willingness from the officials of that program to be engaged with the framework (Interviewee X). In this regard, we found that this normative-level association hindered a broader integration of other policy instruments, restricting TIP based actions to the construction and protection of niches.

Parallel to this transfer process directly supported by TIPC, within Colciencias a policy experiment was configured aimed at creating a Prototype STI Program to contribute to the implementation of the Peace Agreement (2016) in the Sierra de La Macarena. Armed conflict has historically affected this region. This prototype represented the Colombian government's first attempt to implement the TIP framework, given the peace-

building challenge posed by the Peace Agreement (Interviewees A, B, C). Implemented between 2017 and 2022, the prototype was structured to build solutions from STI to solve problems of drinking water, energy, and agricultural production in the region by the co-creation between universities and local social organizations (Interviewees A, B, U, V, W). Although this experiment was based on prior SInn experiences, it attempted to build governance by linking other STI policy actions, as well as other government agencies at different levels (national, departmental, municipal), as well as international organizations (Interviewees A, B, D, E). This generated institutional learnings about new uses and meanings of the TIP framework in the Colombian context, reinforcing a bottom-up model of STI policy (Interviewee F).

4. DISCUSSION

The purpose of this study was to understand why the transformative innovation framework was transferred to STI policy in Colombia during the period 2016-2018. We found that the emergence of this framework in the European academic sphere coincided with a process of strengthening Colciencias' administrative capacities for policy design and evaluation. In that sense, a cooperation agreement with SPRU became the mechanism for transferring the TIP framework, which reflected a long tradition of transferring policy frameworks in Colombia's STI institutions (Nupia, 2013). Furthermore, we sought to understand how, in this process, STI policy actors in Colombia translated the TIP framework, evidencing a reinterpretation based on SInn experiences. This led to configuring the normative objective of the framework in the Colombian context for bottom-up actions, which solved problems at the territorial level. In that sense, governance is associatiate to this framework for policy actions with local communities, limiting the purpose of policies with the construction of niches and shielding (Kanger *et al.*, 2025).

Studies on the transfer of the TIP framework point to the importance of institutional traditions in the process of translation and legitimization (Ulmanen *et al.*, 2022). In the Colombian case, it meant the participation of academic and government actors with a track record in developing programs closer to the SInn framework, such as the SASTI policy. Thus, the mobility of the TIP framework in that context represented the positioning of emerging frameworks that had already been operationalized according to the needs indicated by the actors (Peck, 2011). It was not an effort to fit into the model defended by SPRU. This tendency is common in peripheral countries that operationalize emerging STI policy frameworks, such as responsible innovation (Doezema *et al.*, 2019). This seems

even more recurrent in the transfer of these emerging frameworks, when there is still no consensus regarding what transformative change means and how it is put into practice (Kattel *et al.*, 2025).

The theoretical implications of these results are oriented towards thinking about the convergence of emerging policy frameworks in peripheral countries, whose legitimacy depends on the consideration of the problems present in that context. We found in our study that actors who participate in the translation of novel frameworks appropriate elements from other coherent approaches, such as SInn or ST, to interpret and put TIP into practice. This is comehow contraditory with the European vision of the TIP framework, which aims for large coordinated interventions between sectors and policy instruments as a basis for the destabilization of socio-technical regimes (Haddad *et al.*, 2022); this type of governance is operationalized by multilateral organizations that actively recommend linkage with business development instruments (OECD, 2024). In this regard, it is necessary to consider whether the transfer of this framework to the Colombian context constitutes a window of opportunity to bring to the forefront issues and actors that have remained relegated within the country's STI policy. Specifically, it is relevant to establish the type of socio-technical change that should be normatively desirable in peripheral contexts, namely, reconfigurations of regimes around emerging niches or transformation of the system through exogenous pressures (Sovacool & Hess, 2017).

Limitations of this study are related to the focus given to the initial phase of the transfer process, as well as a profile of information sources from traditional actors such as universities and government representatives. Despite this, actions were implemented to guarantee triangulation of the collected information. In addition, the initial phase of the framework adoption process (2016-2018) was prioritized to understand the initial phase of the studied process, as well as the experiences and meanings given by the actors. This can influence the study of recent cases of transformative innovation in the Latin American context. Therefore, this study opens a path for the analysis of operationalization experiences of the transformative framework. According to the interviewees, the prototype STI program implemented in the context of the Peace Agreement is a relevant case that can shed light on a more recent phase of TIP framework mobility in the Colombian context.

CONCLUSIONS

The transfer of the TIP framework in Colombia from the Green Book 2030 was influenced by the country's prior SInn experiences, as well as the emergence of local problems and the positioning of other actors (such as social organizations). These actors had prior experience working with traditional STI policy actors, such as universities. Thus, the normative objectives of the TIP framework were reinterpreted by the actors as a form of experimentation with other possible governance models of STI policy, but not necessarily overcoming the dominant systemic vision of innovation. Based on the interviewees, it is highlighted that the implementation of this framework in the Colombian context presents different challenges in governance terms. Mostly, overcoming the vision of the TIP framework as a reference for SInn to align with internal Colciencias policy instruments, as well as other sectors and levels of government.

Faced with institutional inertia in the cooperation agreement regarding business development policy instruments, the participating actors translated the territorial level as the scenario for experimenting with this emerging framework. Especially because it was considered the space of an empowered and participatory civil society that could guide transformations. The presence of an active society understood as an advantage for the deployment of the TIP framework has a contradiction with the low institutional capacities at the local level, coupled with a dependence on resources from the central government. This is interpreted as a barrier during the experimentation process. This initial experience of the TIP framework transfer process in Colombia shows that it is not a linear process of using theories in policy but rather involves consideration of the capacities of local actors, as well as their positioning in the political arena. That is, power relations as an articulating element that guarantees long-term experimentation.

The main implications of these results are aimed at rethinking the process of transfer and circulation of emerging STI policy frameworks in the Colombian context. Insofar, as the translation by local actors tends to present different frameworks in which normative elements or models converge according to the problems presented, institutional traditions, or the prior experiences of the actors themselves. In that sense, for the Colombian case, this implied in governance terms an assimilation of the TIP framework as a reference for the experimentation of co-creation processes with communities at the territorial level. This hindered the linkage with other policy instruments capable of influencing changes at the socio-technical regime level. This questions the need for the TIP framework in the Colombian context, insofar as other emerging frameworks offer conceptual references for inclusive-type innovations.

The study of policy instruments designed and implemented from the beginning, based on the TIP framework, remains a research gap, additional studies may illuminate the understanding of how emerging policy frameworks are operationalized in peripheral country contexts. For example, our study identified that the prototype STI program for the implementation of the peace agreement in Colombia can show empirical evidence of the transfer and mobility process of this framework for specific contexts. We argue that, although prior SInn policies that defend bottom-up actions are relevant for the translation of emerging frameworks, it is necessary to transcend the niche level to orient socio-technical changes.

REFERENCES

Albis, N., Sepúlveda, P., Bawarshi, G., González, C., Shaffernich, M., Suazo, D., & Villalobos, P. (2023). Sembrado del agua para la transformación: una aproximación desde las prácticas sostenibles de uso de agua en Chile. In M. Ramírez (Ed.), *Abriendo Pasos a Políticas y Prácticas de Innovación Transformativa en América Latina* (pp. 373–404). Tirant Humanidades. https://editorial.tirant.com/co/libro/abriendo-paso-a-politicas-y-practicas-de-innovacion-transformativa-en-america-latina-matias-ramirez-9788419825728?utm_source.com

Boni, A., Velasco, D., & Ghosh, B. (2025). A human capability approach to transformative innovation policy. Theoretical insights and practical implications for directionality. *Journal of Responsible Innovation, 12*(1), 1–18. https://doi.org/10.1080/23299460.2024.2440966

Bueno, C., Orozco, D., & Betanzos, A. (2023). Anaa witsukj: una apuesta a un cambio transformador. In M. Ramirez (Ed.), *Abriendo Pasos a Políticas y Prácticas de Innovación Transformativa en América Latina2* (pp. 313–344). Tirant Humanidades. https://editorial.tirant.com/free_ebooks/9788419825728.pdf?utm_source.com

Chaminade, C., Lundvall, B. Å., & Haneef, S. (2018). *Advanced introduction to National Innovation Systems*. Edward Elgar. https://www.e-elgar.com/shop/usd/advanced-introduction-to-national-innovation-systems-9781785362033.html

Colciencias. (2018). *Green Book 2030: National science and innovation policy for sustainable development*. Colciencias. https://tipresourcelab.net/resource/green-book-national-science-and-innovation-policy-for-sustainable-development-english-version/

Colciencias, & SPRU. (2018). *Orientaciones para la Formulación de Políticas Regionales de Innovación Transformativa en Colombia*. Colciencias & University of Sussex. https://tipconsortium.net/wp-content/uploads/2018/07/Orientaciones-formulacion-politicas_defweb.pdf

Congreso de Colombia. (2016). *Informe Congreso de la República. Debate de control político FCTeI del SGR* (p. 311). Congreso de la República de Colombia. https://www.camara.gov.co/sites/default/files/2017-08/Respuestas COLCIENCIAS Proposición No 025-16.pdf

CONPES. (2022). *Documento CONPES 4069. Política Nacional de Ciencia, Tecnología e Innovación (2022-2031)*. https://colaboracion.dnp.gov.co/CDT/Conpes/Económicos/4069.pdf

Dagnino, R. (2014). *Tecnologia Social. Contribuições conceituis e metodológicas*. Editora Insular. https://doi.org/10.7476/9788578793272

Daza-Caicedo, S., & Lozano-Borda, M. (2013). Actividades hacia "otros públicos" Entre la difusión, la apropiación y la gobernanza de la ciencia y la tecnología. In M. Salazar (Ed.), *Colciencias cuarenta años: entre la legitimidad, la normatividad y la práctica* (pp. 281–353). Banco Interamericano de Desarrollo.

Diercks, G. (2018). Lost in translation: How legacy limits the OECD in promoting new policy mixes for sustainability transitions. *Research Policy*. https://doi.org/10.1016/j.respol.2018.09.002

Diercks, G., Larsen, H., & Steward, F. (2019). Transformative innovation policy: Addressing variety in an emerging policy paradigm. *Research Policy, 48*(4), 880–894. https://doi.org/10.1016/j.respol.2018.10.028

Doezema, T., Ludwig, D., Macnaghten, P., Shelley-Egan, C., & Forsberg, E. M. (2019). Translation, transduction, and transformation: expanding practices of responsibility across borders. *Journal of Responsible Innovation, 6*(3), 323–331. https://doi.org/10.1080/23299460.2019.1653155

Engels, F., Wentland, A., & Pfotenhauer, S. M. (2019). Testing future societies? Developing a framework for test beds and living labs as instruments of innovation governance. *Research Policy, 48*(9), 103826. https://doi.org/10.1016/j.respol.2019.103826

Feld, A. (2014). Paradigmas internacionales y políticas científico-tecnológicas en Argentina: 1958-1983. In H. Vessuri, P. Kreimer, L. Velho, & A. Arellano (Eds.), *Perspectivas latinoamericanas en el estudio social de la ciencia, la tecnología y el conocimiento* (pp. 337–351). Editorial Siglo Veintiuno. https://sigloxxieditores.com.mx/libro/perspectivas-latinoamericanas-en-el-estudio-social-de-la-ciencia-la-tecnologia-y-la-sociedad/?utm_source.com

Galego, D., & Brans, M. (2023). Governance of social innovation. In J. Howaldt & C. Kaletka (Eds.), *Encyclopedia of Social Innovation* (pp. 169–171). Edward Elgar. https://www.e-elgar.com/shop/usd/encyclopedia-of-social-innovation-9781800373341.html

Garzón, N., & da Costa, J. P. (2021). *Towards a Regional Policy: Transformative Innovation in Colombia* (pp. 81–104). Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-80832-7_5

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The New Production of Knowledge : The Dynamics of Science and Research in Contemporary Societies*. SAGE Publications. https://psycnet.apa.org/record/1994-98499-000

Godin, B. (2017). *Models of Innovation. The history of an idea*. The MIT Press. https://doi.org/10.7551/mitpress/10782.001.0001

Haddad, C., Nakić, V., Bergek, A., & Hellsmark, H. (2022). Transformative innovation policy: A systematic review. *Environmental Innovation and Societal Transitions, 43*(March 2021), 14–40. https://doi.org/10.1016/j.eist.2022.03.002

Kanger, L., Rotolo, D., Steinmueller, W. E., & Schot, J. (2022). Deep transitions : A mixed methods study of the historical evolution of mass production. *Technological Forecasting & Social Change, 177*(January). https://doi.org/10.1016/j.techfore.2022.121491

Kanger, L., & Schot, J. (2019). Deep transitions: Theorizing the long-term patterns of socio-technical change. *Environmental Innovation and Societal Transitions, 32*, 7–21. https://doi.org/10.1016/j.eist.2018.07.006

Kattel, R., Mazzucato, M., Baafi, K., Fernandez-Monge, F., Goulden, A., Gronchi, I., Kalema, N. L., & Puttick, R. (2025). *Dynamic Capabilities for Transformative Change in City Governments*. https://www.ucl.ac.uk/bartlett/publications/2025/feb/dynamic-capabilities-transformative-change-city-governments

Kuhlmann, S., Stegmaier, P., & Konrad, K. (2019). The tentative governance of emerging science and technology—A conceptual introduction. *Research Policy, 48*(5), 1091–1097. https://doi.org/10.1016/j.respol.2019.01.006

Mercado, A., Sánchez, I., & Testa, P. (2014). La (de)construcción de la política científica y tecnológica en Venezuela (1990-2012). In H. Vessuri, P. Kreimer, L. Velho, & A. Arellano (Eds.), *Perspectivas latinoamericanas en el estudio social de la ciencia, la tecnología y el conocimiento* (pp. 337–351). Editorial Siglo Veintiuno.

Molas-Gallart, J., Boni, A., Giachi, S., & Schot, J. (2021). A formative approach to the evaluation of Transformative Innovation Policies. *Research Evaluation, 30*(4), 431–442. https://doi.org/10.1093/reseval/rvab016

Mowery, D. C., Nelson, R. R., & Martin, B. R. (2010). Technology policy and global warming: Why new policy models are needed (or why putting new wine in old bottles won't work). *Research Policy, 39*(8), 1011–1023. https://doi.org/10.1016/j.respol.2010.05.008

Nupia, C. (2013). Origen de la política científica y tecnológica en Colombia: Colciencias y su papel en la transferencia del modelo internacional de política científica. In M. Salazar (Ed.), *Colciencias cuarenta años: entre la legitimidad, la normatividad y la práctica* (pp. 121–177). Banco Interamericano de Desarrollo. https://ocyt.org.co/wp-content/uploads/2021/06/colciencias40.pdf?utm_source.com

OECD. (2024). OECD Agenda for Transformative Science, Technology and Innovation Policies. In *OECD Science, Technology and Industry Policy Papers* (OECD Science, Technology and Industry Policy Papers, Vol. 164, Issue 69). https://doi.org/10.1787/ba2aaf7b-en

Ordóñez-Matamoros, G., Centeno, J. P., Andrade-Sastoque, E., & Pinzón-Camargo, M. A. (2021). Transformative Innovation Policy in Emerging Economies: What Does It Entail? In *Palgrave Studies in Democracy, Innovation and Entrepreneurship for Growth* (Issues 978-3-030-80831–0, pp. 105–146). Springer International Publishing. https://doi.org/10.1007/978-3-030-80832-7_6

Orozco, L., Villaveces, J., Ordoñez-Matamoros, G., & Moreno, G. (2019). Innovation policy and governance networks on national innovation systems. *17th International Conference on Scientometrics & Informetrics, 1*, 541–553.

Osorio-García, A., Pabón, A., & Asprilla, H. (2023). Impulsando transiciones agroecológicas con comunidades agrícolas aisladas: las redes como primer paso. In M. Ramírez (Ed.), *Abriendo Pasos a Políticas y Prácticas de Innovación Transformativa en América Latina* (pp. 343–371). Tirant Humanidades. https://editorial.tirant.com/free_ebooks/9788419825728.pdf

Peck, J. (2011). Geographies of policy: From transfer-diffusion to mobility-mutation. *Progress in Human Geography, 35*(6), 773–797. https://doi.org/10.1177/0309132510394010

Pinzón-Camargo, M. A., Centeno, J. P., Andrade-Sastoque, E., & Ordoñez-Matamoros, H. G. (2023). Logics and Enablers of Transformative Innovation Policies: The case of the Colombian Appropriation of Science and Technology Policy. *NOvation - Critical Studies of Innovation, 5*, 31. https://doi.org/10.5380/nocsi.v0i5.93602

Pozzebon, M., Souza, A., & Saldanha, F. (2023). The South American concept of tecnologia social. In J. Howaldt & C. Kaletka (Eds.), *Encyclopedia of Social Innovation* (pp. 95–99). Edward Elgar. https://doi.org/10.4337/9781800373358.ch17

Ramirez, M., Boni, A., Wade, I., & Byrne, R. (2024). How does transformative innovation policy travel across physical and cognitive spaces? Exploring the role of mutable fluid space in experimental policy engagements. *Environmental Innovation and Societal Transitions, 52*(June), 100881. https://doi.org/10.1016/j.eist.2024.100881

Sagasti, F. (1978). *Science and technology for development: main comparative report of the Science and Technology Policy Instruments Project*. International Development Research Centre. http://hdl.handle.net/10625/4293

Saldaña, J. (2016). *The Coding Manual for Qualitative Researchers*. SAGE.

Schot, J., & Steinmueller, W. E. (2018). Three frames for innovation policy: R&D, systems of innovation and transformative change. *Research Policy, 47*(9), 1554–1567. https://doi.org/10.1016/j.respol.2018.08.011

Smits, R., Kuhlmann, S., & Shapira, P. (2010). *The Theory and Practice of Innovation Policy*. Edward Elgar Publishing. http://www.elgaronline.com/view/9781845428488.xml

Sovacool, B. K., & Hess, D. J. (2017). Ordering theories: Typologies and conceptual frameworks for sociotechnical change. *Social Studies of Science, 47*(5), 703–750. https://doi.org/10.1177/0306312717709363

SPRU, & Ingenio. (2016a). *COLCIENCIAS Training Programme. An introduction to the concepts and roles of evaluation [PowerPoint slides]* (p. 82).

SPRU, & Ingenio. (2016b). *Un marco para la evaluación de las políticas de CTI en Colombia [PowerPoint slides]* (p. 11).

Stone, D. (2012). Transfer and translation of policy. *Policy Studies, 33*(6), 483–499. https://doi.org/10.1080/01442872.2012.695933

Summer, A., & Tribe, M. (2008). *International Development Studies: Theories and Methods in Research and Practice*. SAGE Publications. https://sk.sagepub.com/book/mono/international-development-studies/toc

TIPC. (2021). *Reporte de recomendaciones hacia la innovación transformativa del programa "A Ciencia Cierta."*

Ulmanen, J., Bergek, A., & Hellsmark, H. (2022). Lost in translation: Challenges in creating new transformative innovation policy practices. *PLOS Sustainability and Transformation, 1*(10), e0000031. https://doi.org/10.1371/journal.pstr.0000031

Velho, L. (2011). Conceitos de Ciência e a Política Científica, Tecnológica e de Inovação. *Sociologias, 13*(26), 128–153. https://doi.org/10.1590/S1517-45222011000100006