

Systems Hub for the Energy Transition in Colombia

7 April 2025

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Colombia faces a complex challenge in its transition toward a more sustainable and resilient energy system. This process requires working with multiple actors within the energy ecosystem to coordinate efforts, scale effective solutions, and address the structural gaps that hinder progress in the transition. To achieve this, it is essential to establish a collaborative framework that integrates knowledge, resources, and capacities distributed throughout the ecosystem.

Engineering X, with methodological support from Hexagonal, has created the Systems Hub for the Energy Transition in Colombia, a collaborative platform that seeks to mobilise resources, knowledge, and actors to facilitate the country's energy transformation. This effort aims to consolidate a meeting space that promotes strategic alliances, generates collective learning, and articulates innovation solutions to respond to the needs and opportunities identified within the system.

The Systems Hub Colombia project is part of the Safer Complex Systems (SCS) programme of Engineering X and emerges in response to the

need to strengthen multi-actor coordination identified in previous initiatives such as Transforming Systems through Partnership (TSP), the Frontiers Symposium, and the Bogotá Workshop 2024. These events identified critical gaps in coordination and systemic thinking within the energy transition ecosystem in Colombia.

This report presents the main findings of the diagnosis and co-creation process, as well as the roadmap for implementing the Systems Hub, aimed at generating a shared vision and promoting collaborative work towards a safer, fairer, and more sustainable energy transition.



Participants in the Systemic Innovation Lab

1. Systems Hub development process

The development of the Systems Hub in Colombia was organised into three phases:

01 Ecosystem characterisation

December 2024 to January 2025

A comprehensive literature review, 18 in-depth interviews, and three collaborative workshops were conducted.

This diagnosis made it possible to identify relevant actors, map their interactions, and document the main barriers and opportunities within the Colombian energy ecosystem

02 Systemic innovation lab

27 to 28 January 2025

During two days, 34 key stakeholders from academia, industry, government, and civil society participated in systemic thinking and co-creation activities.

Participants validated findings, consolidated a shared vision, and designed a governance model for the Systems Hub.

03 Call design

February to March 2025

A call for proposals was designed to select the managing team that will implement the hub.

This process included clear criteria to ensure transparency, effectiveness, and representativeness in the hub's management.

The methodology was based on three fundamental pillars:

- **Collaborative construction** of the call for proposals and the hub with the ecosystem.
- **Systemic approaches** to map actors and dynamics.
- **Identification of potential leaders** based on their interests and willingness.



Systemic Innovation Lab

2. Systemic gaps and challenges

The systemic analysis revealed five structural gaps and their symptoms that limit progress in the energy transition:

1. Fragmented governance and lack of multilevel coordination

The energy transition ecosystem in Colombia is institutionally fragmented and has poorly articulated different levels of government, leading to regulatory conflicts, duplicated efforts, and ineffective public policy implementation.

- **Disconnection between levels of government**
- **Competition between government entities**
- **Regulatory uncertainty**
- **Lack of an articulating leadership**

2. Limitation of social participation

The energy transition continues to be perceived as a technology-centred process, where territorial actors have little real influence. The lack of effective participation generates distrust, projects without local ownership, and social resistance to energy projects, which can slow down or even block their implementation. These issues also weaken the perceived safety and legitimacy of energy projects.

- **Lack of local recognition and development**
- **Lack of legitimacy in prior consultation**
- **Social resistance to transition projects**

3. Lack of a common narrative and shared vision

The energy transition in Colombia lacks a unified vision among governmental, industrial, academic, and community actors. Currently, each sector and territory interprets the transition from its own framework of reference, making it difficult to generate consensus and formulate collective strategies.

- **Ambiguous definitions**
- **Narrative disconnection between territories**
- **Exclusionary technical language**

4. Insufficient and misfocused financing

Despite the existence of multiple funds and investment mechanisms, energy transition financing in Colombia faces critical challenges related to insufficient resources, priority misalignment, and lack of long-term sustainability.

- **Insufficient and fragmented resources**
- **Lack of financial continuity**
- **Dispersion of funds in pilot projects**

5. Lack of connection and synergies between initiatives

There are multiple initiatives and actors working on the energy transition in Colombia, but their impact is limited due to ineffective articulation mechanisms. A siloed ecosystem results in duplicated efforts, lost knowledge, and opportunities for collaboration.

- **Lack of knowledge of the ecosystem**
- **Historical distrust**
- **Duplication of efforts**

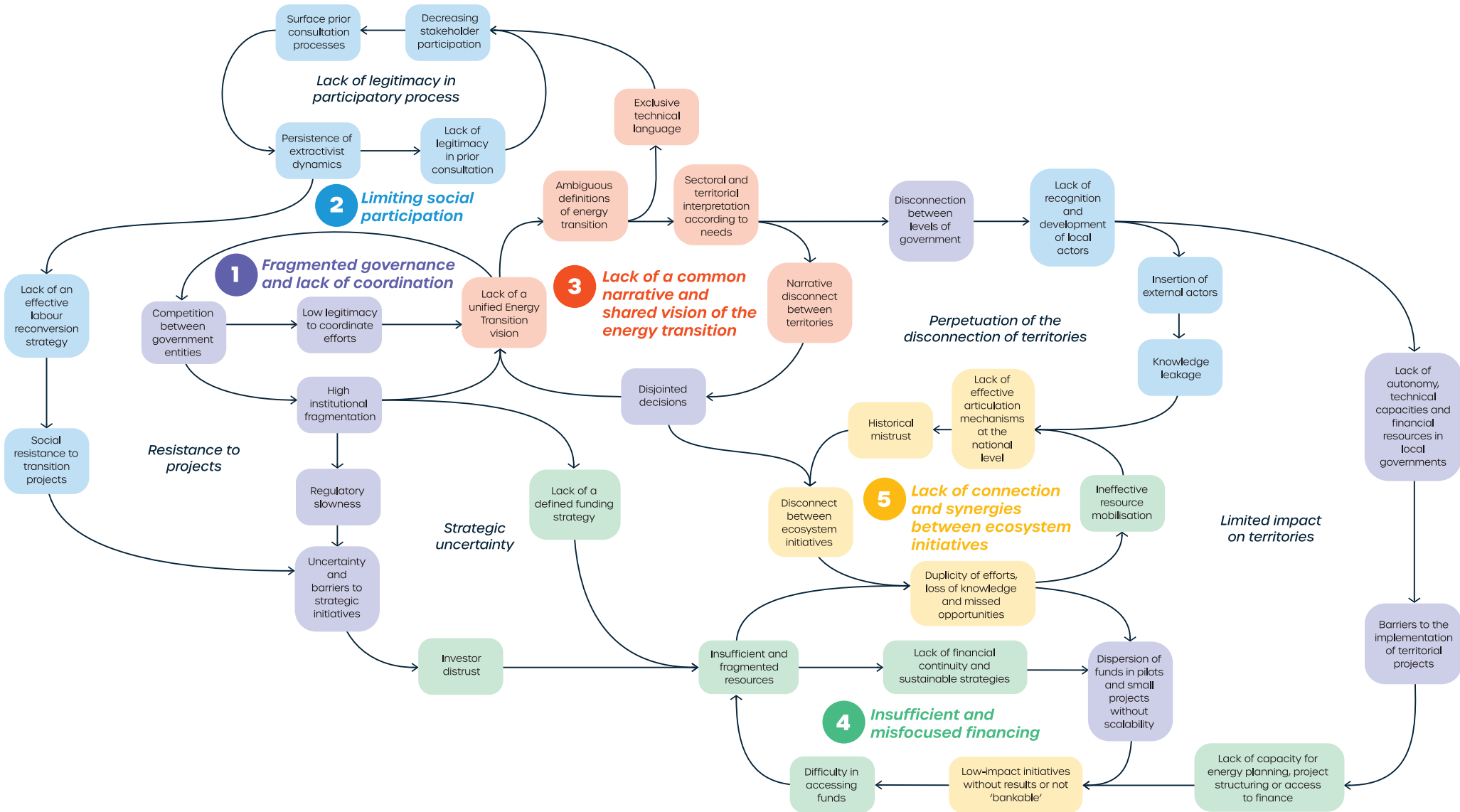


Figure 1. Systemic mapping of barriers

3. Leverage points

The research and validation process revealed five critical leverage points where strategic interventions can trigger profound and sustainable changes within Colombia's energy ecosystem:

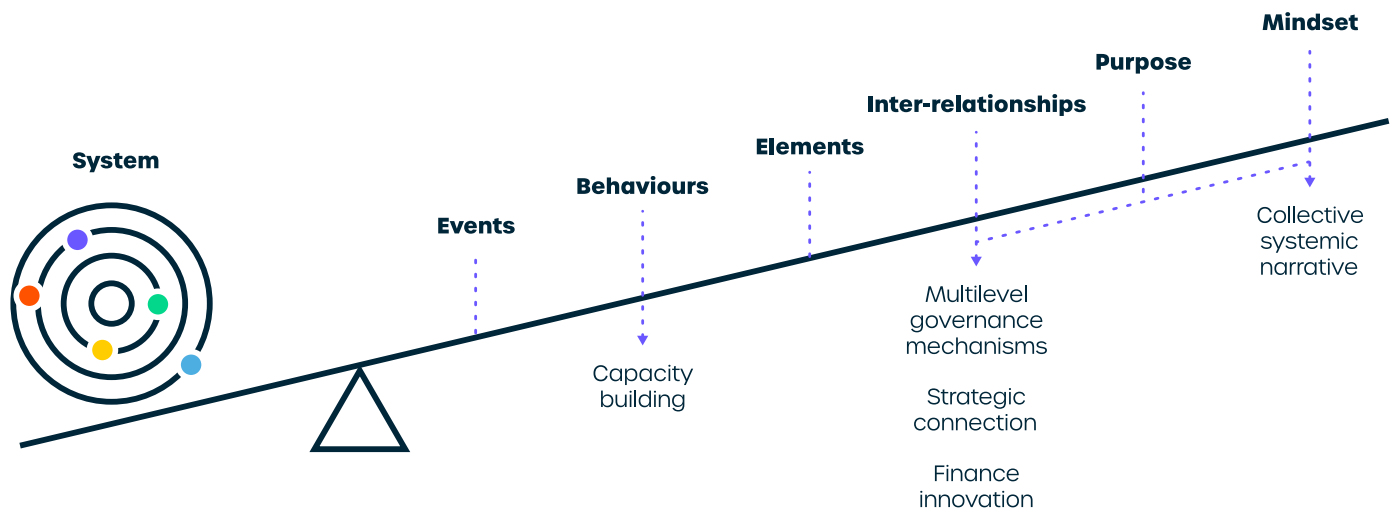


Figure 2. Leverage points

1. Building a collective systemic narrative

Establish shared objectives under a systemic mindset by creating a common discourse that connects technical, social, economic, and cultural perspectives while integrating the diversity of territorial realities into the Hub's strategy.

2. Multilevel governance and inter-institutional coordination

Develop innovative governance mechanisms that facilitate coordination between national, regional, and local actors, promoting deep contextual understanding, adaptive decision-making, and shared accountability, supporting trust-building and conflict mitigation as key aspects of systemic safety.

3. Strategic connection and visibility of the ecosystem

Strengthen networks and enhance collaborative platforms that make dispersed efforts visible, avoid duplications, help to identify synergies, and improve effective project articulation to amplify systemic impact.

4. Innovation in financing models and project scalability

Create innovative financial schemes that facilitate access to funding, optimise resource allocation, promote collective approaches, and prioritise the sustainability and scalability of strategic projects within the ecosystem.

5. Strengthening local capacities for territorial autonomy

Strengthen local leadership and resilience by developing systems thinking skills for strategic leadership and facilitating access to resources to structure sustainable projects without dependency on external actors.

The leverage points constitute the strategic foundation for the Hub. While each of them has the potential to generate structural changes on its own, their true transformative capacity lies in their joint and interconnected intervention.

4. Systems Hub

The Systems Hub is conceived as a collaborative platform that brings together key actors of the Colombian energy ecosystem to address structural challenges in the energy transition.

Its main purpose is to facilitate effective coordination between sectors, mobilise strategic financing for interconnected projects, and develop missions with a systemic approach to generate long-term impact. The Systems Hub positions itself as an ‘articulator of articulators,’ meaning its purpose is not to replace existing initiatives or duplicate efforts but to strengthen and connect them under a common strategic framework.

How does it work?

The Hub operates under a three-component adaptive governance model:

Managing team (operational core):

An organisation or consortium of organisations responsible for daily operational management, executing strategic missions, coordinating actors, and communicating. A team capable of connecting sectors, mobilising resources, and coordinating initiatives without duplicating efforts.

Opportunities board (strategic direction):

A strategic body made up of five to seven multisectoral experts with legitimacy and influence. Its role is to define priority missions, supervise results, and facilitate connections with key actors.

Mission nodes (project executors):

Operational groups composed of multiple actors who design, implement, and scale systemic solutions under the coordination of the managing team. Each node focuses on specific missions with transformative impact potential, aligning diverse actors towards concrete objectives.

The Systems Hub aims to be autonomous and not dependent on the government, while maintaining a strategic relationship that allows it to align its actions with national priorities without losing its operational independence.

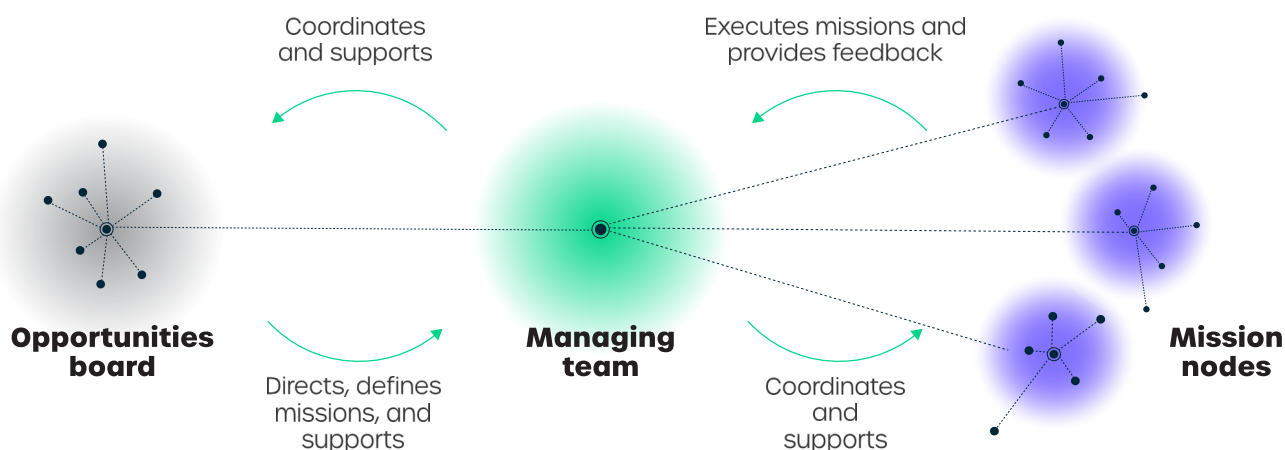


Figure 3. The governance model of the Systems Hub

Impact

The Systems Hub aims to reduce duplication of efforts, improve resource allocation efficiency, and promote cross-sectoral collaborations that strengthen the resilience of the Colombian energy ecosystem. It also seeks to catalyse systemic learning, mobilise strategic resources, and connect diverse actors to drive innovative and scalable solutions.

5. Reflections and recommendations

Below are key recommendations to maximise its impact, ensure its sustainability, and contribute to a safer and more resilient ecosystem:

1. Strategic orientation

The design of the Systems Hub must ensure that its actions are aligned with its methodological principles. Strategic missions should focus on systemic change, prioritising interventions on critical leverage points rather than superficial symptoms while also enhancing the overall safety and resilience of the ecosystem.

2. Articulation and trust-building

The effectiveness of the Hub lies in its ability to connect diverse actors from the start. This involves convening strategic actors in the Opportunities Board, creating multi-actor dialogue spaces, and leveraging the initial mapping (Figure 4) to expand the participation of actors absent in the initial phase, particularly the financial sector.

3. Adaptation and iterative learning

It is necessary to identify recurring patterns and adjust strategies according to the evolution of the ecosystem. Continuous evaluation and transparency in communicating results will ensure the Hub's legitimacy.

4. Capacity building

Beyond theoretical training in systems thinking, practical skills development should be promoted to enable a holistic vision for identifying and acting on key leverage points, generating structural-level impacts.

5. Inclusiveness and cultural considerations

Design strategies that respond to the cultural and linguistic particularities of the Colombian context, ensuring effective participation of all relevant actors in the Hub.

6. Long-term sustainability

The success of the Systems Hub requires the consolidation of the adaptive governance model and the development of a sustainable financing scheme. This includes strategic partnerships and diversified financing models. Engineering X will play an operational support role initially and maintain a strategic role later on.

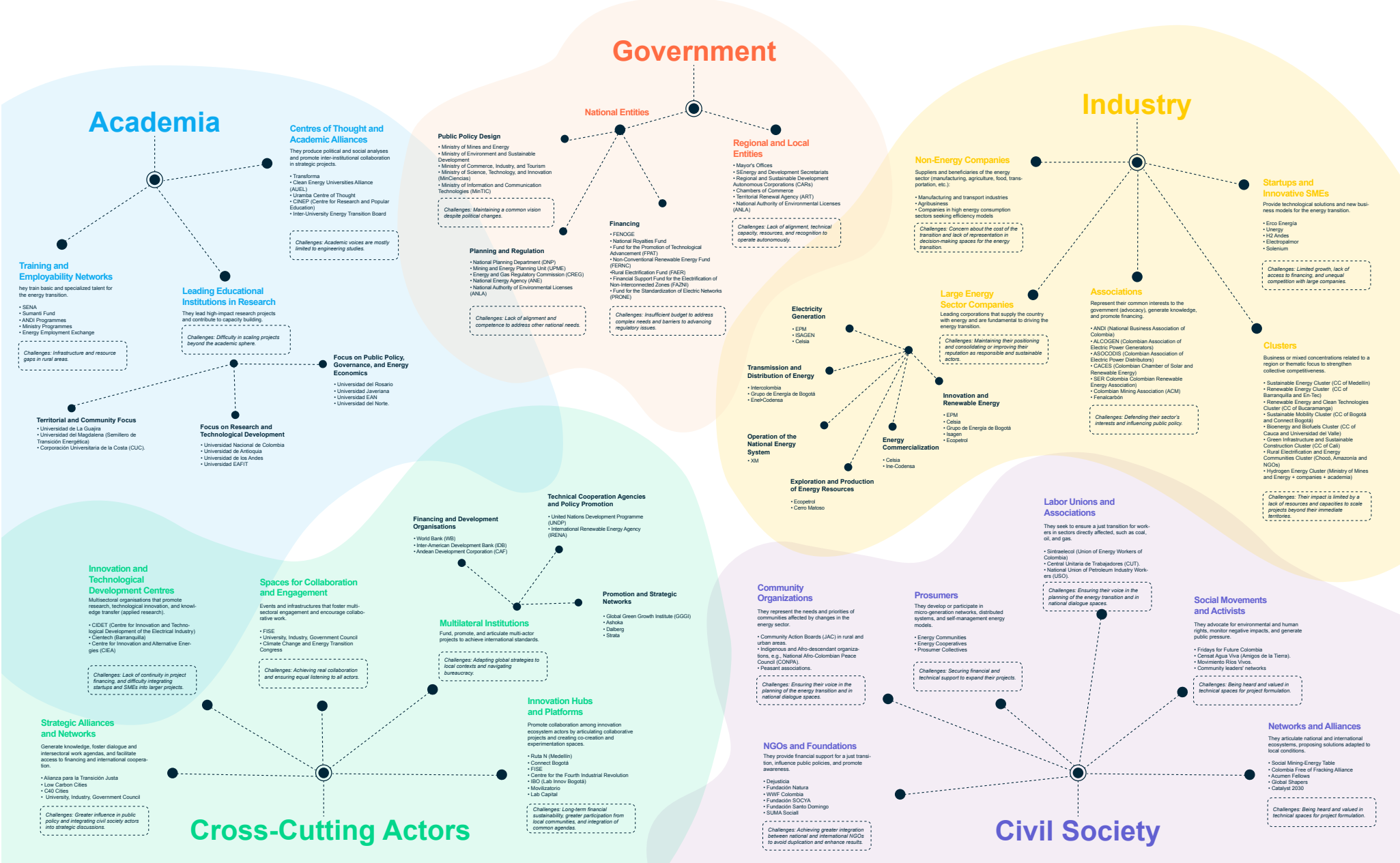


Figure 4. Actor mapping

6. Acknowledgements

This process would not have been possible without the active and committed participation of a wide range of actors from various sectors. Their commitment and willingness to collaborate have been essential to the collective construction of the Systems Hub Colombia and to advancing towards a fairer, more inclusive, and sustainable energy transition.

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7. About this collaboration

This project was developed as a collaboration between Engineering X and **Hexagonal**. Hexagonal (foundation, laboratory, and consultancy) supports individuals and organisations aiming to transform the world. Its model is based on six vectors of change – a universal DNA of innovation: open, mix, accelerate, experiment, collaborate, and digitalise. This approach enables Hexagonal to generate systemic impact, navigate complexity, and craft narratives that inspire.



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