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INTERWEAVING DIPLOMACY, DATA, AND TECHNOLOGY FOR SUSTAINABILITY: A CASE STUDY OF BARCELONA'S LOCAL GOVERNANCE

ABSTRACT

Local governance plays a crucial role in sustainable development. While research has examined diplomacy, data, and technology within local governance, their combined impact still needs to be explored. This study aimed to investigate how the city of Barcelona integrated diplomatic relations, data-driven insights, and technological advancements to propel local sustainability efforts. Employing a qualitative approach with a multi-method design, the study explored the interaction of diplomacy, data, and technology in fostering sustainable community development. The tracing process involved analyzing official reports, city council documents, and academic publications from 2015 to 2023. In-case analysis complemented process tracing and focused on specific policies, programs, and practices that promoted data-driven decision-making and technology use within Barcelona's sustainability efforts. The detailed examination included documents from the Barcelona city website and other official sources. The Inductive, Descriptive Case Study allowed natural phenomena to emerge; finally, thematic analysis categorized patterns and identified key themes related to diplomacy, data, and digital technologies within Barcelona's LGSD context. The investigation revealed a compelling three-pronged approach: (i) Cross-sectoral Diplomacy and Engagement: Barcelona fostered a collaborative environment where diverse stakeholders worked in concert. (ii) Data-Driven Decision Making: The city leveraged the power of data to inform strategic policy choices. (iii) Technology-Enhanced Governance: Technology acted as a catalyst, streamlining and optimizing governance processes. The study offers valuable insights for policymakers and stakeholders in other countries seeking to adopt similar strategies. Further research must explore context-specific implementation approaches and diplomatic strategies, considering different regions' diverse social, civic, political, and economic landscapes.

Keywords

Local Governance; Sustainability; Diplomacy; Data-Driven Decisions; Technology-Enhanced Governance.

1. Introduction

One of the most critical global issues today is sustainable development, which needs green technologies to enhance the sustainability of corresponding industries (Fu & Ma, 2020). In alignment with this perspective, the United Nations Sustainable Development Goals emphasize the 11th goal, asserting that cities must be inclusive, safe, resilient, and sustainable (Salvador & Sancho, 2021). This approach has inspired concepts such as sustainable cities, eco-cities, and digital cities, along with strategies for global sustainable development. Importantly, it underscores the critical role of local governance in fostering sustainable city development at the micro-level (Fu & Zhang, 2017).

When governments at both international and grassroots levels prioritize sustainable practices, their significance becomes paramount. Local governments play a vital role in understanding the challenges and potential sustainable solutions (Ansell et al., 2022). However, sustainable community development is not solely the responsibility of governments. Local communities are crucial in mobilizing community members and resources and adapting UN SDGs to specific situations, thereby emphasizing societal involvement in promoting sustainable community development (Ansell et al., 2022).

Current researches show that as difficulties in chasing sustainability challenge local communities, leaders must set up effective governance systems to address these difficulties and align the system with community goals (Moomaw et al., 2017). Active local governance is important for adapting to the challenges, translating sustainable development goals into practical plans, using resources, and authorizing citizens for accountability (Ansell et al., 2022). Despite the self-help approach, integrated strategies are necessary to successfully address economic weakening, insufficient social services, and safety matters (Han et al., 2015).

Diplomacy has appeared as an important approach to promoting sustainable community development, integrating local people in addressing global problems (Espiñeira-Guirao, 2022). The phrase 'think global, act local' explains how cities can implement global policies, leading to 'city diplomacy' (Espiñeira-Guirao, 2022). City diplomacy refers to the ability of cities to increase local dynamics in global governance and represent local benefits and needs within the international community. It permits cities to use their local strengths and collaborate with stakeholders through shared motivations to support and participate in sustainable development (Moomaw et al., 2017). This collaboration spreads beyond local and national boundaries because it involves international organizations and other cities sharing best practices and resources for sustainable community development.

Big data pointedly aid evidence-based local governance by giving large-scale datasets on service delivery and citizen use (Quilty, 2020). Policymakers can make well-reasoned decisions, informed by evidence, to pursue local sustainable development (Jain & Espey, 2022). Data matters—for better past and present decisions that can lead to a prosperous and sustainable future.

Technological advancements provide new opportunities and challenges for sustaining community development. The combination of diplomacy, data, and technology can advance local governance, transform practices, and promote smart cities for sustainable development (Goi, 2017; Romanelli, 2020). The constructive collaboration of diplomacy, data, and technology works at multiple levels. At the micro-level, local actors employ diplomacy to advocate for community needs, use data to inform decisions, and leverage technology to implement solutions. At the meso level, collaboration among local stakeholders is enhanced through diplomatic efforts supported by data-driven insights and technological tools. Finally, at the macro-level, global sustainable development goals are integrated into local governance through diplomatic tracks, informed by data, and implemented using technology.

Despite their influence on sustainable community development, these elements also present challenges. For example, stakeholders need diplomacy to navigate complex power dynamics. Local communities often need more advanced tech, which can hinder participation. Tech-based data can raise privacy fears and questions about data security and ethical use. Local groups play a role in tackling this barrier. They help in the combination of diplomacy, data, and technology for better sustainable community development.

Diplomacy, data, and technology are popular methods (Moomaw et al., 2017; United Nations, 2023; Romanelli, 2020). Nevertheless, their success depends on specific situations. We need tailored studies on how these complex approaches enhance sustainable community development. This gap in research is still significant. Diplomacy is vital in sustainable development practice (Moomaw et al., 2017). Advanced techniques seamlessly integrating data and technology can enhance the proposed method's effectiveness. Romanelli (2020) advocates a community-oriented approach emphasizing socially responsible, human-centric growth and embracing technological advancements in building smart cities for sustainable development.

This study adopts a comprehensive approach to address this research gap by investigating how diplomacy, data, and technology can enhance local governance and enable sustainable community development. Using Barcelona, Spain, as a case study, it looks to answer the following questions:

1. How can diplomacy help stakeholder collaboration at the local level to promote sustainable community development?
2. What role does data play in promoting informed decision-making, transparency, and accountability among local actors in sustainable community development?
3. How can technology improve local governance practices and enhance service delivery, participation, and civic engagement for sustainable community development?
4. What is the relationship between diplomacy, data, and technology that fosters sustainable community development?

The study contributes to academic discourse by providing insights into the integration of diplomacy, data, and technology. Policymakers and practitioners can use these findings to develop initiatives that harness the synergistic effects of these factors to promote sustainability.

This study opens a fresh area of exploration for future research, enriching the existing literature on the theory and practice of developing sustainable communities.

2. Methodology

This research delves into the intricate and multifaceted relationship between diplomacy, data, and technology within Barcelona's Local Governance for Sustainable Development (LGSD). The implementation of a qualitative approach and the engagement of a multi-method design, made the current study discovered how these key elements interconnect and interact to develop sustainable community development, and lead to a positive change in the city.

- **Process Tracing (Historical Insights into Policy Evolution):** The researcher employed process tracing, that is a qualitative research procedure in order to track the development of ideas and methods throughout history. The researcher utilized this approach through exploring official reports, city council records, and academic writings from 2015 to 2023. Process tracing shows how specific events and decisions have expected consequences (Collier, 2011). The researcher could expose the intricate connections and relationships that have shaped Barcelona's sustainable local governance strategy over the past eight/nine years by studying how many policies and programs had evolved. The analysis offered long-term insights into how diplomacy, data, and technology were joint into the Barcelona's sustainability efforts.
- **Case Study (Examining Data-Driven and Technological Initiatives):** The case study helped in enhancing the researcher's investigation into Barcelona's approach to sustainable development. The case study of the city carefully examined Barcelona's policies and programs that adopted data-driven decision-making and intentionally leveraged technology to advance sustainability goals. The researcher cautiously inspected the materials from the Barcelona's city website, municipal reports, and other trustworthy sources in order to understand how these initiatives are implemented and to understand their influence (Yin, 2018). The case study uncovered how the city of Barcelona combined diplomacy with data and technology to support its local governance and sustainability efforts.
- **Inductive Case Study and Thematic Analysis:** The inductive, descriptive case study allows the natural patterns and phenomena to emerge from the data. This approach permits a comprehensive understanding of complicated dynamics and revealed advanced and important findings (Yin, 2018). The researcher could recognize the main patterns through thematic analysis and pointed to the complicated interconnectedness between diplomacy, data, and digital technologies within Barcelona's LGSD context. This approach offered notable insights that can be valuable for other cities looking to build more sustainable futures.

- **Data Collection and Focused Investigation:** The data collection procedure was strict because it involved an extensive examination of reports, city council archives, and academic literature, in addition to the examination of the content available on Barcelona's official website. The researcher followed specific guidelines that guaranteed the research focused on the city's LGSD strategies from 2015 to 2023, highlighting diplomacy, data, technology, and sustainability.
- **Data Analysis:** The data analysis procedure involves categorization of qualitative data from the selected documents and reports that are based on predefined themes. New themes that emerged from the data were also identified, refined, and then categorized to expose the critical findings. These final findings offered valuable perspectives on the sophisticated dynamics that shaped sustainable local governance in Barcelona.
- **Synthesis of Findings (through Process Tracing and Case Study Analysis):** This current study used process tracing to provide insights into how the city of Barcelona has shaped its governance policies and practices over time (Collier, 2011). The study revealed the connections and influences that have shaped the city's method to sustainable governance by tracking changes in thoughts and strategies. The detailed case study approach (Yin, 2018; Braun & Clarke, 2006) additionally examined how the combination of diplomacy, data, and technology has promoted sustainability, offering in-depth perspectives on implementation and consequences. This comprehensive methodology sought to enhance knowledge, reveal crucial insights, and provide lessons for other cities aiming for sustainable urban environments.
- **Broader Implications:** Barcelona's sustainability initiatives that integrated diplomacy, data, and technology, offered valuable insights into eco-urban development. This research aimed to contribute to the academic discourse and practical applications by giving practical instructions to guide other cities toward a greener future.

3. Findings and Discussion

The framework of the study points to the importance of diplomacy in promoting collaboration among Barcelona's residents beyond the borders of the city's center. This approach helps as a connection that fosters unity and reduces the divide between the downtown area and its outskirts. This dedication to teamwork is evident in implementing the "Sustainable Community Network," a collective effort to develop and implement Barcelona's Sustainability Plan. The "Sustainability Participatory Council" network brings representatives from different institutions within the "More Sustainable Barcelona" network. These institutions include schools, universities, NGOs, businesses, and social movements, representing several stakeholders locally (The European Climate-ADAPT, 2023). By engaging citizens, this network ensures that environmental issues are addressed through joint projects and programs, aligned with cultural and business activities, and establishing a shared agenda for action. (See Table 1.)

Table 1. Stakeholder groups for sustainable community development.

Stakeholder Groups	Contributions
Sustainable Participatory Council (NGOs, businesses, schools, and universities)	It implemented the city's sustainable plans, including the Nature Plan 2030, an extension of the Green Infrastructure and Biodiversity Plan (GIBP) 2020.
City of Barcelona departments (e.g., environmental and housing departments)	It developed the city's Green Strategy, including the Tree Master Plan and the GIBP, which have improved the city's ecological, environmental, social, and economic well-being by integrating suitable vegetation. Notably, the city government has planted 65% of the 310,800 trees in Barcelona and allocated €1 million for school climate shelters.
Citizen Council for Sustainability (public bodies and organizations)	Promoted public commitment to expanding the climate shelter network. Since summer 2022, Barcelona has increased its climate shelter network to over 200 locations, incorporating new features suitable for diverse users.

Source: The European Climate ADAPT, 2023.

The Barcelona Innova Lab Mobility initiative stands out for its stakeholder-driven approach to sustainable development. It has effectively addressed urban mobility challenges by fostering a consensus model through dialogue, participation, and collaboration across sectors.

This approach is evident in Barcelona City Council's 2023 report (Barcelona City Council, 2023a). Similarly, cross-sectoral committees like the Citizen Council for Sustainability prove the effectiveness of collaborative implementation efforts. As outlined in Agenda 2030 (Rull & Planas, 2021), such multi-sectoral engagement is crucial for effectively addressing sustainability challenges.

Data-driven decision-making played a crucial role in Barcelona's sustainable community development efforts, as shown by the Municipal Data Office's effective use of data to track progress toward Agenda 2030 goals (Rull & Planas, 2021). For instance, data-informed projections guided the city's efforts to improve air quality by 2030, as outlined in its 2011–2020 Energy, Climate Change, and Air Quality Plan. Figure 1 presents a graph of projected emissions in 2030 for sustainable cities and communities, aligning with SDG 11 (Barcelona City Council, 2020, p. 159).

Change of urban model

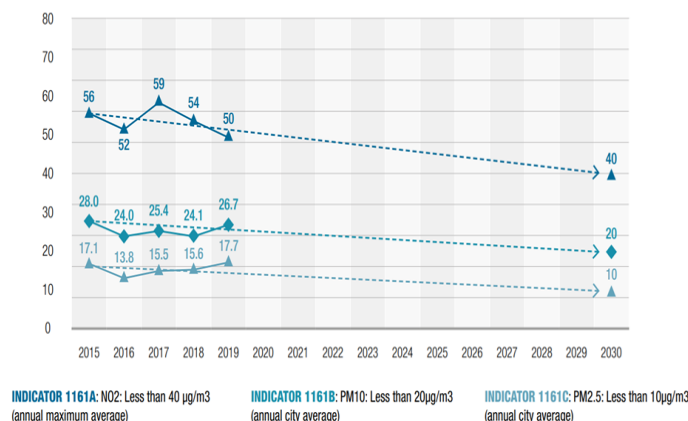


Figure 1. Estimated emissions change by 2030 in Barcelona

Barcelona's digital city strategy aims to improve service delivery and citizen participation in decision-making. By fostering collaborative policymaking, the city engages global communities and its innovative environment to collectively reimagine the concept of a smart city (Ferrer, 2017). Recognizing this commitment, the European Commission (2016) acknowledged Barcelona's efforts to use emerging technology to help its residents.

Demonstrating this commitment, Barcelona distributes a sizable part of its budget to digital development. The city prioritizes open-source software, cost-saving measures, security, independence, and collaboration with the ICT sector (Bria, 2015). This approach underscores Barcelona's emphasis on harnessing technology to enhance citizen skills and capabilities, contributing to sustainable community development.

The 5G network further enables Barcelona's openness to global exploration as it pursues sustainable development. Table 2 outlines the city's 2017 budget for digital development.

Table 2. Budget Allocation for the Digital Transformation Plan of Barcelona City Council

Category	Budget (€)
Total budget	€72,000,000
Allocated to the Open Digitization program for flagship projects using agile methods, free/open-source software, or innovative data practices.	€31,750,000
Program for Open Digitization: Free software and agile service development for the governance of transformation processes	€1,500,000
Allocation for ICT and security measures	€38,750,000

Data Source: Barcelona City Council, 2017, p. 36

The analysis underscores the crucial role of cross-sectoral cooperation in sustaining community development. One significant issue is the impact of global population growth on resource depletion and environmental concerns (Marín-González et al., 2022). Local communities, like Barcelona, recognize the value of adopting modern practices and using contemporary technologies to address local needs and promote sustainable development (Mensah, 2019). This further emphasizes the value of diplomacy, data, and technology in achieving sustainable development locally.

Table 3. Strategic sectors in Barcelona's sustainable development

Sector	Expected Outcomes
Digital economy or ICT sector	Positions the city as a global hub while creating numerous jobs. For instance, Barcelona generated 54,039 jobs in 2017, an increase from 51,510 in 2016.
Creativity	Generates new business opportunities by expanding creative activities.
Health	Enhances quality of life through research and improved service delivery. In 2017, 74.7% of jobs were in the healthcare sector.
Green and circular economy	Promotes job creation, boosting Barcelona's GDP. In 2017, this sector, including technology parks, experienced a 4% growth.
Social and solidarity	Improves coordination among sector players to foster sustainable development. 2015, it connected approximately 1,200 joint-stock companies, 861 cooperatives, 2,400 third-sector social entities, and 260 community economy initiatives.

Source: Barcelona City Council, 2018.

Barcelona's willingness and ability to adopt shared norms, values, and beliefs aligned with diplomacy, data, and technology position it as an exemplar of a city fulfilling SDG 11: "Make cities and human settlements inclusive, safe, resilient, and sustainable" (Salvador & Sancho, 2021, p. 1). This approach has been critical in advancing the United Nations Sustainable Development Goals (SDGs) (Jacobson et al., 2018). By integrating data, Barcelona has eased sustainable development within its local community, fostered trade, promoted growth, and addressed specific regional issues.

The analysis finds a fundamental relationship between diplomacy, data, and technology that foster sustainable community development:

- **Data-Driven Decision-Making:** Data plays a fundamental role in understanding problems, informing actions, and measuring improvement toward the 2030 Goals (Quilty, 2020; Jain & Espey, 2022). For example, Barcelona uses data to predict greenhouse gas emissions by 2030, aiding decision-makers in reducing these emissions to achieve SDG 11.
- **Community Diplomacy:** Community diplomacy involves stakeholder groups, such as the Sustainable Participatory Council, the Citizen's Council, and the Barcelona City Council.

These groups play important roles in developing and implementing the sustainable development strategies (Moomaw et al., 2017).

- **Technology Integration:** Technology is an innovation that focus for Barcelona's sustainable development efforts. The city allocates noteworthy funds to improve technology and that is shown in its plan for building Barcelona's Digital City with open-source software (Barcelona City Council, 2023b).

In summary, the findings exemplify that diplomacy, data, and technology can work together to improve the local government's ability to track sustainable development. Also, these elements should be integrated with modern approaches and data to support community development, and enabling all stakeholders to work together effectively. The main results of this study are summarized in Table 4.

Table 4. Summary of Barcelona's findings on sustainable development.

Anchors of Barcelona's Sustainable Community Development	Findings
Stakeholder engagement	Stakeholder groups (such as the Sustainable Participatory Council, Citizen's Council, and Barcelona City Council) are crucial to sustainable development.
Data-driven decisions	Barcelona's predictive analytics help forecast greenhouse gas emissions by 2030 and assist decision-makers in achieving SDG 11.
Technology integration	Significant funding was allocated to enhance technology in building Barcelona's Digital City with open-source software.
Cross-sectoral cooperation	Key sectors facilitating sustainability in Barcelona include (manufacturing, creativity, health, green economy, and ICT).

4. Final Considerations

This research illustrates the vital connection between diplomacy, data, and technology. Throughout the study, the researcher has pointed out how these elements can work together to create a better, more sustainable future for cities. The city of Barcelona—as a case study—serves as an excellent example of this. Stakeholders' efforts to combine technology and local governance are inspiring as they show that cities can play a significant role in sustainable community development.

The qualitative research approaches used, such as case study and process tracing, gave deep insights into the dynamics at work. These revelations highlight how crucial community involvement is and how local perspectives may have a big impact on choices.

As reflected in the study's findings, the researcher was excited about how cities like Barcelona lead the way in this subject. Their Digital City initiative and the collaboration with the Municipal Data Office illustrate the powerful impact of local governance on community growth. Cities can promote sustainability by using diplomacy, data, and technology collectively. This study states the importance of corporations across borders. Cities can share ideas and resources by working collaboratively, helping them confront common challenges and obstacles.

The researcher believes that every city can learn from Barcelona's approach. Other urban areas can explore adapting Barcelona's strategies and techniques to fit their unique contexts. It is hoped that they will find ways to address their specific challenges while promoting sustainability. For example, a city facing issues like air pollution can study how Barcelona uses data to monitor and improve air quality. They can then implement similar strategies that are personalized based on their needs.

Cities need to engage their communities actively. Sustainable development is not just a top-down process; it requires input from residents. Local communities have valuable insights that can guide decision-making. When cities listen to their residents, they can develop initiatives that meet the community's needs. This research encourages scholars, policymakers, and stakeholders to draw inspiration from Barcelona's success. We should work together to implement similar strategies in different urban areas. More effective and inclusive development projects can be created by fostering collaboration and encouraging open communication.

Looking ahead, significant future research can be conducted focusing on how diplomacy and data can work nationally and internationally. Combining traditional diplomacy with creative approaches can surely enhance sustainable development. For illustration, countries can collaborate on environmental matters by sharing data and best practices, which leads to better consequences for all parties involved. The new researches might need to discover these diplomatic routes because understanding how to navigate the complexities of international relations is central to practical sustainability efforts.

Moreover, the creation of corporations between cities and communities to tackle demanding issues is important. It became clear that involving people and stakeholders in research can help us better understand their needs. Surveys and interviews with people and stakeholders will provide treasured insights into local viewpoints. These insights can inform policies and initiatives, and then making them more relevant and effective. Local communities are more likely to support and engage in sustainable development practices when their voices and ideas heard.

The identification of the value of combining diplomacy with technology can help achieve our goals and can lead to solid and reasonable societies. For example, technology can help cities on gathering and analyzing the resources, waste management, and energy consumption data. By understanding these outlines, cities can make informed decisions about resource allocation and sustainability initiatives. Stakeholders in urban areas must invest in technology that is useful to enhance data collection and analysis.

Adding to that, it is essential to create structures that allow cities to share knowledge and collaborate. Expanding collaboration that aims to include different organizations and institutions, local communities, and businesses can surely make plans and projects broader. When varied stakeholders decide to work together, they can share their resources and knowledge. And then, this collaboration can lead to pioneering resolves that address complex challenges. For example, partnerships between cities and technology companies can result in new data-sharing and analysis platforms.

Cities can further concentrate on building strong systems that can be adapted to changing conditions. This flexibility is essential in confronting climate change and other global challenges. Additional, cities that can invest and care in green infrastructure, renewable energy, and sustainable transportation systems will be better ready to bypass these challenges. In this matter, Barcelona's commitment to sustainability can assist as a model for other cities. They have shown that creating urban environments prioritizing local people and the planet is something possible.

In conclusion, this research has revealed a unique opportunity to generate a sustainable future. We can confront sustainability problems by the integration of the three major aspects; diplomacy, data-driven approaches, and technology. Remarkably, the road to successful sustainability is a shared mission because it requires cooperation, creativity, and commitments from all parts. By fostering collaboration across borders and engaging local communities in decision-making, we can create a better future for the next generations. Together, cities can be built not only sustainable, but also judicious and comfortable places for everyone.

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