

Harmonizing Spatial Plans: A Methodology to Integrate Sustainable Mobility and Energy Plans to Promote Resilient City Planning

B. Sanchez, D. Zambrana-Vasquez, J. Fresner, C. Krenn, F. Morea, L. Mercatelli

Abstract—Local administrations are facing established targets on sustainable development from different disciplines at the heart of different city departments. Nevertheless, some of these targets, such as CO₂ reduction, relate to two or more disciplines, as it is the case of sustainable mobility and energy plans (SUMP & SECAP/SEAP). This opens up the possibility to efficiently cooperate among different city departments and to create and develop harmonized spatial plans by using available resources and together achieving more ambitious goals in cities. The steps of the harmonization processes developed result in the identification of areas to achieve common strategic objectives. Harmonization, in other words, helps different departments in local authorities to work together and optimize the use of resources by sharing the same vision, involving key stakeholders, and promoting common data assessment to better optimize the resources. A methodology to promote resilient city planning via the harmonization of sustainable mobility and energy plans is presented in this paper. In order to validate the proposed methodology, a representative city engaged in an innovation process in efficient spatial planning is used as a case study. The harmonization process of sustainable mobility and energy plans covers identifying matching targets between different fields, developing different spatial plans with dual benefit and common indicators guaranteeing the continuous improvement of the harmonized plans. The proposed methodology supports local administrations in consistent spatial planning, considering both energy efficiency and sustainable mobility. Thus, municipalities can use their human and economic resources efficiently. This guarantees an efficient upgrade of land use plans integrating energy and mobility aspects in order to achieve sustainability targets, as well as to improve the wellbeing of its citizens.

Keywords—Harmonized planning, spatial planning, sustainable energy, sustainable mobility, SECAP, SUMP.

I. INTRODUCTION

FROM the local to the supranational level, municipalities and other forms of local authorities (LAs) are playing a crucial role by taking actions aiming to reduce energy consumption, reduce CO₂ emissions and tackle local environmental issues in the European Union. Initiatives

B.S., D.Z.V. are with the Research Centre for Energy Resources and Consumption (CIRCE), CIRCE Building – Campus Río Ebro, Mariano Esquillor Gómez, 15, 50018 Zaragoza, Spain (e-mail: bsanchez@fcirce.es, zambrana@fcirce.es).

J.F., C.K. are with the Environmental Consultancy and Research Company Ltd (STENUM), Anton Kleinoscheg Straße 21, 8051 Graz, Austria (e-mail: johannes.fresner@stenum.at, christina.krenn@stenum.at).

F.M., L.M. are with AREA Science park, Padriciano, 99 34149 Trieste, Italy (e-mail: fabio.morea@areasciencepark.it, luca.mercatelli@areasciencepark.it).

supporting sustainable planning from the local scale are various and address common goals. However, they are not always complementary regarding their time frameworks, stakeholders' involvement or monitoring indicators among others, which directly condition the feasibility in looking for common synergies. For the purpose of this methodological approach though, it is meaningful to highlight two initiatives that boosted the development of local sustainable energy and mobility plans, Sustainable Energy and Climate Action Plans (SECAPs) (or the previous version, SEAPs) and Sustainable Urban Mobility Plans (SUMPs).

Regarding climate mitigation and adaptation, on the one hand, the EU Covenant of Mayors for Climate and Energy invites local governments to voluntarily sign and commit to **achieve EU climate and energy targets**. Born in 2008, the Covenant of Mayors is an initiative supported by the European Commission and based upon the European Union's 2020 Climate and Energy Package. The SECAP works under a bottom-up framework, from local to supranational, aiming to increase energy efficiency and the use of renewable energy sources in their territories by reducing up to 40% greenhouse gases by 2030 and adopting a joint approach to tackling mitigation and adaptation to climate change [1]. On the other hand, the development of local SUMPs has been supported especially since the adoption of the Transport White Paper "Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system" in 2011. This document follows the previous EC's Action Plan on Urban Mobility in 2009 [2] and the Civitas Initiative, raising awareness in Europe's towns and cities for the need to develop SUMPs since 2002. The Transport White Paper includes a series of up to 40 initiatives willing to integrate mobility systems, improve safety and security, establishing regulatory framework for innovative transports and above all, decarbonizing transports by ensuring the reduction of CO₂ and pollutant emissions. Linked to the last one, initiatives aim to develop carbon footprints calculators or near zero-emission urban logistics' measures among others [3].

Sustainable Energy and Mobility plans interconnect disciplines with common goals such as energy efficiency and GHG reduction. These objectives need to be considered when designing push and pull measures aiming to reduce the dependency of the car while increasing the quality offer of alternative means of transport. Last but not the least, Sustainable Urban Mobility is one of the topics raised in the Covenant of Mayors, described above, and incorporated in the

“How to develop a Sustainable Energy Action Plan (SEAP) Guidebook” [4].

European policies have set ambitious sustainability targets that translate into the development of powerful sectorial plans such as SUMP or SECAPs. However, it is common to find several **barriers to their implementation**. For the latter, it can be very challenging for smaller or less experienced municipalities, which sometimes lack the necessary skills or economic resources to fulfill their requirements [5]. For the case of sustainable mobility plans, by instance, the principal barriers are identified as strong pro-car and infrastructure lobbies, lack of joint cooperation between transport and land use departments, inadequate coordination between tiers of government, the demands of intensive public or the stakeholder involvement [6]. Nevertheless, taking advantage of the close relativeness among these, individual sectorial plans could benefit from a **potential dual enhancement** by coordinating vision, stakeholders involvement and data input among others under a harmonized working framework.

Harmonization does not mean the integration of the activities from both SECAP and SUMP, but their coordination and cooperation by working together under a common objective [7]. To provide a figurative visualization, the harmonization in spatial planning works as a main gear which moves two others (mobility and energy plan) in a coordinated way for the development and revision of both plans.

Harmonization helps different departments in LAs share the same vision, work together and optimize the use of resources. However, this process requires multidisciplinary skills to assess different cross-sector sustainable energy options and engage stakeholders in both the definition and implementation of the solutions, and to secure funding. Therefore, the **SIMPLA** (Sustainable Integrated Multi-sector PLanning) project was conceived to empower LAs and offer them an innovative, comprehensive approach to harmonize energy and mobility planning in the frame of wider urban development and land-use planning. SIMPLA provides a **step-by-step**

methodology for harmonization included in the project’s main document, the “Guidelines for the harmonization of energy and mobility planning” (the Guidelines) [7].

SIMPLA’s work-plan established a network of National Focal Points (NFPs) in 6 countries (expanding to further 12 through replication actions) merging technical expertise, methodological know-how and institutional capacity of technical partners and public authorities. Their role is to look for local synergies encompassing training and coaching, promoting mutual learning and best practices for the whole project.

SIMPLA’s guiding principles consider the EU benefit (involving countries and areas with different levels of tradition in integrated multi-sector planning) and capitalization of previous EU-funded initiatives, contributing to the **EU’s energy and climate targets for 2020** and beyond.

This paper presents a methodology to promote resilient city planning via the harmonization of sustainable mobility and energy plans. As a case study, the methodology proposed is validated through the assessment of 13 public entities following the implementation of a part of the harmonization process in a given industrial LA.

II. METHODOLOGY

SIMPLA’s **step-by-step** methodology aims to strengthen LAs’ capabilities to plan and deploy policies and measures in sustainable energy, creating **ideal conditions**, which allow the proper harmonization of mobility and energy plans. This methodology is described in the Guidelines, the project’s backbone document, and it has been created by incorporating the **expertise** from various public and private experts during previous focus groups and workshops. Nonetheless, its initial version is being upgraded as far as the project continues, **enhancing its content** with the project development experience. Fig. 1 shows the creation process of the Guidelines.

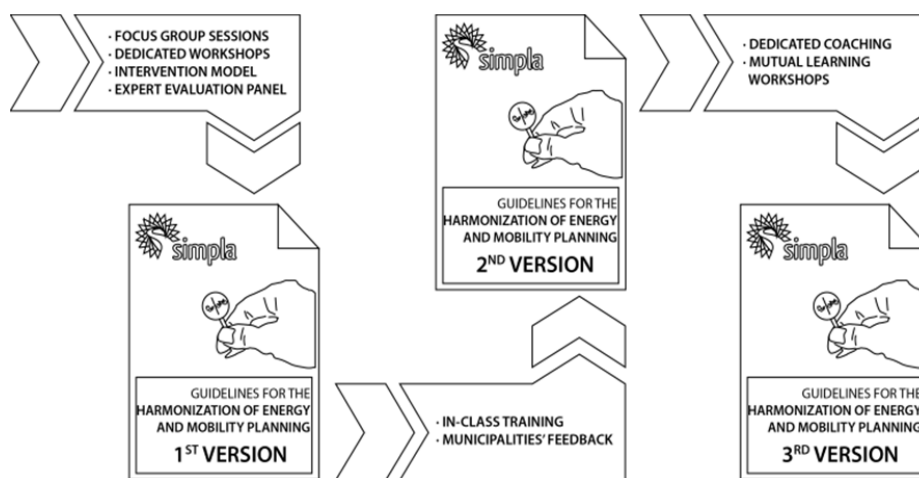


Fig. 1 Creation process of the Guidelines for the Harmonization of Energy and Mobility Planning

The current version (second) of the Guidelines includes **4 key chapters** designed to provide LAs’ officers a set of

concepts, advices and case studies to help them with the implementation of the harmonization process.

The first chapter introduces the definitions of both SECAPs/SEAPs and SUMP, and the **synergies** between them, crucial information to assess the harmonization.

The second chapter corresponds to the **harmonization process** itself and includes the necessary information to follow the four steps in order to achieve the harmonization of energy and mobility plans. Fig. 2 presents the four steps, initiating with the confirmation of political commitment and the setting up of the harmonization team, continuing with the planning stages, the implementation and finalizing with the monitoring and controlling of the harmonization process. This chapter concludes with some recommendations for an intermediate stage of updating and continuation of the harmonized plans, setting up the basis for a new cycle.



Fig. 2 Steps of the Harmonization Process. Diagram adapted from the original one in the Guidelines

The third chapter describes the Guidelines' appendices and includes important information such as **funding opportunities**, references, a self-assessment questionnaire or the **harmonization report** template.

Finally, the fourth chapter presents the **turn-key energy-saving packages**, a set of 18 initiatives and measures with references, investments ideas, available tools, expected results to easily implement in the municipal mobility and energy plans, available in the online observatory of the project website [8].

III. APPLICATION

This section focuses on the description of the application of the **harmonization actions in Spain**, following the above mentioned SIMPLA methodology. As a part of the project, a selection of municipalities aiming to develop the harmonization of their energy and mobility plans within the SIMPLA framework benefited from dedicated coaching actions involving trained experts.

To briefly provide the context, 13 public entities joined a 6-days in-class capacity building program in order to explore together **opportunities for synergies** between SECAPs/SEAPs and SUMP and identify connections between the two plans. The 13 LAs represented were the city councils of Leon (Le), Terrassa (Tr), Benidorm (Be), San Sebastian (Ss), Huerca-Overa (Ho), Cordoba (Co), Caceres (Ca) and Logroño (Lo) on the one side, and the Municipal associations of El

Condado (Ec), East Almeria (La), Cinca Medio (Mz), Zaragoza Area (Zg) and Great Huelva (Hu) on the other side.

During the in-class training, it has been rewarding the **exchange of experiences** from a wide range of profiles (councillors, technicians, police officers from small and big LAs) who fed the contents of the Guidelines.

From the 13-abovementioned LAs, a **careful selection** was done by developing a customized multi-criteria analysis. The analysis took into consideration a set of seven criteria to rank the five most promising authorities in Spain. Table I shows the score of the 13 LA after being analysed. Other processes have been applied in the rest of NFP in order to achieve up to 30 harmonized plans by the end of the project. Thus, the following criteria are as follows:

- Representation** in all in-class sessions: As a sign of continuity in the training process (weighted value 10/10);
- General engagement** during the classroom training: Showing proven interest in debates and contributions during in-class training represents a sign of dedication (weighted value 4/10);
- The **Initial Status**: a symbolic weight showing the initial willingness of engagement of the municipalities has been applied taking into consideration the different starting points. Therefore, if the LA has already both plans it would score 7 out of 10 possible points, if it has one of the plans and is implementing the other one it would get 6/10 and, finally, if it is implementing one of the two plans it would get 5/10;
- The LA shows **intention on pursuing** with coaching actions (weighted value 7/10);
- Demonstrate to be **able to assign a harmonization responsible** within the organisation (weighted value 5/10);
- Has **already started** to move forward harmonizing actions (weighted value 9/10);
- Political Engagement** (expression of interest): As an optional deliverable during applications stages, LAs which prepared and forwarded to the team an expression of interest on behalf of councillors or council would initially prove an important engagement to fulfil the SIMPLA project (weighted value 10/10).

As a result, the LAs of Leon, Benidorm, San Sebastian, Cordoba and the municipal association of Cinca Medio (on behalf of the municipality of Monzon), were selected to receive a **dedicated coaching action**.

As a remarkable experience during the application of the spatial plans harmonization process, the industrial town of Monzon, representing the municipal association of Cinca Medio, embarked on the implementation of its first SECAP and first SUMP, fully harmonized. Therefore, the case of Cinca Medio has been **highlighted** as an example deserved to be explained since the harmonization is contemplated since the early stage of both plans.

Prior to formalization of this decision, the councillor and the technical officer from the Department of Environment of Monzon, trainees during the capacity-building programme, understood the advantages of the harmonization, especially in

terms of effectiveness and cost-efficiency. Furthermore, as a LA that had not yet implemented any mobility or energy plan, the trainees were well prepared towards **jumping to an advanced stage**, correcting their delays by learning from a decade of experiences on pros and cons during the implementation of both plans in other participant

municipalities. Consequently, the municipality initiated the bidding for a harmonized SECAP and SUMP development in October 2017 and, four months later, the coaching formerly started by initiating the process. The harmonization team was assigned and the political commitment signed. Fig. 2 represents the 4 steps the harmonization cycle is based on.

TABLE I
MULTI-CRITERIA TABLE FOR SELECTION OF LAS

Represent (a)	General engagement (b)	Initial Status (c)	Intention (d)	Harmonization. team (e)	Already started (f)	Political engagement (g)	Score	Ranking	
Le	10	4	6	7	5	9	10	51	2 nd
Tr	10	4	7	-	5	-	-	26	9 th
Be	10	4	7	7	5	9	10	52	1 st
Ss	10	4	7	-	5	9	10	45	3 rd
Ho	10	4	6	7	-	-	-	30	6 th
Co	-	4	7	7	5	9	10	40	4 th
Ca	-	-	7	-	5	-	-	12	10 th
Lo	-	-	7	-	5	-	-	12	10 th
Ec	10	4	6	7	5	-	10	30	6 th
La	-	4	-	-	-	-	-	4	13 th
Mz	10	4	5	7	5	9	-	40	4 th
Zg	10	4	6	7	-	-	-	27	7 th
Hu	-	-	5	-	-	-	-	5	12 th

IV. RESULTS

Following the initiation of the harmonization process, a five-hour session as a part of the initial assessment meeting was held on 23rd March 2018 (Fig. 3).

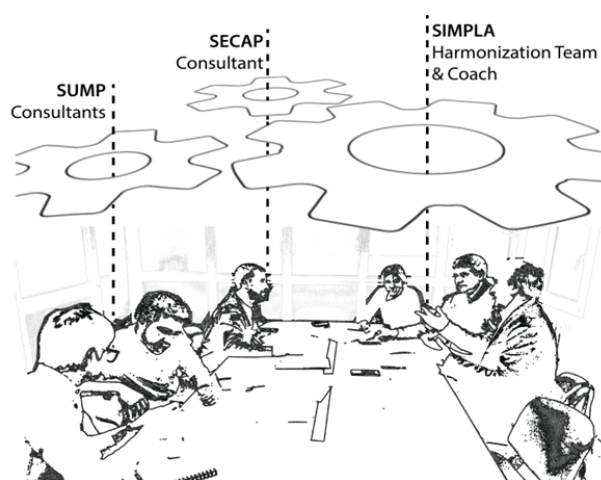


Fig. 3 Schema of harmonization represented by the stakeholders during the initial assessment meeting

The stakeholders who participated in the working session were divided in 4 main groups:

- SUMP consultants:** 2 experts in sustainable mobility plans development to assess the main objectives and initiatives to be considered during the elaboration of the plan.
- SECAP consultants:** 2 experts in sustainable energy plans development to initiate together with the municipality the action plan as well as to integrate

additional information to be explored during the diagnosis.

- The Harmonization Team:** Composed by 3 members including 1 technical officer (acting as general coordinator), the councilor in environment (who is also president of the municipal association of Cinca Medio) and an external coach provided by the SIMPLA project. A technician from the Spanish technical partner, Fundación CIRCE assumed the role of external coach, accompanied the process, and guaranteed the correct interpretation of the Guidelines.
- Municipality technicians:** The abovementioned groups were assisted by 2 assigned architects and 1 energy engineer.

The five-hour session was divided into three sections:

During the first section, SUMP and SECAP consultants met with the Harmonization Team and were accompanied by the energy engineer. After a brief introduction on the purpose of the meeting and the harmonization, the initial topic was to address the needs of the SECAP. For this purpose, a list of representative municipal buildings was provided. The first part concluded with the recommendation from the harmonization team, of setting 2030 as a horizon, not only for the SECAP, but also as a long-term horizon for the SUMP.

During the second section, the municipal architects supplanted the engineer to put on the table the initiatives the municipality has been planned in terms of accessibility, parking and urban expansion specially. The harmonization team ensured that the information as a digital map was delivered to both SECAP and SUMP team, in order to localize the places where the interventions will be planned.

Finally, the end of the session was dedicated to set the principles in which the harmonization of both plans will be

set. Regarding **data collection and sharing**, discussions revolved around the available methods, opting for an indexed cloud storage system to be initiated by the harmonization team. A first draft of a **monitoring plan** was also designed; taking advantage of the fact that the three parties could easily check their availabilities and possibilities to join forces in **simultaneous tasks**.

This section also focused on designing the first draft of the **participatory process** the municipality would hold. This, by gathering the potential questions both SUMP and SECAP consultants found it very interesting to collect relevant information and proposals from the citizens themselves.

After the session, officers demonstrated to be satisfied with the process noticing a previous lack of knowledge of both the development of the municipal mobility and energy plan and their similarities in terms of targets and goals. Last but not the least; officers recognized the methodology applied in the initial assessment to be efficient.

Table II contains the timeline of the monitoring plan as a Gantt chart including the next steps regarding coordinated actions, collection of data for indicators (as a part of the monitoring process) and final revision of the plan with the stakeholders prior to develop the harmonization report as well as the SECAP and SUMP following the SIMPLA guidelines.

TABLE II
 MONITORING PLAN OF THE HARMONIZATION

	jan.	feb.	march	april	may	june	july	aug.	sep.	oct.	nov.	dec.
1. Initiation												
Political commitment												
Harmonization team												
2. Planning												
Initial evaluation												
Involv. stakeholders												
Definition of workplan												
3. Implementation												
Harmoniz. of vision												
Data sharing/collection												
Harmoniz. ref. years												
Harmoniz. of actions												
Harmoniz. of monit syst												
4. Monitoring												
Progress harmonization												
Harmonization report												

The role of the responsible of harmonization, during the session, as a **coordinator** able to maintain good communication and collaboration between different municipality's departments and stakeholders [9] has been an asset.

V. DISCUSSION

Assessment meetings under the coordination of the harmonization team proved to be **beneficial** to the three parties (SUMP, SECAP and LA) detecting complementarities and matching potential nexus of intervention. For example, during the initial assessment meeting, the SUMP team highlighted the complementarity of public lighting and the indicator of safety as an incentive to boost on-foot mobility, in some specific areas of the city.

It is worth noting that in further essays, the selected criteria used in the multi-criteria analysis (including some modifications) as well as the calculation method by weight could be taken into consideration in two ways. On the one hand, it could serve as a sort of self-evaluation from the LA willing to initiate the harmonization process of spatial plans (energy and mobility or any other potential combination). On the other hand, it could be used as an initial status of a group of LAs (by region or state) to study the feasibility on how

promising the development of a harmonization process actually is.

This paper invites readers to develop further examples on the harmonization or any related methodology to better implement related spatial plans. The smart integration of relevant stakeholders in the process is a must and could be further developed. As a potential risk, stakeholder requirements and expectations at the individual level cannot be fully identified upfront and therefore the number of stakeholders involved might increase over the progression of the project. This means that new needs may come up; the stakeholders may come up with new demands and new goals while the project is under development [10].

VI. CONCLUSIONS

The harmonization of energy and mobility planning was recognized as a **need** in all project countries. In light of this, many of the involved LAs expressed their interest in pursuing along the SIMPLA path to harmonization, beyond the coaching phase.

The methodology described in the Guidelines is evolving since the practical implementation of the harmonization is taking place in an initial stage of 30 LAs. They demonstrate to work differently depending on their size and organization. The

gathering of the harmonization implementation in each case would therefore enhance the adaptability of the Guidelines to any specific case.

In the case of implementation in Cinca Medio, it can be highlighted that the initial assessment task has been a key factor to facilitate the smooth running of the project since important main stakeholders set up the harmonized information basis of both plans. It was integrated with the other actions and initiatives of the relevant municipality departments, and it must be ensured that it becomes part of the overall planning of the LA. Multi-departmental and cross-sectorial involvement is required, with organisational targets in line [11].

SIMPLA's methodology has been applied in a case study, providing a broad range of tools to achieve the harmonization of mobility and energy plans. For LAs it was rewarding to gain capabilities in finding potential axes of collaboration within other departments from their own organization. Overall, the Guidelines provided answers of some of the participating LAs officers on how to efficiently answer established EU targets on environment. These results invite to find opportunities for a potential replication on a wider scale, considering different topics such as water management, waste, and air quality and in more than two combination, setting up specific methodologies and recommendations to this effect.

In conclusion, SIMPLA methodology has proven to be effective in helping local administrations facing complex sustainable development targets, integrating the activities of different city departments working in different disciplines.

ACKNOWLEDGMENTS

This contribution has been developed in the framework of the SIMPLA project 'Sustainable Integrated Multi-sector PLanning', funded by the European Union's Horizon 2020 research and innovation programme under grant agreement N.695955. <http://www.simpla-project.eu>.

REFERENCES

- [1] Quick Reference Guide Monitoring SECAP implementation. Covenant of Mayors for Climate & Energy
- [2] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Action Plan on Urban Mobility {SEC(2009) 1211} {SEC(2009) 1212} /* COM/2009/0490 final */
- [3] WHITE PAPER Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system/* COM/2011/0144 final */
- [4] Action Plan on Urban Mobility – State of Play. European Commission Directorate-General For Mobility And Transport. Brussels, February 2012.
- [5] Giulia Melica, Paolo Bertoldi, Albana Kona, Andreea Iancu, Silvia Rivas, Paolo Zancanella. Multilevel governance of sustainable energy policies: The role of regions and provinces to support the participation of small local authorities in the Covenant of Mayors. Sustainable Cities and Society Volume 39, May 2018, Pages 729-739.
- [6] Anthony D. May. Encouraging good practice in the development of Sustainable Urban Mobility Plans. Case Studies on Transport Policy.
- [7] Fresner J., Krenn C., Morea F., Mercatelli L., Alessandrini S., (2017). Guidelines for the harmonization of energy and mobility planning. (STENUM GmbH, Austria, AREA Science Park, Italy).
- [8] Online Observatory of the H2020 SIMPLA project (<http://www.simpla-project.eu/en/guidelines/>).
- [9] Eurico Vasco Amorim. Sustainable energy action plans: project management intercomparison. - *Procedia Technology* 16 (2014) 1183 – 1189
- [10] Johansen, A., Eik-Andresen, P., & Ekambaram, A., 2014. Stakeholder Benefit Assessment – Project Success through Management of Stakeholders. *Procedia - Social and Behavioral Sciences*, 119 (1877), pp581–590.
- [11] Oliver-Solà, J., Armero, M., de Foix, B. M., & Rieradevall, J. , 2013. Energy and environmental evaluation of municipal facilities: Case study in the province of Barcelona. *Energy Policy*, 61, pp920-930.