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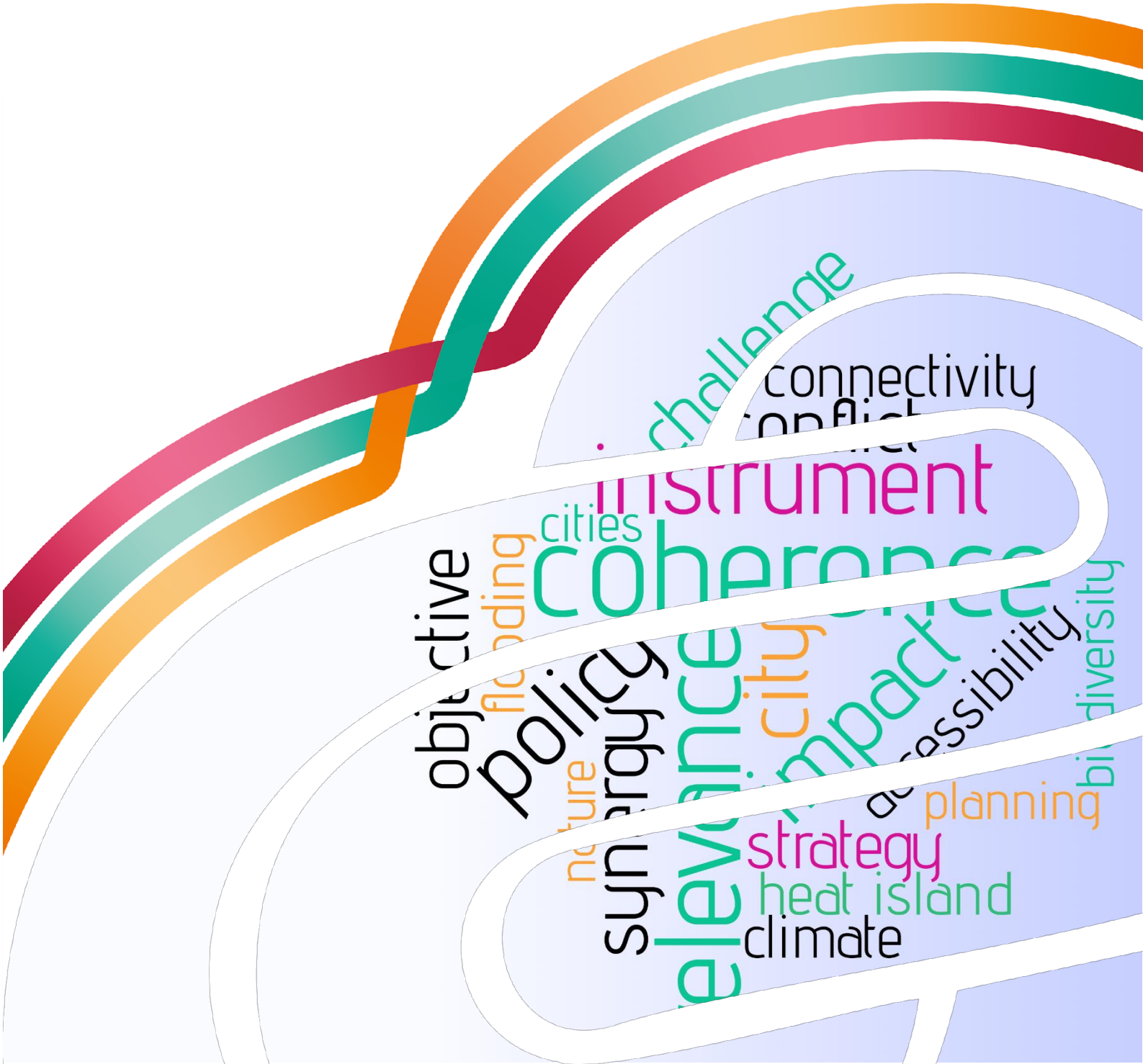
# Policy Coherence Analysis Report

## Summary of Policy Coherence and Relevance Analysis for Six INTERLACE Cities



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# 1.Executive Summary

To get a better understanding to what extent a policy mix, or set of policy instruments, is effective in tackling key city challenges (e.g., the reduction of heat island effects, access to green areas or ecological connectivity), a policy coherence analysis is helpful. Policy coherence is referring here to how effectively different policies and policy instruments work together regarding a range of challenges or objectives, particularly when they are under the responsibility of different city departments.

This report summarizes a coherence and impact analysis of policy instruments conducted in three European and three Latin-American cities or urban areas: Granollers (Spain), Chemnitz (Germany), Kraków (Poland), CBIMA (Costa Rica), Envigado (Colombia) and Portoviejo (Ecuador). The overall objective was to determine for each city, which policy instruments had the main impacts (negative or positive) on the city challenges and how well they operated together in achieving these challenges. In addition to this overall objective and based on expressed city needs, the respective policy coherence analyses focused on aspects of policy coherence that were relevant to their specific contexts (e.g., coherence of policy instruments under development versus implemented ones, exemplary synergies between policy instruments, etc.).

The policy coherence analysis was done using the PolCA method (Mortelmans et al, 2021) and is based on a series of policy coherence matrices that were filled in by policy experts from the respective city administrations. The PolCA method aims to capture local knowledge and expertise about policy instrument implementation and bring it together in a format suitable to support discussions between decision makers from different sectors. At the same time, it aims to form a common reference for further discussions on policy instrument efficacy.

For each city, a list of key policy instruments and their impacts on the respective city challenges is provided, together with an overview of synergies and conflicts between these instruments. Knowledge gaps are systematically identified to allow, where needed, prioritization of further research needs on highly relevant impacts or synergies for the respective cities.

The results show a few very strong synergetic policy instruments that could form potential inspiring examples of coherent policy mixes. There are also numerous policy instruments with neutral impacts on city challenges, suggesting that some city challenges are insufficiently addressed at this stage. Overall, it is remarkable that only few policy instruments had negative impacts or were strongly conflicting with each other. The latter may result from the fact that respondents all belonged to city administrations. By expanding this analysis to a larger group of stakeholders, more contrasting results may yet appear.

Together with a governance assessment carried out in parallel to this coherence analysis (Deliverable 2.2), these reports aim to provide a better understanding of successful governance practices and effective policy instrument combinations to address the cities' challenges. They further provide assistance in the co-production of local governance solutions to be carried out in each INTERLACE city.

# 2.Introduction

This report was written as part of the INTERLACE project which aims to empower and equip European and CELAC cities to effectively restore and rehabilitate (peri)urban ecosystems towards more liveable, resilient and inclusive cities. To this end to projects builds on six city case studies. Three of them are located in Europe: Chemnitz (Germany), Granollers (Spain) and Kraków Metropolis (Poland); and three in the CELAC region CBIMA (Costa-Rica), Envigado (Colombia) and Portoviejo (Ecuador).

The report presents an overview of the policy impact and coherence of existing policy instruments in the six INTERLACE cities with regards to each city's outlined challenges (Knoblauch et al, 2021). The policy impact and coherence analysis that led this overview was tailored towards city needs and aims to support local decision-makers in discussing how well current policy instruments perform together towards addressing their city challenges. Also, it aims to help them to detect where successful examples of successful policy instrument synergies could be replicated or where interventions may be advisable due to conflicting instruments or low positive impacts on city challenges. These interventions may be directed at improving efficacy and synergies or remove or reduce the effect of counterproductive policy instruments.

The results of an expert-based policy coherence analysis using the Policy Coherence Analysis (PolCA) method address following objectives (Mortelmans et al, 2021):

- Get a tangible (quantified) overview how policy instruments in a given area interact with each other.
- Systematically identify conflicts and synergies between policy instruments and set the basis for further integration of policy objectives at a strategic level.
- Render the complexity and relevance of policies and policy instrument interactions in a format fit for discussion with policymakers and other key stakeholders in a relatively quick manner.
- Provide the means to focus decision maker efforts on critical conflicts and potentially (more) readily achievable win-wins.
- Assess how well a set of policies and policy instruments perform in regard to a set of local or supra-local societal needs, challenges and/or objectives.
- Identify knowledge gaps on policy interactions and impacts.
- Co-create a shared knowledge base that can act as a reference frame in participative decision-making processes.

In parallel to the policy coherence analysis, a governance assessment (Deliverable 2.2) has been conducted, focusing on current good governance practices, challenges, and knowledge gaps in the six INTERLACE cities. Together, the outcomes of these two processes aim to provide a better understanding of successful governance practices and effective policy instrument combinations to address the INTERLACE cities' challenges and support the co-production of local governance solutions.

# 3.About the Policy Coherence approach

## 3.1. Why analyse policy coherence?

When is an analysis of policy coherence useful and why did we choose to apply it in INTERLACE? Strategic planning and implementation of socio-economical, environmental and climate objectives in urban settings requires considerable resources and concerted action at multiple scales involving a large number of stakeholders and institutions, with often conflicting objectives, perceptions, and expectations. It is therefore difficult, if not in many cases impossible, for a single decision-making institution to obtain a comprehensive overview of the impact of policy instruments on environment and climate related challenges. This lack of overview often leads to highly complex, resource- intensive and rather ineffective meetings between policymakers and stakeholders to reach agreed decisions and action plans. A policy coherence analysis provides the means to address this lack of overview by creating a common reference and knowledge base for conducting discussions.

## 3.2. What is policy coherence?

Policy coherence is understood as an "*attribute of policy that systematically reduces conflicts and promotes synergies between and within different policy areas to achieve the outcomes associated with jointly agreed policy objectives*" (Nilsson et al, 2012). Said differently, policy coherence is essentially referring to how effectively different policies and policy instruments work together regarding a range of challenges or objectives, particularly when they are in the responsibility of different departments.

Policy coherence can be analysed at three levels: 1) vertically (e.g. between EU policies and Member State policies), 2) horizontally (between several policy sectors at the same level or scale) or 3) internally (within the same policy sector). Table 1 provides examples of horizontal and vertical policy coherence.

**Table 1**: Examples of policy coherence levels (adapted from Nilsson et al, 2012)

| Horizontal | Vertical |
|---|---|
| City level climate change mitigation policy in relation to city level air pollution policy | National climate change policy in relation to city level climate change policy |
| City level employment policy in relation to city level urban agriculture policy | National agriculture policy in relation to city level urban agricultural policy |
| City level transport access policy in relation to city level air pollution policy | National transport policy with city level air pollution policy |
| City level water quality regulation policy in relation to local policies for soft recreation activities | International water quality policies (e.g. Water Framework Directive in EU) with city level water quality regulations |

For the purpose of this study, we have focussed mostly on the horizontal level, which is the city level for

the INTERLACE project. However, we also considered regional or national policy instruments when they had clear impacts on the challenges at city level.

## 3.3. How did we analyse policy coherence?

To conduct a policy coherence analysis, we used the PolCA methodology (Mortelmans et al, 2021) and applied it to the INTERLACE context (see Figure 1). The PolCA method recognises the complexity of local urban governance processes and the numerous and complex interactions between policy instruments. It draws on local expertise, knowledge, and experiences in a comprehensive way (e.g. using quantitative data and summary figures) rather than focusing on an in-depth study (e.g. qualitative and descriptive study).

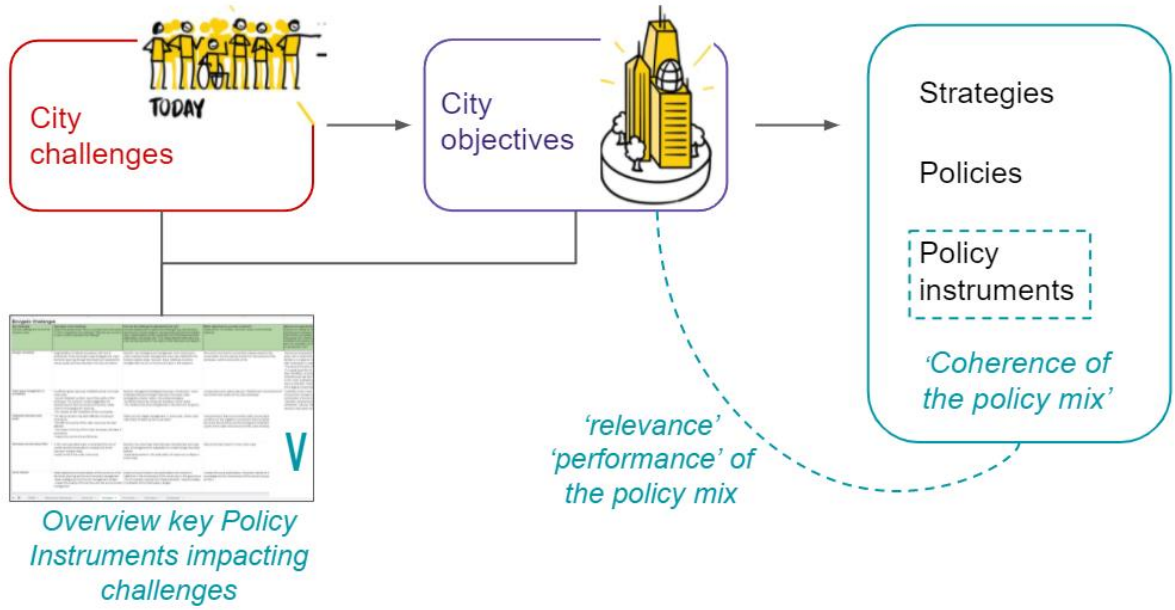


**Figure 1**: Steps to conduct the PolCA in INTERLACE

As a first step, the respective city challenges and objectives were identified together with the INTERLACE city representatives. From these challenges, a list of key policy instruments was derived. Each instrument was selected based on the importance of its perceived impact (positive or negative) to address the city challenges, but also based on city preferences for the scope of the analysis. To achieve the latter, consultations were conducted with city representatives to define a scope tailored to their interests, ranging for example from a focussed analysis on a recently implemented policy instrument to see how well it performs regarding to other policy instruments that are already well implemented, to a broader analysis about the impact and coherence of a larger set of policy instruments on all the identified city challenges identified for a given city.

Based on the selected city challenges and policy instruments, a policy matrix (Figure 2) was drawn up and circulated among local policy experts from the respective city administrations. To ensure that enough expertise was mobilized, at least one expert for each policy instrument was identified, with a total minimum of six respondents per city.

| SCORE | Negative impac | -3 | -2 | -1 | 0 | 1 | 2 | 3 | Positive impact | Conflict | -3 | -2 | -1 | 0 | 1 | 2 | 3 | Synergy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ? | I don't know | | | | | | | | ? | I don't know | | | | | | | |
| **Policy Instruments that have an impact on selected city challenges** | IMPACT ON: | | | | | | | | | Coherence between instruments: conflicts and synergies | | | | | | | | |
| | **Potenciar la reutilització de l'aigua** (promote water reutilization) | | **Reduir el risc de sequera** (reduce drought risk) | | **Reduir el risc d'inundacions** (reduce flood risk) | | **Promoure la reconnexió de la gent amb la natura** (promote people's reconnection with nature) | | **Potenciar l'educació ambiental** (enhance environmental education) | | **Promoure la connectivitat ecològica** (promote ecological connectivity) | | **Potenciar la naturalització dels espais verds** (foster the naturalization of green areas) | | **Promoure l'agricultura sostenible** (promote sustainable agriculture) | | **Potenciar l'economia social i solidària** (enhance the social and solidarity economy) | | Pla especial de protecció i gestió del patrimoni natural 2004 (Protection and management plan of the natural heritage 2004) | Pla Director del Verd Urbà de Granollers 2020 (Director plan of Green Areas, 2020) | Palou 2025 - Pla Estratègic de Palou, 2018 (Strategic agro-urban project for the Palou plain, 2018) | Pla d'Ordenació Urbanística Municipal 2006 (Municipal Urban Development Plan, 2006) | Programa d'Actuació Municipal | Acord de Govern GOV/150/2014, de declaració de zones especials de conservació de la regió biogeogràfica mediterrània integrants de la Xarxa Natura 2000, i | Ordenança municipal d'estalvi d'aigua (Water saving municipal ordinance) |
| Pla especial de protecció i gestió del patrimoni natural 2004 (Protection and management plan of the natural heritage 2004) | 1 | 2 | -1 | 2 | 1 | 2 | -1 | 2 | 1 | 2 | -1 | 2 | 1 | 2 | -1 | 2 | 2 | 0 | | 0 0 | 1 1 | 1 1 | 1 3 | -2 -2 | 0 0 |
| Pla Director del Verd Urbà de Granollers 2020 (Director plan of Green Areas, 2020) | 0 | 0 | 3 | -2 | 0 | 0 | 3 | -2 | 0 | 0 | 3 | -2 | 0 | 0 | 3 | -2 | 0 | 0 | | | 0 3 | 0 3 | -2 2 | 2 3 | 0 3 |
| Palou 2025 - Pla Estratègic de Palou, 2018 (Strategic agro-urban project for the Palou plain, 2018) | 1 | 3 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | -3 | | | | 2 3 | -1 0 | -1 -1 | 1 3 |
| Pla d'Ordenació Urbanística Municipal 2006 (Municipal Urban Development Plan, 2006) | -1 | 2 | 1 | 3 | -1 | 2 | 1 | 3 | -1 | 2 | 1 | 3 | -1 | 2 | 1 | 3 | -2 | 0 | | | | | 0 1 | 2 2 | 2 2 |
| Programa d'Actuació Municipal | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 0 | | | | | | 0 3 | 0 0 |
| Acord de Govern GOV/150/2014, de declaració de zones especials de conservació de la regió biogeogràfica mediterrània integrants de la Xarxa Natura 2000, i que aprova els seus Instruments de gestió | 1 | 2 | 0 | 2 | 1 | 2 | 0 | 2 | 1 | 2 | 0 | 2 | 1 | 2 | 0 | 2 | 1 | 1 | | | | | | | -3 -3 |
| Ordenança municipal d'estalvi d'aigua (Water saving municipal ordinance) | -2 | -2 | -3 | 1 | -2 | -2 | -3 | 1 | -2 | -2 | -3 | 1 | -2 | -2 | -3 | 1 | 0 | 2 | | | | | | | |

**Figure 2**: Example of a policy coherence matrix

Each respondent was given the option to score between a strongly negative impact (-3) and strongly positive impact (+3) to estimate the impact of the policy instruments on the challenges and a strongly negative conflict (-3) and a strongly positive synergy (+3) to estimate the coherence between the policy instruments. When respondents did not know the impact or coherence, they could put a question mark instead. Since each policy instrument can have a positive and negative impacts on a city challenge because of varying contexts within the same city, the matrix provided respondents with the option to fill in the most positive and most negative impacts. Therefore, it contained two cells for each impact.

The following section summarizes the analysis of these matrices. For each INTERLACE city we provide a list of the selected policy instruments and city challenges, an overview of the impact of these policy instruments on the city challenges and potential knowledge gaps on these impacts, and finally an overview of the policy coherence and potential knowledge gaps about the policy coherence.

# 4.Granollers

## 4.1. Policy instruments

The impact of seven policy instruments (Table 2) on nine city challenges (Table 3) were evaluated by seven field experts in Granollers. For each of the instruments policy experts have been selected that have operational knowledge of their implementation. Their respective names have been kept anonymous.

**Table 2**: List of policy instruments selected for Granollers

| Policy Instrument | Description |
|---|---|
| Pla especial de protecció i gestió del patrimoni natural 2004 *Protection and management plan of the natural heritage 2004* | Objective(s): conservation of 17 natural areas of local interest and implementation of management tools<br>Operational level: city |
| Pla Director del Verd Urbà de Granollers 2020 *Director plan of Green Areas, 2020* | Objective(s): planning and management tool for the improvement of the public urban green<br>Operational level: city |
| Palou 2025 - Pla Estratègic de Palou, 2018 *Strategic agro-urban project for the Palou plain, 2018* | Objective(s): plan focusing on the agricultural sector and all related activities, but also considers other aspects such as identity, services, infrastructure, natural heritage and the natural environment for the next 10 years in the rural areas of Palou (Granollers)<br>Operational level: city |
| Pla d'Ordenació Urbanística Municipal 2012 *Municipal Urban Development Plan, 2012* | Objective(s): instrument of integral urban planning of the Granollers territory (master plan)<br>Operational level: city |
| Programa d'Actuació Municipal 2019-2023 | Objective(s): strategic plan for the sustainable development of Granollers for the achievement of the Sustainable Development Goals (SDGs), adopted by the United Nations in 2015,<br>Operational level: city |
| Acord de Govern GOV/150/2014, de declaració de zones especials de conservació de la regió biogeogràfica mediterrània integrants de la Xarxa Natura 2000, i que aprova els seus Instruments de gestió | Objective(s): creation of an ecologic network of special conservation areas according with Natura 2000 European legislation. (Government Agreement GOV / 150/2014, which declares special areas of conservation of the Mediterranean biogeographical region belonging to the Natura 2000 Network, and approval of their management instruments)<br>Operational level: regional |
| Ordenança municipal d'estalvi d'aigua Water saving municipal ordinance | Objective(s): regulate the use of water saving systems and adapt water quality to different uses (domestic, gardening ...)<br>Operational level: city |

**Table 3:** List of city challenges and policy instruments for Granollers together with the abbreviations used for the PolCA analysis

| Abbreviation | City challenge |
|---|---|
| Water re-use | Promote water reutilization |
| Drought reduc. | Reduce drought risk |
| Flood reduc. | Reduce flood risk |
| Reconnec. nature | Promote people's reconnection with nature |
| Env. Education | Enhance environmental education |
| Connectivity | Promote ecological connectivity |
| Naturalization | Foster the naturalization of green areas |
| Sust. Agri. | Promote sustainable agriculture |
| Soc. Economy | Enhance the social and solidarity economy |
| **Abbreviation** | **Policy Instrument** |
| Heritage 2004 | Protection and management plan of the natural heritage 2004 |
| Green areas 2020 | Director plan of Green Areas, 2020 |
| Palou 2018 | Strategic agro-urban project for the Palou plain, 2018 |
| Urban Dev. 2012 | Municipal Urban Development Plan, 2012 |
| Municipal 2019-2023 | Strategic plan for the sustainable development of Granollers for the achievement of the Sustainable Development Goals |
| N2000 Mediterranean | Plan for the creation of an ecologic network of special conservation areas according with Nature 2000 European legislation. |
| Water saving (Muni.) | Water saving municipal ordinance |

The results of this analysis are presented in two sections: the first relates to the respondents perceived impact of the policy instruments on the selected city challenges and the second to the respondents' perceived synergies and conflicts between the policy instruments. For each section there is a short summary on knowledge gaps identified in the responses from the experts.

## 4.2. Impact of policy instruments on city challenges

Figure 4 shows an estimation of how well the given policy mix performs regarding the city challenges. In other words, it provides an estimation of how well all the policy instruments coherently work together to address all the city challenges. This is useful to get a global picture of instrument versus challenge performance.

**Figure 4 Interpretation**: As can be seen in the figure, the policy experts indicated that the policies are having mostly neutral impact (=0) and a slightly positive impact (=1). It means that the policy instruments

are not adversely affecting the city challenges, yet there is room to improve their potential impact.

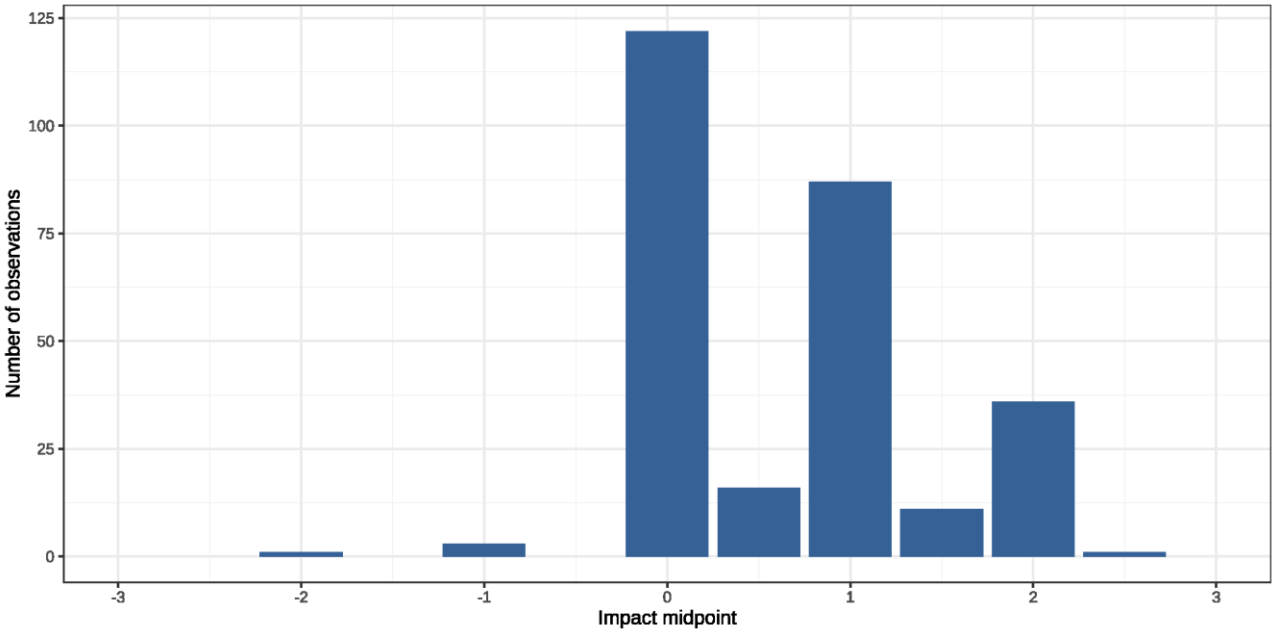


**Figure 4**: Total number of policy expert responses for each of policy instrument impacts (from -3 to +3)

Similarly to the previous figure, Figure 5 is a violin plot that shows the impact on the combined city challenges but now for each of the policy instruments separately. In other words, it provides an estimation of the performance of each policy instrument on the city challenges. It helps to distinguish which policy instruments are contributing most to a negative, neutral or positive impact.

The white tube of the violin plot contains 50% of the expert scores ($25^{th}$ to $75^{th}$ quantile) and the small blue line inside the white tube is the 'middle' value (median) of the expert scores. The blue round dots indicate the extreme highest or lowest expert scores, and the shaded blue colour in the background of the white tubes indicates the overall distribution of the expert scores.

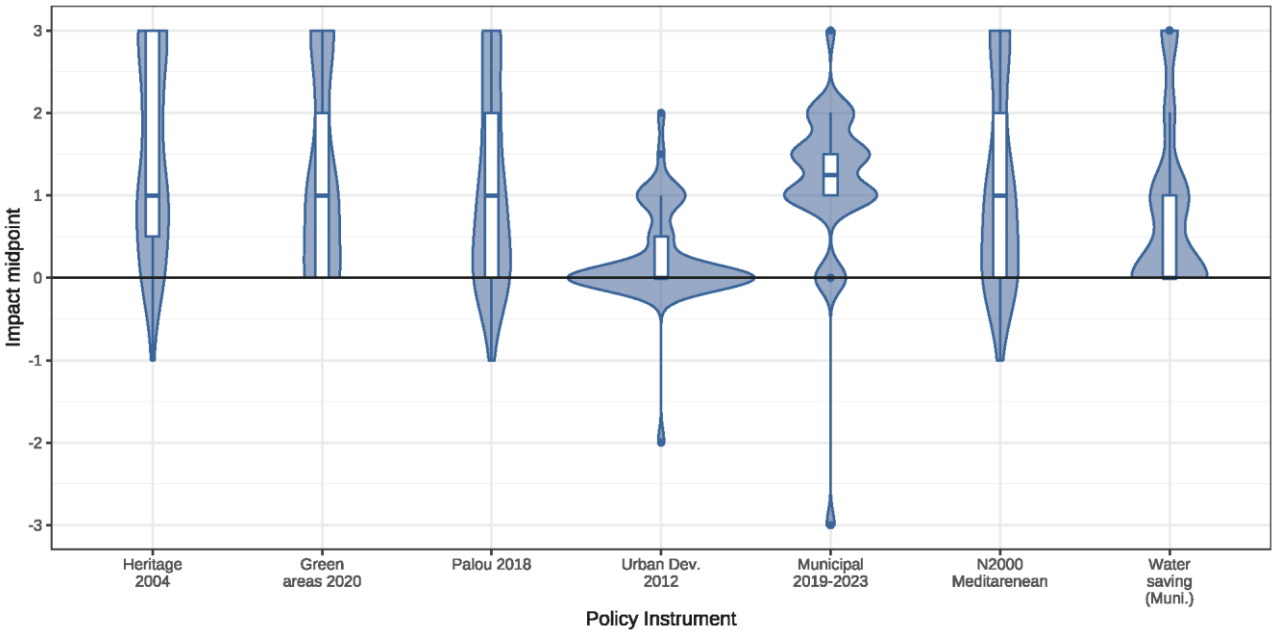


**Figure 5**: Impact of each policy instrument on the city challenges

**Interpretation Figure 5:** The figure shows that the 'urban development plan' from the municipality and the 'water saving municipal ordinance' score mostly neutrally in addressing the city challenges. The other policy instruments score slightly positive, with the 'Programa d'Actuació Municipal 2019-2023' being slightly more positive.

A few negative to very negative impacts have been reported for the 'urban development plan' from the municipality and the 'Programa d'Actuació Municipal', indicating potential undesirable impacts or diverging opinions among the policy experts.

Finally Figure 6 provides an overview of the impact of each policy instrument on each city challenge. The colour gradient illustrates whether this impact is positive (green), neutral (yellow) or negative (red). The size of the dots provides an indication about the extent to which this impact is highly reliable (bigger dots) or variable (smaller dots), for example due to different city contexts or because of different perceptions among the respondents.

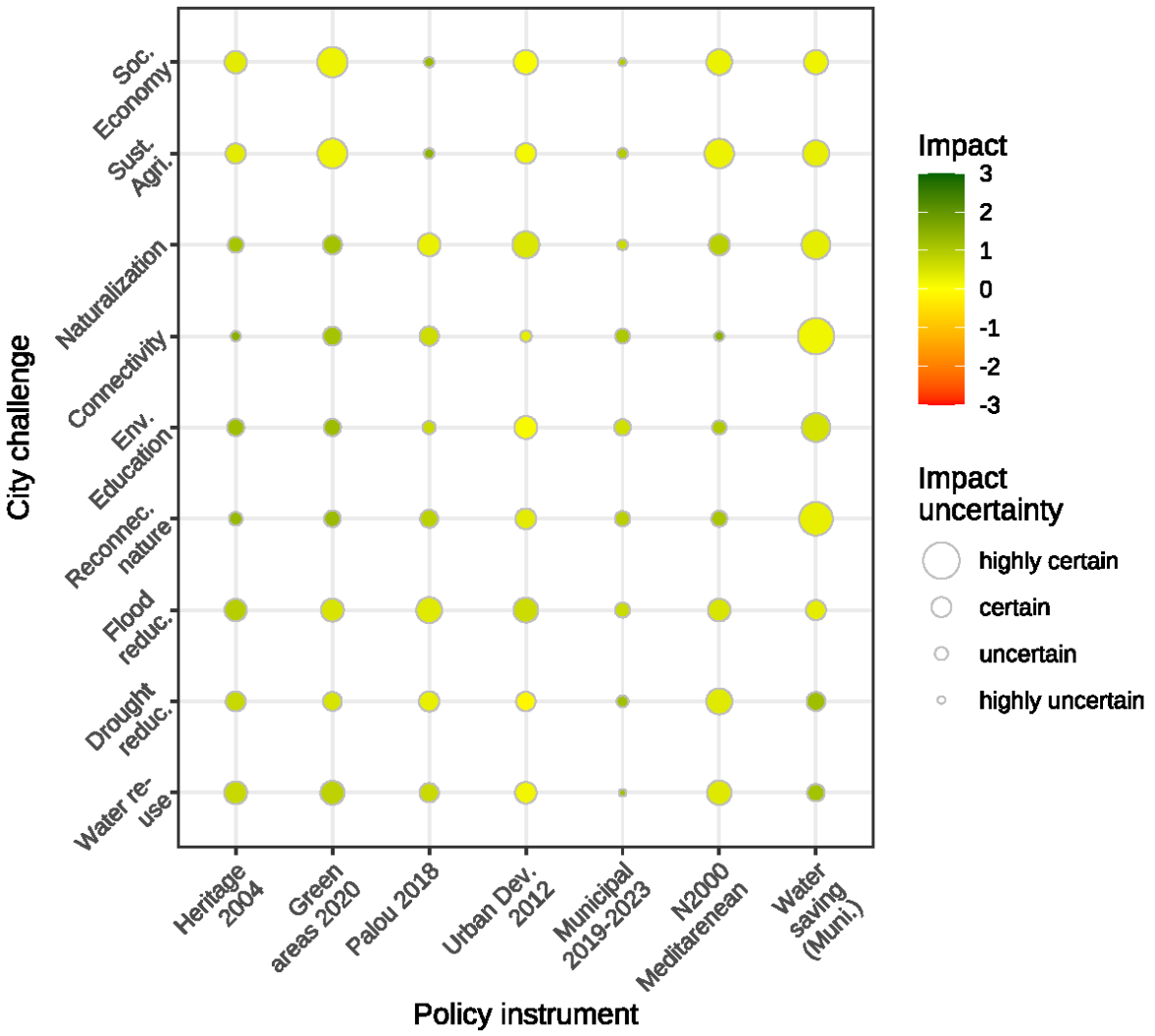


**Figure 6**: Nature (positive or negative) and reliability (certain or uncertain) of each policy instrument impact on each city challenge

In other words, Figure 6 illustrates whether the policy experts consistently indicated a given impact, or if there were variable answers. The small dots in this figure help to determine for example where follow up discussions with policy experts would be warranted to ascertain why there is no consensus among the policy experts over the impact.

Figure 6 can be read either vertically or horizontally. Vertically it provides a measure of performance for each instrument in achieving positive results for key city challenges. Horizontally it provides insights for each city challenge as to whether they are sufficiently addressed by the policy instruments. For example, a lot of neutral or negative values for a city challenge means this challenge is insufficiently addressed by these instruments or even negatively impacted by them.

**Interpretation Figure 6:**

Vertical interpretation (instruments): Overall there is no instrument that scores negatively on the city

challenges. The 'Programa d'Actuació Municipal 2019-2023' jumps out as there have been lots of variable answers provided by the experts about its impact on any of the city challenges. This can be because the impact is variable according to the context of where it has been applied in the city, or because the impact is uncertain due to a lack of knowledge or different perceptions by the experts. Additionally, some experts have reported they didn't know what the impact of this instrument was (see Figure 7 in the knowledge gap section).

The 'Protection and management plan of the natural heritage 2004' scores rather positively on most of the city challenges, albeit with some uncertainty concerning connectivity and the reconnection with nature. Nonetheless it seems to be an instrument that performs quite well across a broad range of challenges.

The 'water saving municipal ordinance' is a good example of a sectoral instrument that scores relatively well for water issues (drought reduction and water re-use) while scoring neutrally for other city challenges.

Horizontal interpretation (city challenges): The impact of the policy instruments on enhancing the social and solidarity economy is mostly neutral, indicating that this city challenge is not addressed much by any of the instruments, except for the 'strategic agro-urban project for the Palou plain'. However, the impact of this project is reported as uncertain by the experts. The same holds for the city challenge 'promotion of sustainable agriculture'.

There is also quite some uncertainty on the impact of the policy instruments on ecological connectivity, except for the 'water saving municipal ordinance' that has a highly certain neutral impact.

## 4.3. Knowledge gaps about impacts

Figure 7 provides an overview of the knowledge gaps reported by the policy experts. This figure is useful to better understand where information is missing about the impact of policy instruments on the city challenges. Dark red cells, for example, indicate that four experts have reported that they didn't know the impact of the instrument on a particular challenge. The percentages on the right and the top of the figure indicate the percentage of these missing impact scores per challenge (right side) and per instrument (on top).

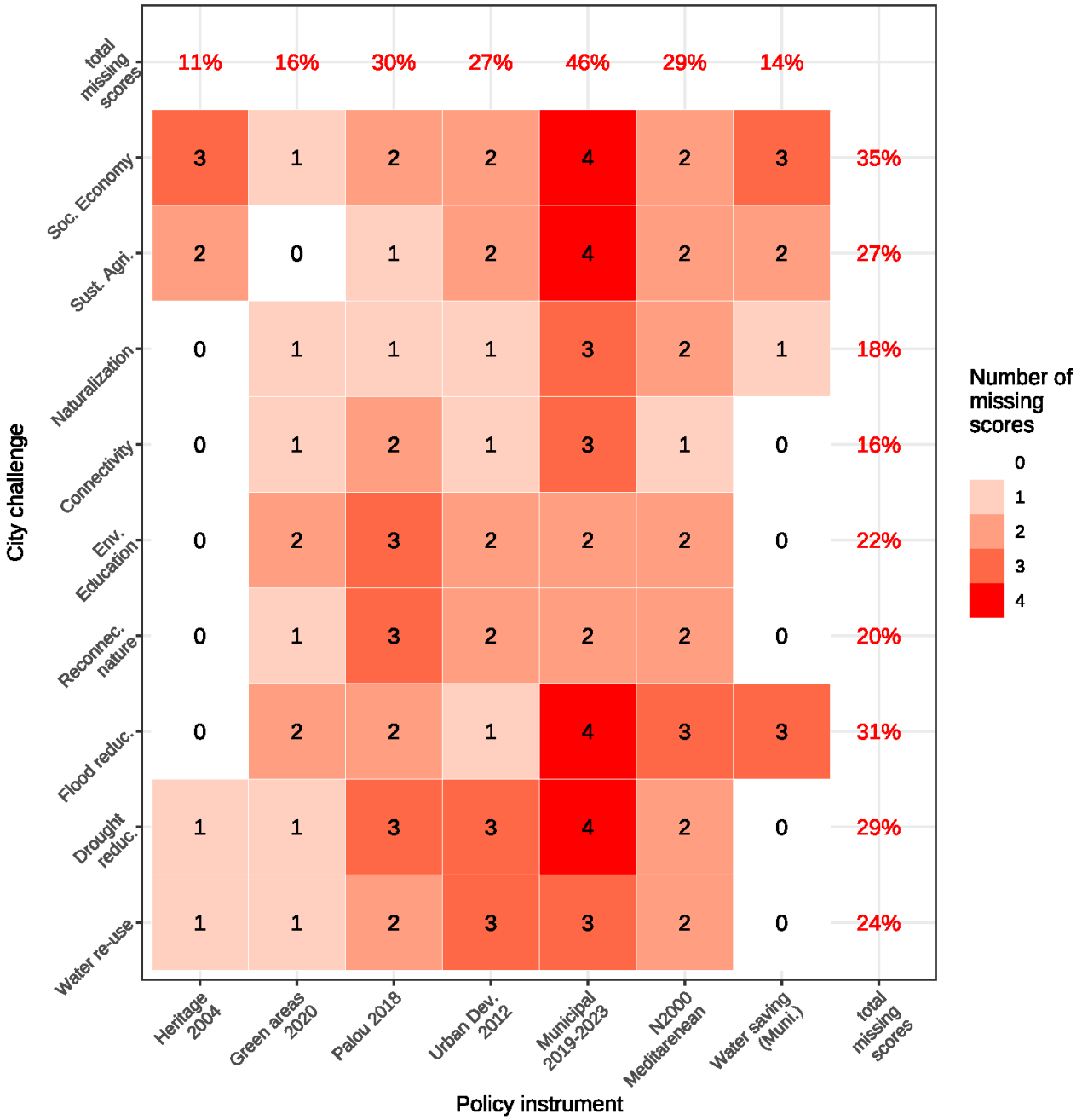


**Figure 7**: Number of missing impact scores by policy experts because they reported not to know the instrument impact on the city challenge (total number of scores: 7)

Results from this figure can be interpreted in two ways: high numbers of missing scores can be due to a lack of knowledge on actual impact and therefore warrant research to determine that impact, or they can point to the need to further pursue this analysis and therefore warrant expanding this analysis to include more experts potentially able of addressing the information gap.

**Interpretation Figure 7:** The impact of the 'Programa d'Actuació Municipal 2019-2023' on enhancing the social and solidarity economy, promoting sustainable agriculture, fostering the naturalization of green areas, ecological connectivity, reduce flood risk, reduce drought risk, and promote water reutilization is often reported as unknown by the experts (46% of the reported expert answers was 'unknown'). The impact of this instrument is therefore uncertain. It may require interviewing additional experts on this instrument or it may be due to current knowledge gaps about the impact.

Among the city challenges, the impact on the enhancement of the social and solidarity economy was missing the most scores (35%), which is still a relatively good indication of impact.

## 4.4. Coherence of policy instruments

Figure 8 shows an estimation of the coherence of the policy mix. In other words, it helps to determine if the instruments generally work well together, or alternatively if there are many conflicts. This is useful to get a global picture of policy coherence.

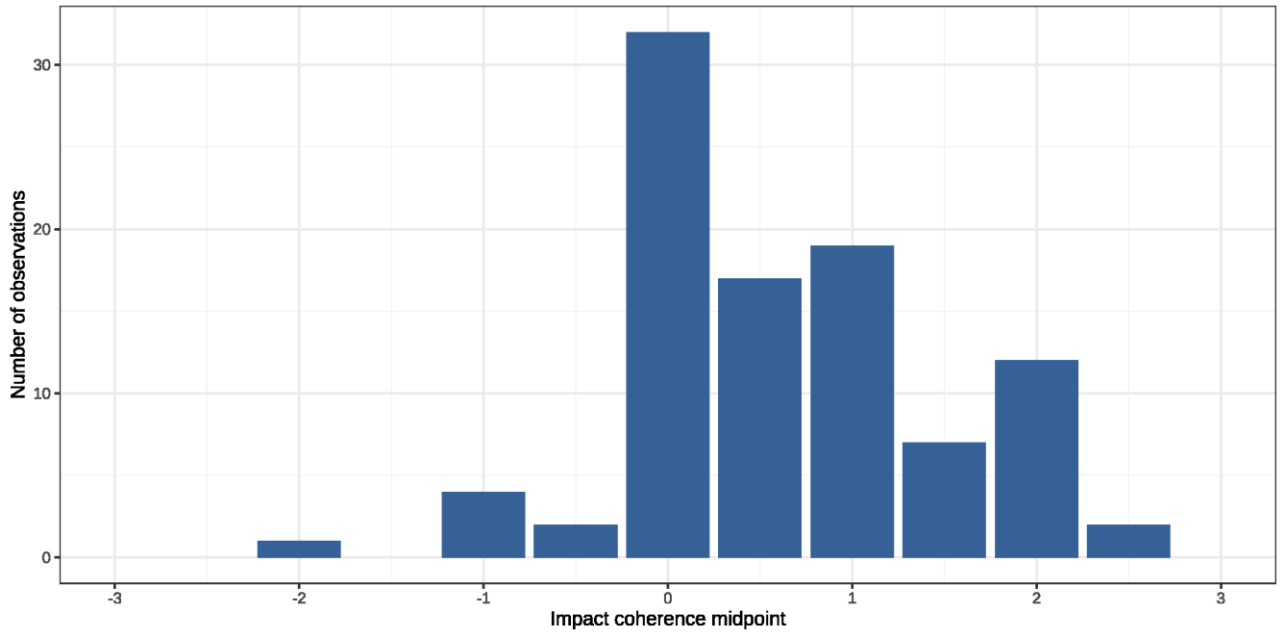


**Figure 8**: Total number of policy expert responses reporting synergies (from 0 to +3) or conflicts (from 0 to -3)

**Interpretation Figure 8:** As can be seen in the figure, the policy experts indicated that the policies are having mostly neutral coherence (=0) up to a slightly positive (=1) to positive synergies (=2). It means that

the policy instruments are generally not impacting each other a lot, and when they do, this impact is mostly synergetic. The policy mix therefore is generally quite coherent, even if there may still be room for improvements.

Figure 9 provides an overview of the synergies and conflicts for each policy instrument towards the others. The colour gradient illustrates whether the relation between two instruments is a synergy (green), neutral (yellow) or a conflict (red). The size of the dots provides an indication about the extent to which this relation is highly reliable (bigger dots) or variable (smaller dots), for example due to different city contexts or because of different perceptions among the respondents.

In other words, Figure 9 illustrates whether the policy experts consistently indicated a synergy or conflict, or if there were variable answers. The small dots in this figure help to determine for example where follow up discussions with policy experts would be warranted to ascertain why there is no consensus among the policy experts over synergies or impacts.

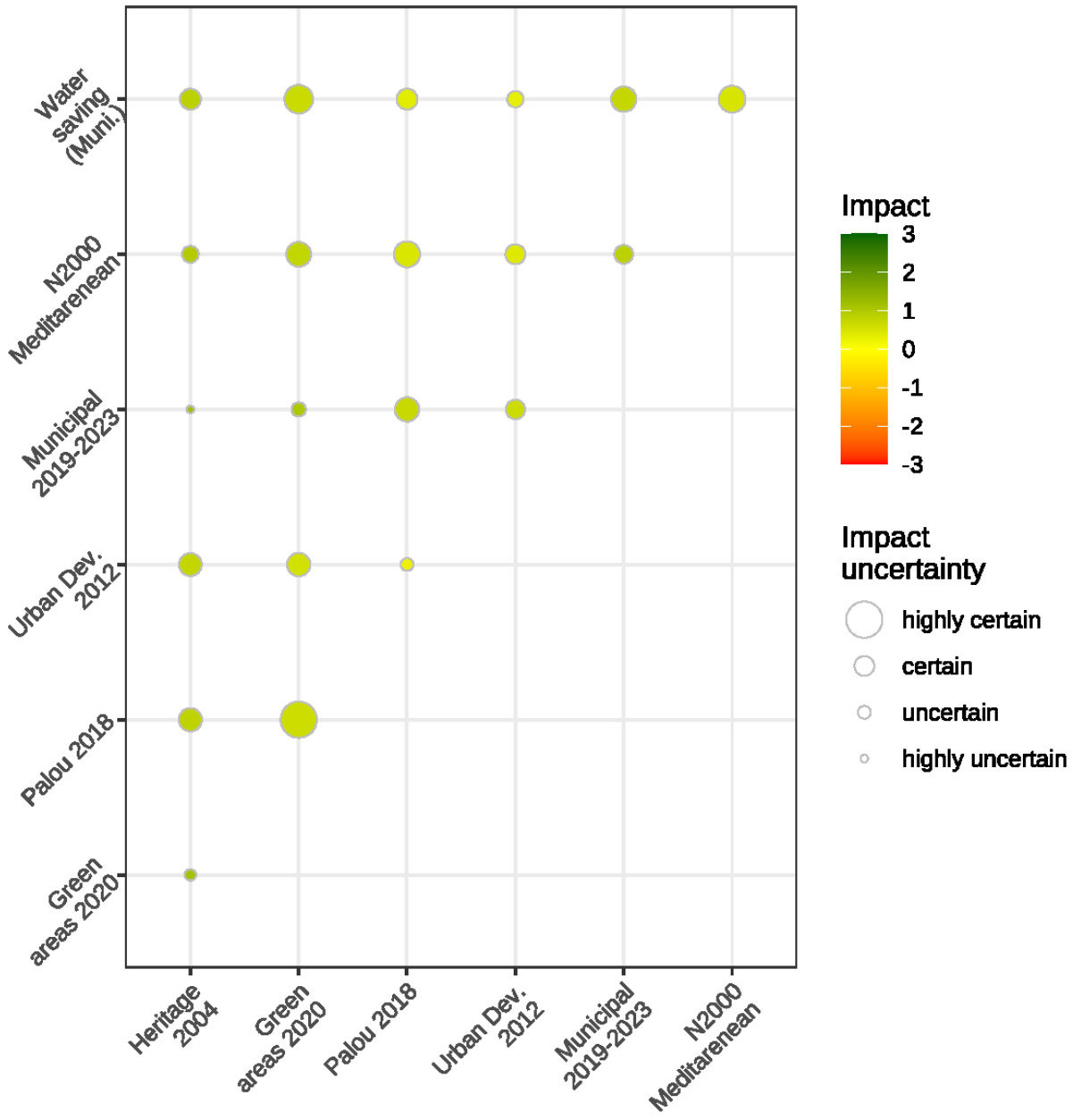


**Figure 9**: Nature (synergy or conflict) and reliability (certain or uncertain) of policy instrument' mutual relation

**Interpretation Figure 9:** Most relations between the instruments seem to be well known and are neutral or positive synergies. However, there are a few very uncertain relations especially for the 'Protection and management plan of the natural heritage' and the 'Programa d'Actuació Municipal 2019-2023'.

There is one, highly certain, positive synergy between the 'Director plan of green areas' and the 'strategic agro-urban project for the Palou plain'.

## 4.5. Knowledge gaps about coherence

Figure 10 provides an overview of the knowledge gaps reported by the policy experts. This figure is useful

to better understand where information is missing regarding policy coherence.

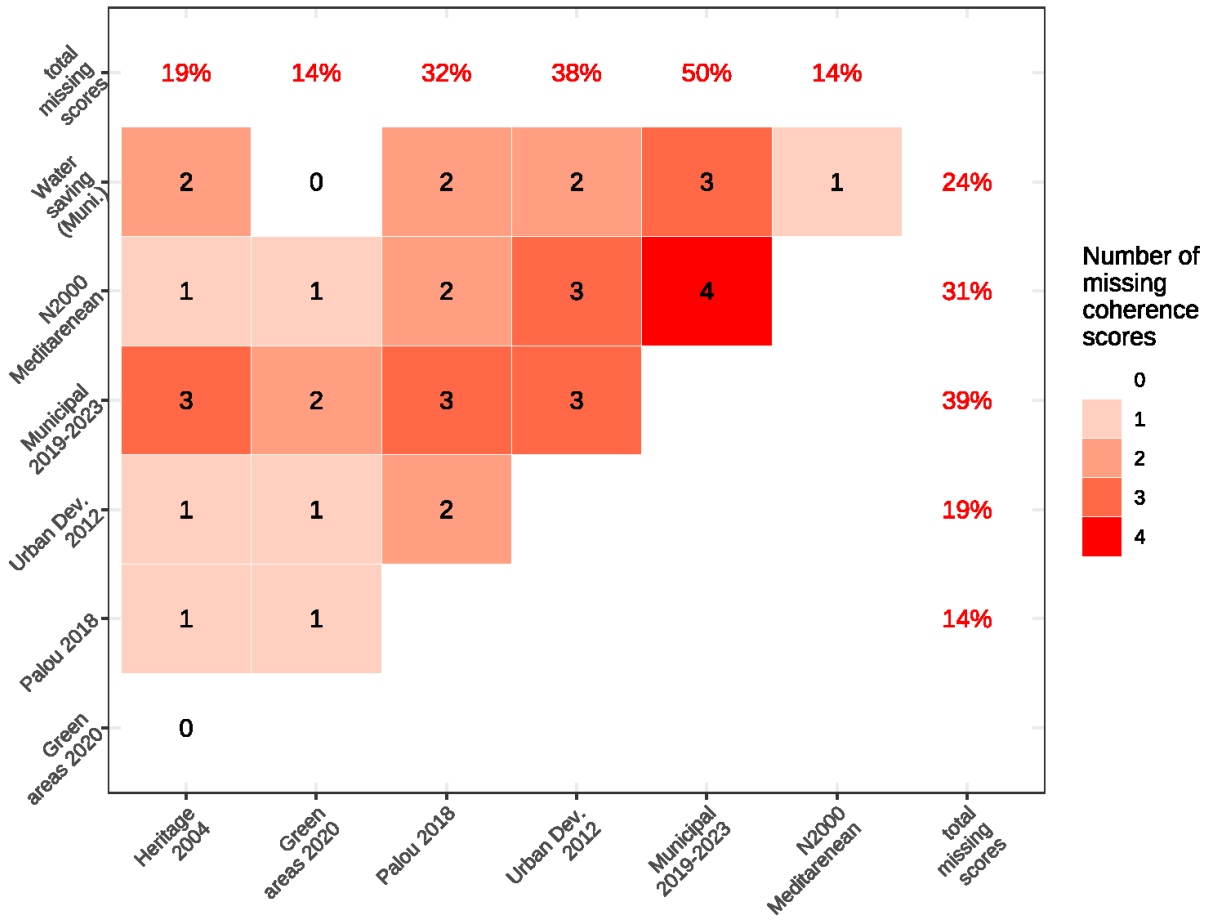


**Figure 10**: number of missing coherence scores by policy experts because they reported not to know the relation between two given instruments (total number of scores: 7)

Dark red cells, for example, indicate that four out of seven experts have reported that they didn't know the relation between two instruments.

Results from this figure can be interpreted in two ways: high numbers of missing scores can be due to a lack of knowledge on either positive or negative relations between instruments, and therefore warrant research to determine this relation; or can point to the need to further pursue this analysis and therefore warrant expanding this analysis to include more experts potentially able of addressing the information gap.

**Interpretation Figure 10:** The relation of the 'Programa d'Actuació Municipal 2019-2023' with other policy instruments is often reported as unknown by the experts. The relation of this instrument with the rest of the policy mix is therefore uncertain. It may require interview additional experts on this instrument or may be due to current knowledge gaps on how this instrument relates to the other instruments.

# 5.Kraków Metropolis

## 5.1. Policy instruments

The impact of 17 policy instruments (Table 4) on eight city challenges (Table 5) were evaluated by nine field experts from Kraków Metropolis. For each of the instruments policy experts with operational knowledge of their implementation have been selected. Their respective names have been kept anonymous.

**Table 4**: List of policy instruments selected for Kraków

| **Policy Instruments** |
|---|
| Strategia Metropolii Krakowskiej (projekt, obecnie w opracowaniu)<br>Kraków Metropolitan Area Strategy (draft, currently under development) |
| Strategia Rozwoju Województwa "Małopolska 2030"<br>Development Strategy "Małopolska 2030" |
| Strategia Rozwoju Krakowa "Tu chcę żyć. Kraków 2030"<br>Kraków Development Strategy "Here I want to live. Kraków 2030" |
| Studium Uwarunkowań i Kierunków Zagospodarowania Przestrzennego (SUiKZP) Krakowa<br>Study of Conditions and Directions for Spatial Development of Kraków |
| SUiKZP w pozostałych miastach Metropolii Krakowskiej<br>Study of Conditions and Directions for Spatial Development in the remaining cities of the Kraków Metropolis (generally as a tool, assessment of the actual impact of the provisions currently contained therein) |
| SUiKZP w gminach wiejskich Metropolii Krakowskiej<br>Study of Conditions and Directions for Spatial Development in the rural areas of the Kraków Metropolis (generally as a tool, assessment of the actual impact of the provisions currently binding in them) |
| Miejscowy Plan Zagospodarowania Przestrzennego (MPZP) Kraków<br>Local Spatial Development Plan Kraków (generally as a tool, assessment of the actual impact of the provisions currently included in them) |
| MPZP w pozostałych miastach Metropolii Krakowskiej<br>MPZP in the remaining cities of the Kraków Metropolitan Area (generally as a tool, assessment of the actual impact of the provisions currently functioning therein) |
| MPZP w gminach wiejskich Metropolii Krakowskiej<br>MPZP in the rural areas of the Kraków Metropolis (generally as a tool, assessment of the actual impact of the provisions currently functioning therein) |
| Plan Zagospodarowania Przestrzennego Województwa Małopolskiego<br>Spatial Development Plan of the Małopolska Voivodship (Region) |
| Polityka transportowa dla miasta Krakowa na lata 2016–2025<br>Transport Policy for Krakow 2016-2025 |
| Kierunki Rozwoju i Zarządzania Terenami Zielonymi w Krakowie na lata 2019-2030<br>Directions of Development and Management of Green Areas in Kraków for the years 2019-2030 |
| Powiatowy program zwiększenia lesistości miasta Krakowa na lata 2018-2040<br>District programme for increasing the forest cover of Kraków for 2018-2040 |
| Plan Adaptacji Miasta Krakowa do zmian klimatu do roku 2030 (MPA)<br>Adaptation Plan for the City of Kraków to Climate Change by 2030 (MPA) |

| |
|---|
| Program Ochrony Środowiska (POŚ) Miasta Krakowa<br>Environmental Protection Programme (POŚ) of the City of Kraków |
| Program Ochrony Środowiska POŚ w pozostałych miastach Metropolii Krakowskiej<br>Environmental Protection Programme in the remaining cities of the Kraków Metropolis (generally as a tool, to assess the actual impact of the provisions currently in place) |
| Program Ochrony Środowiska POŚ w gminach wiejskich Metropolii Krakowskiej<br>Environmental Protection Programme in the rural communes of the Kraków Metropolis (generally as a tool, assessing the actual impact of the provisions currently in place therein) |

**Table 5**: List of city challenges and policy instruments for Kraków together with the abbreviations used for the PolCA analysis

| **Abbreviation** | **City challenge** |
|---|---|
| Connectivity | The blue-green network: continuity, effective protection |
| Drought reduc. | Prevention of drought and fire risks |
| Heat Isl. | Reduction of heat waves and heat island effect |
| Flood reduc. & Infiltration | Protection against floods and flooding; increase in infiltration |
| Air quality | Improve air quality |
| Noise reduc. | Prevention of noise |
| Biodiversity | Increasing biodiversity |
| Access Nat. | Environmental education, awareness of the need to protect the biosphere |
| **Abbreviation** | **Policy instrument** |
| Str. Met. Krakowskiej | Kraków Metropolitan Area Strategy |
| Str. Rozwoju Województwa | Development Strategy "Małopolska 2030" |
| Str. Rozwoju Krakowa | Kraków Development Strategy "Here I want to live. Kraków 2030" |
| Studium Uwarunkowań | Study of Conditions and Directions for Spatial Development of Kraków |
| SUiKZP Met. Krakowskiej | Study of Conditions and Directions for Spatial Development in the remaining cities of the Kraków Metropolis |
| SUiKZP w gminach wiejskich | Study of Conditions and Directions for Spatial Development in the rural areas of the Kraków Metropolis |
| MPZP Kraków | Local Spatial Development Plan Kraków |
| MPZP w miastach | MPZP in the remaining cities of the Kraków Metropolitan Area |
| MPZP w gminach wiejskich | MPZP in the rural areas of the Kraków Metropolis |

| | |
|---|---|
| Pl. ZP Województwa Małopolskiego | Spatial Development Plan of the Małopolska Voivodship |
| Polityka transportowa Kr. (16-25) | Transport Policy for Krakow 2016-2025 |
| Terenami Zielonymi w Kr. | Directions of Development and Management of Green Areas in Kraków for the years 2019-2030 |
| Zwiększenia lesistości Kr. | District programme for increasing the forest cover of Kraków for 2018-2040 |
| Pl. zmian klimatu (MPA) | Adaptation Plan for the City of Kraków to Climate Change by 2030 (MPA) |
| POŚ Kr. | Environmental Protection Programme (POŚ) of the City of Kraków |
| POŚ w miastach | Environmental Protection Programme in the remaining cities of the Kraków Metropolis |
| POŚ w gminach wiejskich | Environmental Protection Programme in the rural communes of the Kraków Metropolis |

The results of this analysis are presented in 2 sections: the first relates to the respondents perceived impact of the policy instruments on the selected city challenges and the second to the respondents' perceived synergies and conflicts between the policy instruments. For each section there is a short summary on knowledge gaps identified in the responses from the experts.

## 5.2. Impact of policy instruments on city challenges

Figure 11 shows an estimation of how well the given policy mix performs regarding the city challenges. In other words, it provides an estimation of how well all the policy instruments coherently work together to address all the city challenges. This is useful to get a global picture of instrument versus challenge performance.

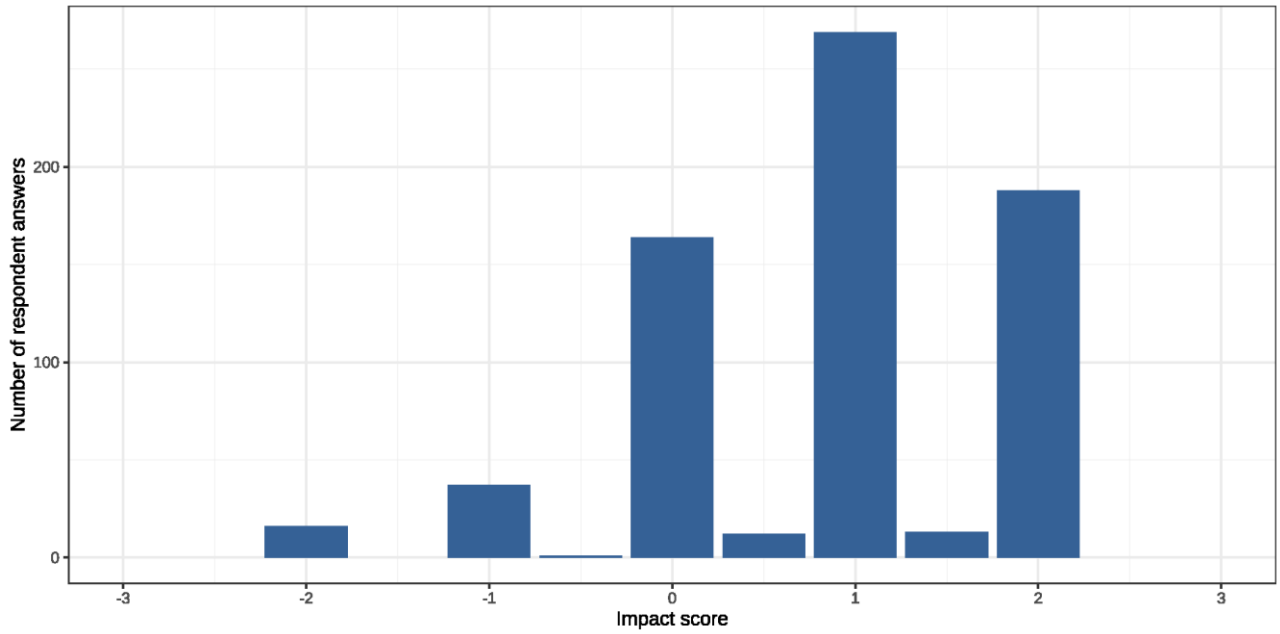


**Figure 11**: total number of policy expert responses for each of policy instrument impacts (from -3 to +3)

**Interpretation Figure 11**: As can be seen in the figure, the policy experts indicated that the policies are having mostly slightly positive (=1), to positive (=2) impact, with quite many neutral (=0) impacts. It means that the policy instruments are mostly addressing the city challenges in positive ways.

Similarly to the previous figure, Figure 12 shows the impact on the combined city challenges but now for each of the policy instruments separately. In other words, it provides an estimation of the performance of each policy instrument on the city challenges. It helps to distinguish which policy instruments are contributing most to a negative, neutral or positive impact.

The white tube of the violin plot contains 50% of the expert scores (25$^{th}$ to 75$^{th}$ quantile) and the small blue line inside the white tube is the 'middle' value (median) of the expert scores. The blue round dots indicate the extreme highest or lowest expert scores, and the shaded blue colour in the background of the white tubes indicates the overall distribution of the expert scores.

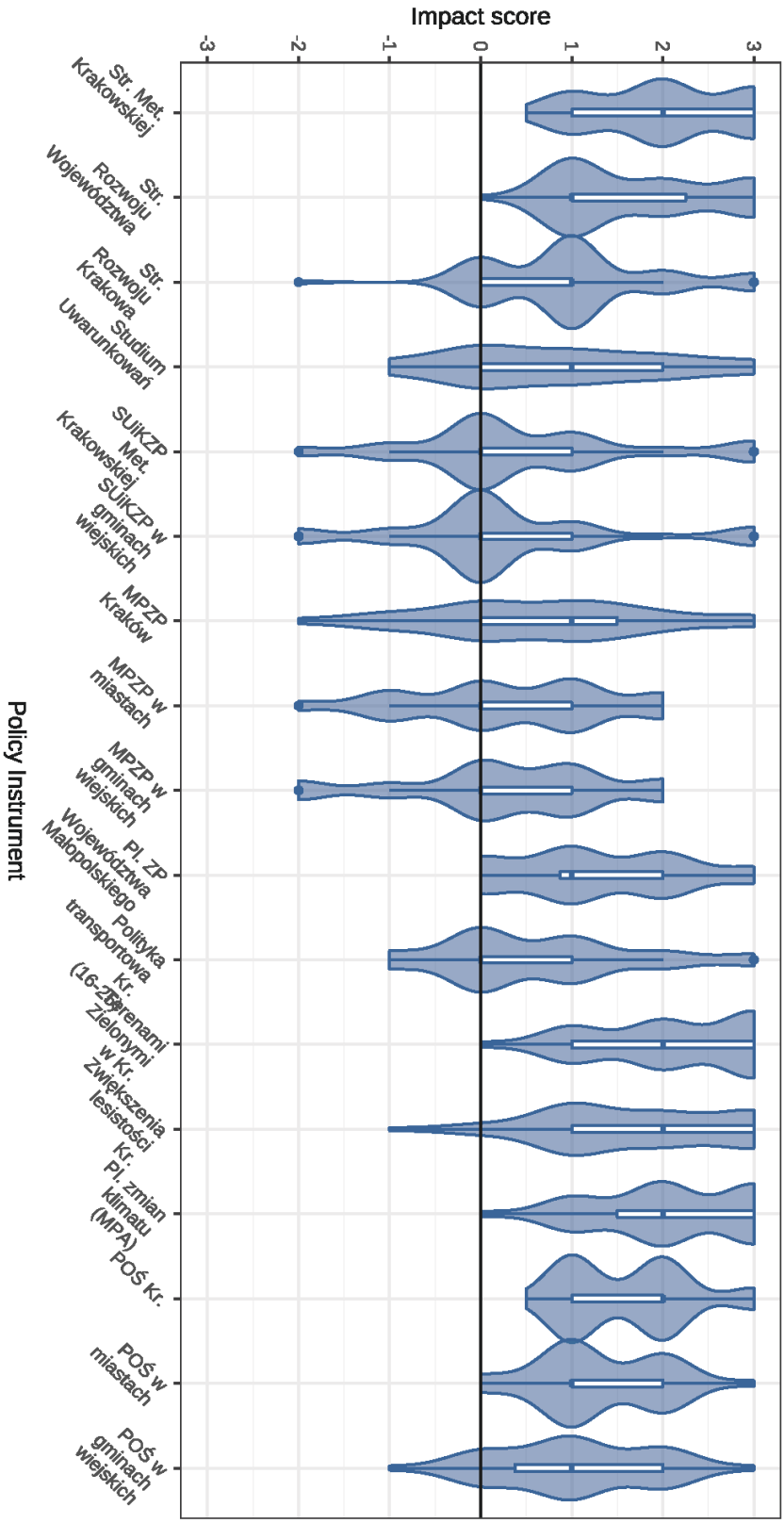


**Figure 12**: Impact of each policy instrument on the city challenges

**Interpretation Figure 12:** The figure shows that the 'Kraków Metropolitan Area Strategy', the 'Directions of Development and Management of Green Areas in Kraków', 'District programme for increasing the forest cover of Kraków', the 'Adaptation Plan for the City of Kraków to Climate Change' generally have positive impacts (=2) on the 8 city challenges identified in Kraków.

Other policy instruments such as the 'studies of Conditions and Directions for Spatial Development' (SUiKZP) and 'Local Spatial Development Plan Kraków' (MPZP) contribute less to these challenges, and together account for most of the few negative impacts that have been reported by experts.

Finally Figure 13 provides an overview of the impact of each policy instrument on each city challenge. The colour gradient illustrates whether this impact is positive (green), neutral (yellow) or negative (red). The size of the dots provides an indication about the extent to which this impact is highly reliable (bigger dots) or variable (smaller dots), for example due to different city contexts or because of different perceptions among the respondents.

In other words, Figure 13 illustrates whether the policy experts consistently indicated a given impact, or if there were variable answers. The small dots in this figure help to determine for example where follow up discussions with policy experts would be warranted to ascertain why there is no consensus among the policy experts over the impact.

Figure 13 can be read either vertically or horizontally. Vertically it provides a measure of performance for each instrument in achieving positive results for key city challenges. Horizontally it provides insights for each city challenge as to whether they are sufficiently addressed by the policy instruments. For example, a lot of neutral or negative values for a city challenge means this challenge is insufficiently addressed by these instruments or even negatively impacted.

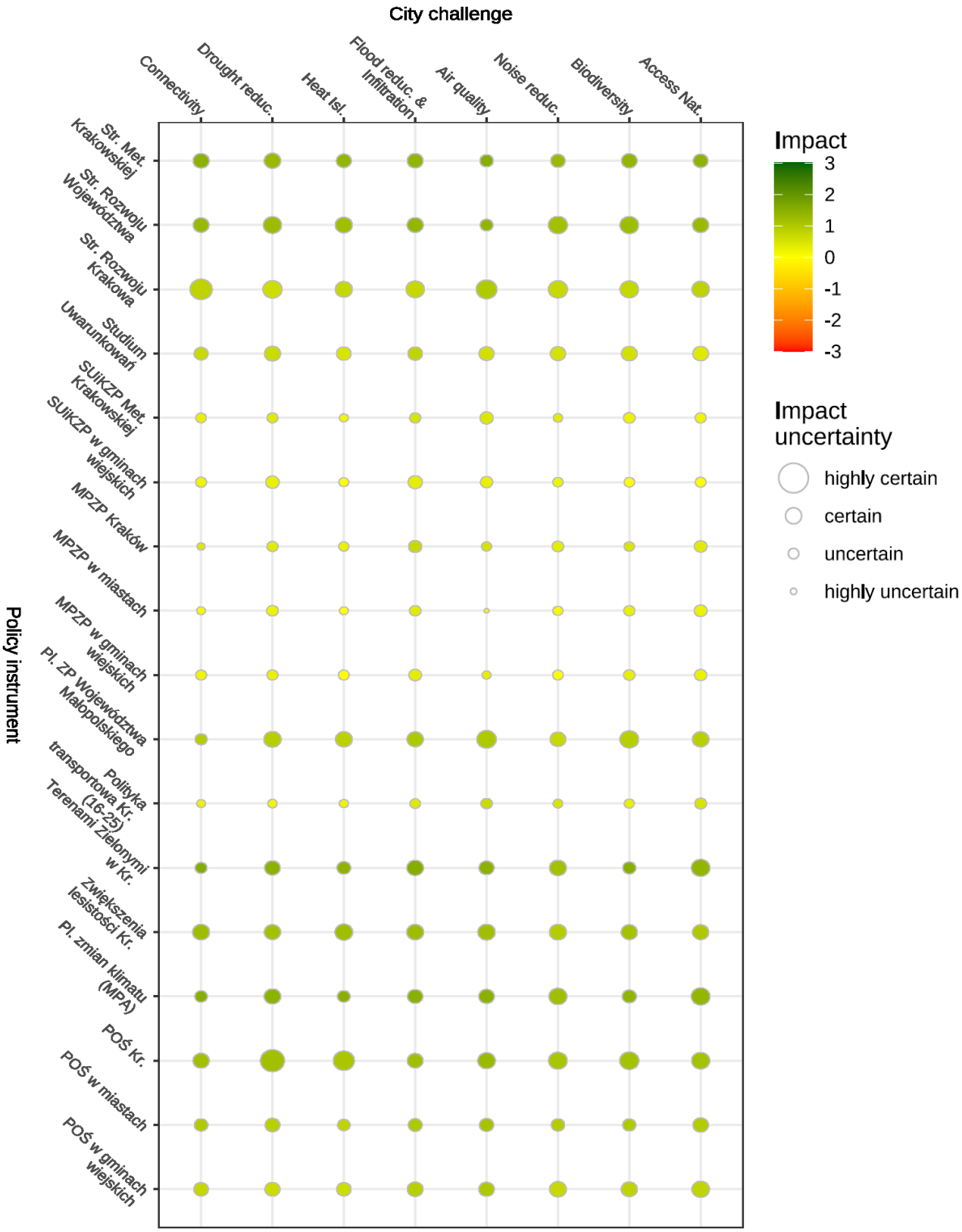


**Figure 13** Nature (positive or negative) and reliability (certain or uncertain) of each policy instrument impact on each city challenge

**Interpretation Figure 13:**

Vertical interpretation (instruments): Overall, there is no instrument that scores negatively on the city challenges. There is a lot of uncertainty regarding the impact of the 'studies of Conditions and Directions for Spatial Development' (SUiKZP) and the 'MPZP' instruments, and these consistently have a neutral to slightly positive impact on each of the respective city challenges. This indicates they seem to contribute little to the challenges, confirming the trend shown in Figure 12. Additionally, there is also a lot of uncertainty regarding the impact of 'Transport Policy for Kraków 2016-2025'.

There are also a few instruments that have quite positive impacts on all the challenges, such as the 'Kraków Metropolitan Area Strategy', the 'Development Strategy Małopolska 2030', Directions of Development and Management of Green Areas in Kraków for the years 2019-2030, the 'District programme for increasing the forest cover of Kraków for 2018-2040', the 'Adaptation Plan for the City of Kraków to Climate Change by 2030' and the 'Environmental Protection Programme of the City of Kraków'. These seem to be examples of well performing policy instruments, albeit the impact on a few of the challenges is sometimes uncertain.

Horizontal interpretation (city challenges): Each of the city challenges is covered in a positive way by several policy instruments simultaneously. This indicates that all challenges are addressed by policy instruments.

## 5.3. Knowledge gaps about impacts

Figure 14 provides an overview of the knowledge gaps reported by the policy experts. This figure is useful to better understand where information is missing on the impact of policy instruments on the city challenges. Dark red cells, for example, indicate that eight experts out of nine have reported that they didn't know the impact of the instrument on a particular challenge. The percentages on the right and the top of the figure indicate the percentage of these missing impact scores per challenge (right side) and per instrument (on top).

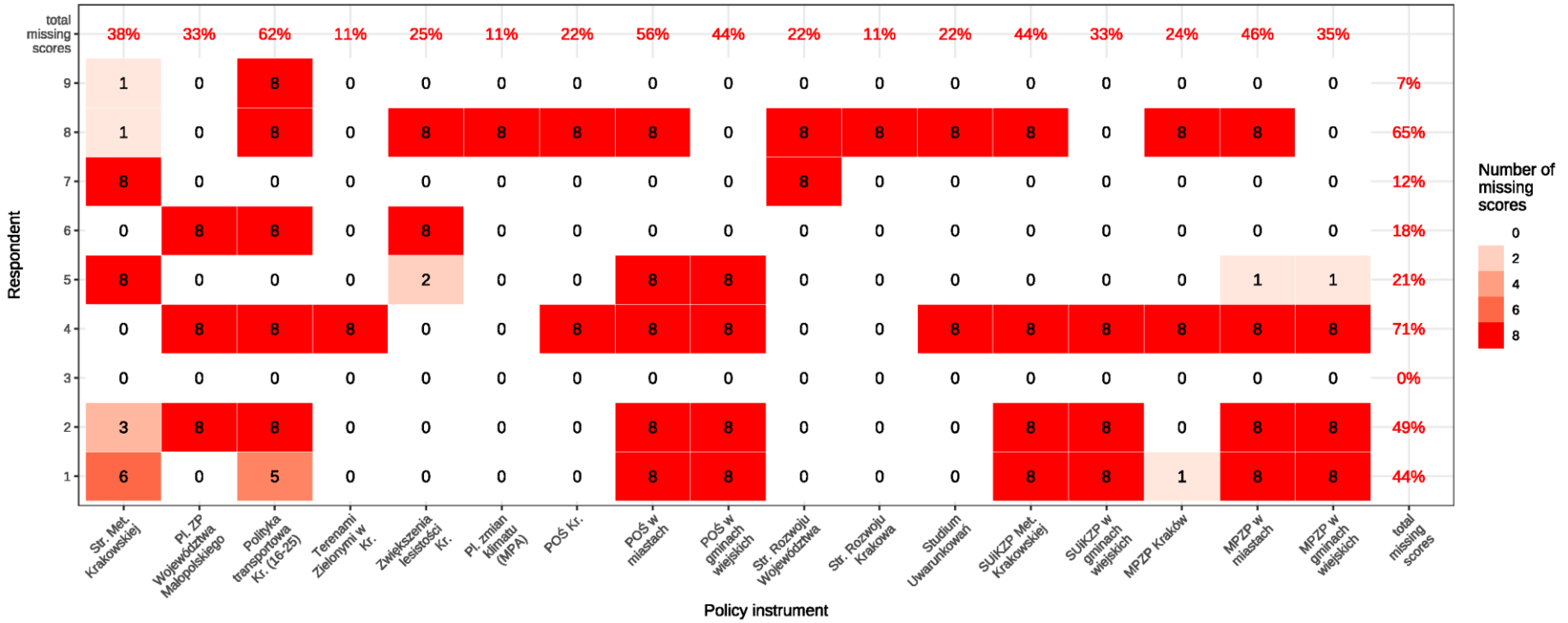


**Figure 14**: Number of missing impact scores by policy experts because they reported not to know the instrument impact on the policy instrument (total respondents: 9)

Results from this figure can be interpreted in two ways: high numbers of missing scores can be due to a lack of knowledge on actual impact and therefore warrant research to determine that impact, or they can point to the need to further pursue this analysis and therefore warrant expanding this analysis to include more experts potentially able of addressing the information gap.

**Interpretation Figure 14:** The 'Transport Policy for Kraków 2016-2025' (62% missing scores) and the 'Environmental Protection Programmes in the remaining cities of the Kraków Metropolis' (56% missing scores) have the most missing scores. The impact of these instruments is therefore uncertain. It may require interviewing additional experts on these instruments or, alternatively, it may be due to current knowledge gaps about the actual impact.

## 5.4. Coherence of policy instruments

Figure 15 shows an estimation of the coherence of the policy mix. In other words, it helps to determine if the instruments generally work well together, or alternatively if there are many conflicts. This is useful to get a global picture of policy coherence.

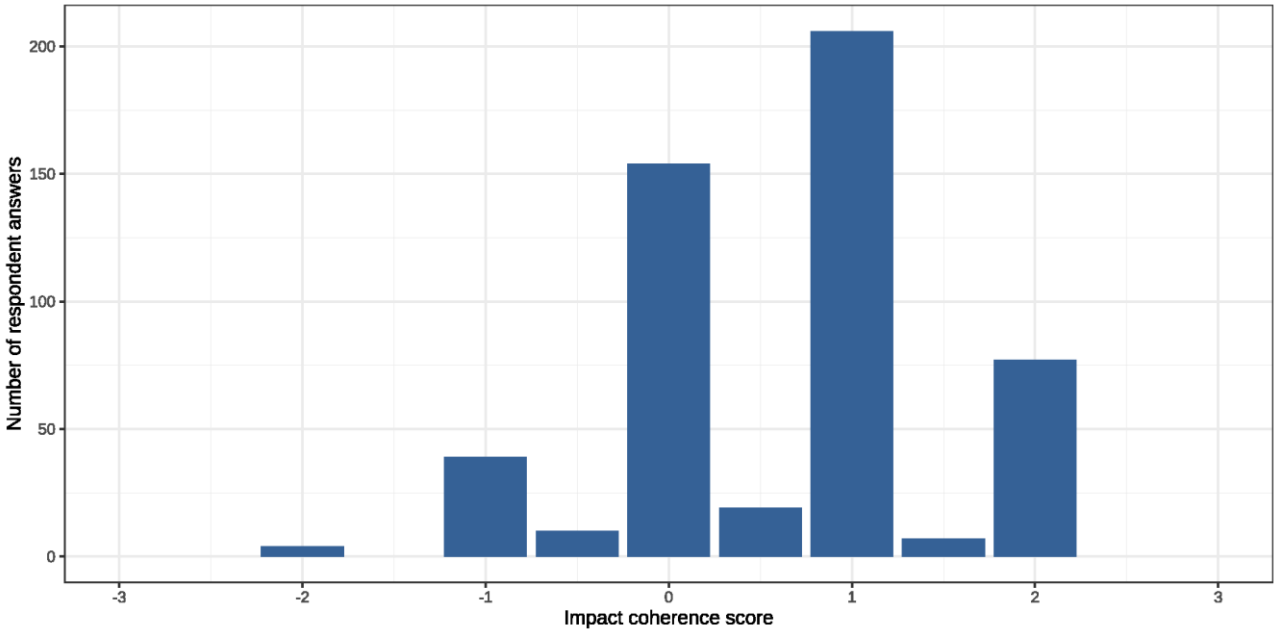


**Figure 15**: total number of policy expert responses reporting synergies (from 0 to +3) or conflicts (from 0 to -3)

**Interpretation Figure 15:** As can be seen in the figure, the policy experts indicated that the policies are having mostly slightly positive (=1) and neutral (=0 coherence). It means that the policy instruments are generally not impacting each other a lot, and when they do, this impact is mostly a synergy. The policy mix therefore is generally quite coherent, even if there seems to be room for improvements.

Figure 16 provides an overview of the synergies and conflicts for each policy instrument towards the others. The colour gradient illustrates whether the relation between two instruments is synergetic (green), neutral (yellow) or a conflict (red). The size of the dots provides an indication about the extent to

which this relation is highly reliable (bigger dots) or variable (smaller dots), for example due to different city contexts or because of different perceptions among the respondents.

In other words, Figure 16 illustrates whether the policy experts consistently indicated a synergy or conflict, or if there were variable answers. The small dots in this figure help to determine for example where follow up discussions with policy experts would be warranted to ascertain why there is no consensus among the policy experts over synergies or impacts.

**Interpretation Figure 16:** There are very uncertain relations especially for the 'studies of Conditions and Directions for Spatial Development' (SUiKZP) and the 'MPZP' instruments, which seem to confirm their impact on the city challenges (Figure 12 and 13) and their relation to other instruments is unclear or highly variable according to context.

There are also examples of, highly certain, strong synergies, between:

- The 'Kraków Metropolitan Area Strategy', the 'Development Strategy "Małopolska 2030' and the 'Directions of Development and Management of Green Areas in Kraków for the years 2019-2030'.
- The 'Spatial Development Plan of the Małopolska Voivodship' and the 'Development Strategy Małopolska 2030'
- The 'Study of Conditions and Directions for Spatial Development of Kraków' and the 'Directions of Development and Management of Green Areas in Kraków for the years 2019-2030'

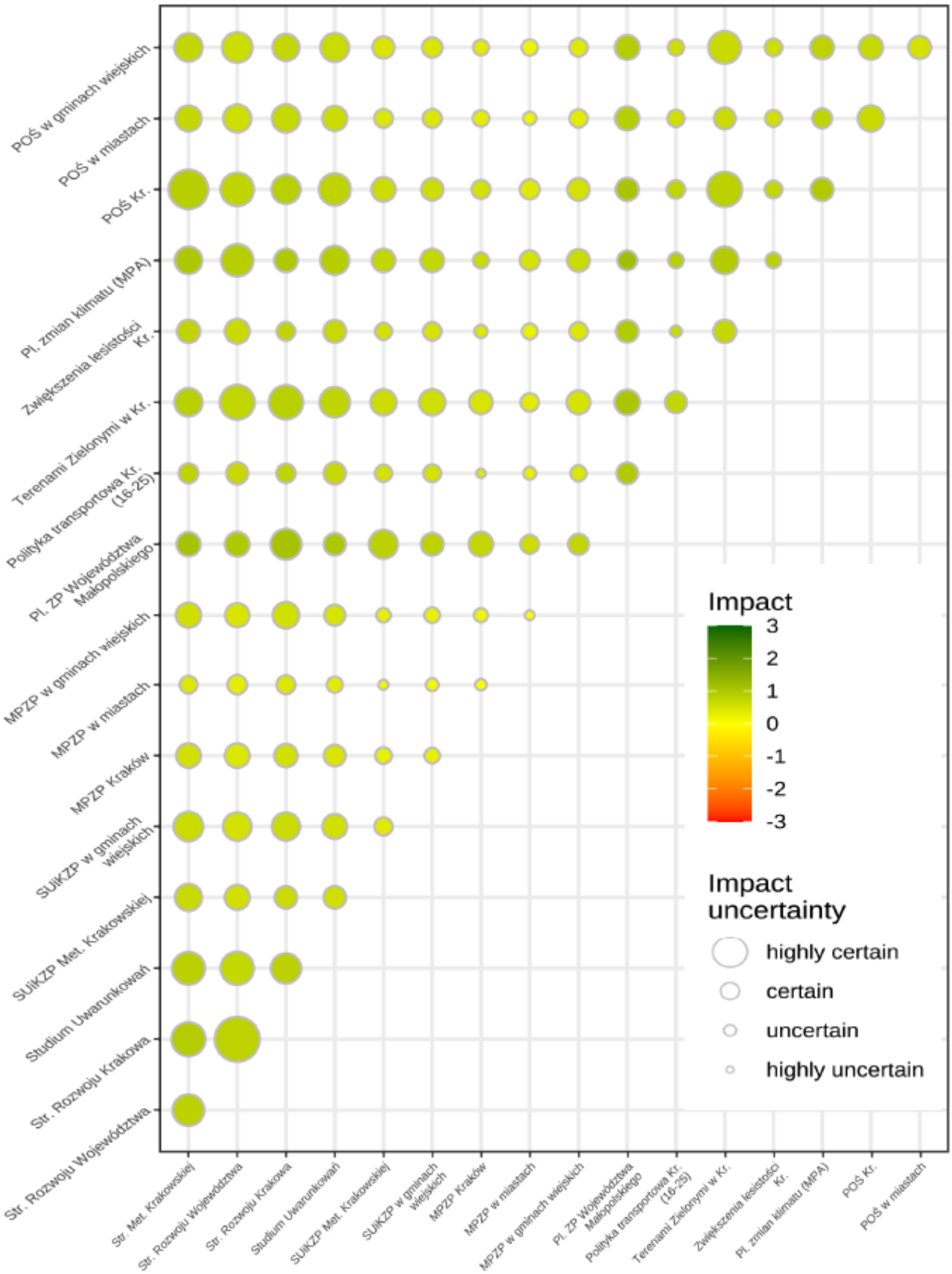


**Figure 16**: Nature (synergy or conflict) and reliability (certain or uncertain) of policy instruments' mutual relation

## 5.5. Knowledge gaps about coherence

Figure 17 provides an overview of the knowledge gaps reported by the policy experts. This figure is useful to better understand where information is missing regarding policy coherence.

Dark red cells, for example, indicate that seven experts have reported that they didn't know the relation between two instruments.

Results from this figure can be interpreted in two ways: high numbers of missing scores can be due to a lack of knowledge on either positive or negative relations between instruments, and therefore warrant research to determine this relation; or can point to the need to further pursue this analysis and therefore warrant expanding this analysis to include more experts potentially able of addressing the information gap.

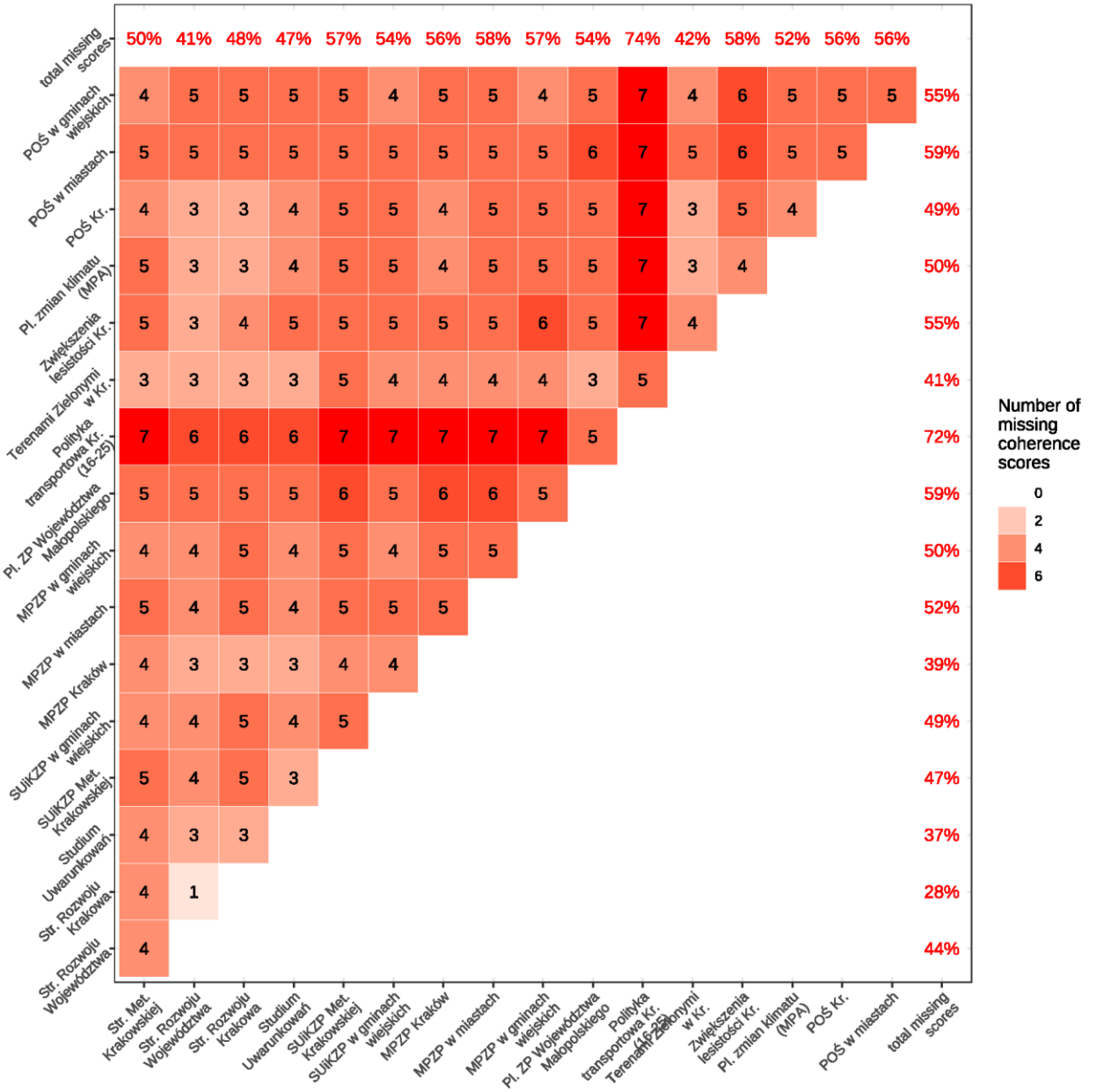


**Figure 17**: Number of missing coherence scores by policy experts because they reported not to know the relation between two given instruments

**Interpretation Figure 17:** Similarly to Figure 14, the relation between the 'Transport Policy for Kraków 2016-2025' and other instruments have reported as unknown by many experts. The impact of this instrument is therefore uncertain. It may require interviewing additional experts on this instrument or, alternatively, it may be due to current knowledge gaps on how this instrument relates to the other instruments.

# 6.Chemnitz

## 6.1. Policy instruments

The impact of 20 policy instruments (Table 6) on four city challenges (Table 7) were evaluated by eight policy experts in Chemnitz. For each of the instruments policy experts have been selected that have operational knowledge of their implementation. Their respective names have been kept anonymous.

**Table 6**: List of policy instruments selected for Chemnitz

| Policy Instrument | Description |
|---|---|
| Ausgleichsflächenkonzept (compensation area concept) | Objective(s): for every new building or street an area to compensate the impact needs to be established; keep and increase the quality of nature<br>Operational level: city |
| Flächennutzungsplan mit Landschaftsplan (Zoning and landscape plan) | Objective(s): strategic direction for Chemnitz as a city and its offices; based on already existing concepts; develops a vision for Chemnitz; SEKO 2020 will be continued with the InSek<br>Operational level: city |
| SEKO 2020 (urban development concept) | |
| Agenda 2030 für eine nachhaltige Entwicklung / SDGs (agenda 2030 for sustainable development) | Objective(s): implementation of the SDGs in the city context; implementation of the Klimaschutzprogramm; support for a sustainable development of Chemnitz<br>Operational level: city |
| Pflanzenliste zur Anwendung in der Bauleitplanung (Plant list used in zoning) | Objective(s): list of specific plant species which are adopted to the changing climate<br>Operational level: city |
| Satzung für Dach/Fassaden/Stellplatzbegrünung und Verhinderung von Schottergärten (statutes for the greening of roofs/facades/parking lots and the ban of stone gardens) | Objective(s): increase the number of green areas vertically and horizontal in the city (greening of roofs, facades and parking lots); ban of artificial stone gardens<br><br>Operational level: city |
| Zukunft Stadtgrün - Städtebauförderung (future urban nature) | Objective(s): funding program; development of the green corridor "Pleißbach"<br>Operational level: city |
| Schutzgebiete (protected areas) | Objective(s): creation of nature protection areas and protection of animals<br>Operational level: city |
| Baumschutzsatzung der Stadt Chemnitz (Tree protection statute for Chemnitz) | Objective(s): protection of trees to increase biodiversity, reduce noise, reduce heat island effects, support ecological connectivity<br>Operational level: city |

| | |
|---|---|
| Sächsisches Naturschutzgesetz (saxon nature protection law) | Objective(s): creation of nature protection areas and protection of animals on the regional level<br>Operational level: regional |
| Bundesnaturschutzgesetz (federal nature protection law) | Objective(s): creation of nature protection areas and protection of animals on the national level<br>Operational level: national |
| Straßenbaumkonzeption (concept for street trees) | Objective(s): basis of action for long term development and protection of street trees as aesthetic elements as well as ecological important parts of the city's green infrastructure<br>Operational level: city |
| Naturnahe Gestaltung von Grünflächen (nature adopted design of green spaces) | Objective(s): increase biodiversity through a nature adopted design of green areas<br>Operational level: city |
| Grünpflege- und Entwicklungskonzeption (concept for the management of green areas) | Objective(s): focus on the management of public green spaces and street trees<br>Operational level: city |
| Klimaanpassungsprogramm 2017-2020 (climate adaptation program) | Objective(s): update of the previous climate protection program; individual and complex measures to reduce Co2 emissions; main activities against climate change<br>Operational level: city |
| Beitritt zum Kommunalen Bündnis für biologische Vielfalt (accession to the local alliance for biodiversity) | Objective(s): alliance to communicate interests and problems of municipalities on biodiversity in the public debate<br>Operational level: city |
| Bebauungspläne (zoning) | Objective(s): there is no law for that just guidelines; in the end it depends on the official in charge<br>Operational level: city |
| upcoming: INSEK (integrated urban development concept) | Objective(s): update of the SeKo 2020; but now with an even more comprehensive view including a stronger focus on climate change aspects<br>Operational level: city |
| bald (upcoming): Grünanlagenkonzeption "Stadtgrün 2025" (Green space concept "urban green 2025") | Objective(s): update of the already existing one<br><br>Operational level: city |
| Masterplan Stadtnatur (under development) (Masterplan on urban nature) | Objective(s): to combine laws and guidelines connected to the urban nature in Chemnitz under one<br>Operational level: city |

**Table 7**: List of city challenges and policy instruments for Chemnitz together with the abbreviations used for the PolCA analysis

| Abbreviation | City challenge |
|---|---|
| Heat Isl. | Reducing heat island effect and heat stress |

| | |
|---|---|
| Biodiv. protection | Biodiversity protection |
| Soc. equity | Social equity |
| Env. education | Environmental education and awareness |
| **Abbreviation** | **Policy Instrument** |
| Area compensation | Compensation area concept |
| Zoning & Landsc. plan | Zoning and landscape plan |
| SEKO 2020 | Urban development concept |
| Agenda 2030 | Agenda 2030 for sustainable development |
| Plan list (zoning) | Plant list used in zoning |
| Green roof/parking st. | Statutes for the greening of roofs/facades/parking lots and the ban of stone gardens |
| Fut. Urb. Nature | Future urban nature |
| Protected areas | Protected areas |
| Tree protection st. | Tree protection statute for Chemnitz |
| Saxon nat. protect. law | Saxon nature protection law |
| Federal nat. protect. law | Federal nature protection law |
| Street tress concept | Concept for street trees |
| Nat. design green spaces | Nature adopted design of green spaces |
| Green maint. And dev. concept | Concept for the management of green areas |
| Climate adap. Progr. | Climate adaptation program |
| Local alliance for biodiv. | accession to the local alliance for biodiversity |
| Zoning plans | Zoning plans |
| INSEK | Integrated urban development concept |
| Urban Green 2025 | Green space concept "urban green 2025" |
| Masterplan urban nat. | Masterplan on urban nature |

The results of this analysis are presented in two sections: the first relates to the respondents perceived impact of the policy instruments on the selected city challenges and the second to the respondents' perceived synergies and conflicts between the policy instruments. For each section there is a short summary on knowledge gaps identified in the responses from the experts.

## 6.2. Impact of policy instruments on city challenges

Figure 18 shows an estimation of how well the given policy mix performs regarding the city challenges. In other words, it provides an estimation of how well all the policy instruments coherently work together to address all the city challenges. This is useful to get a global picture of instrument versus challenge

performance.

**Interpretation Figure 18**: As can be seen in the figure, the policy experts indicated that the policies are having mostly a slightly positive impact (=1) to positive (=2) impact, with quite many also having a neutral (=0) impact. It means that the policy instruments are generally impacting the city challenges in a positive manner. There are only few instruments with negative (=-2) impacts.

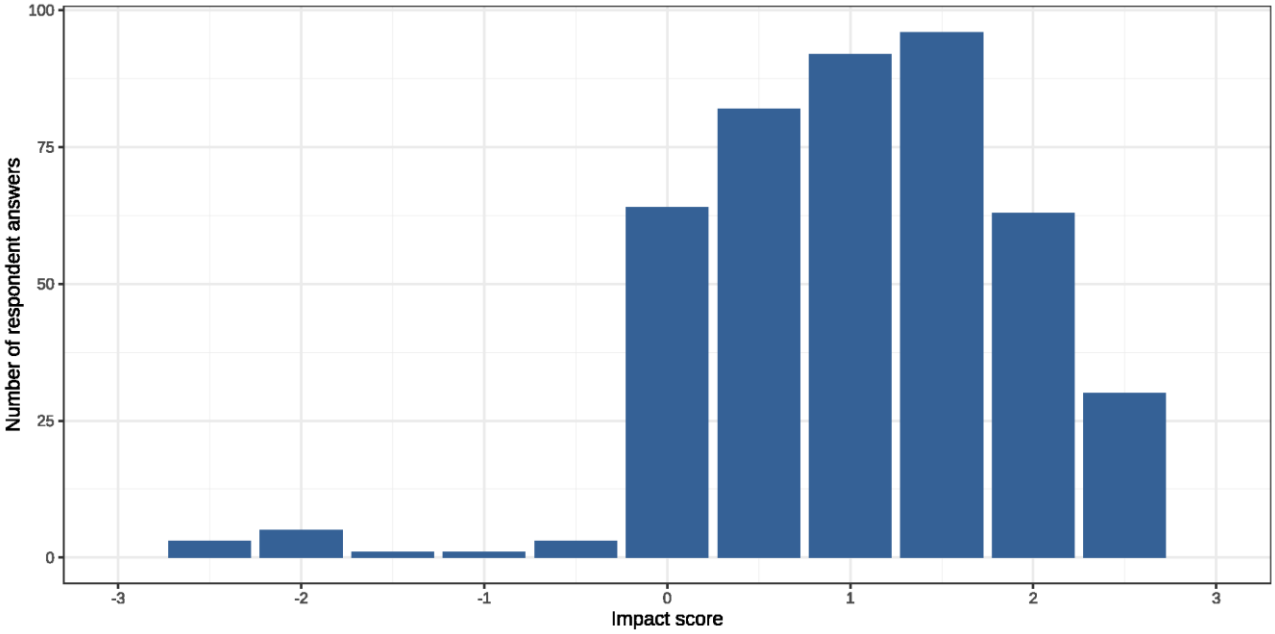


**Figure 18**: total number of policy expert responses for each of policy instrument impacts (from -3 to +3)

Similarly to the previous figure, Figure 19 shows the impact on the combined city challenges but now for each of the policy instruments separately. In other words, it provides an estimation of the performance of each policy instrument on the city challenges. It helps to distinguish which policy instruments are contributing most to a negative, neutral or positive impact.

The white tube of the violin plot contains 50% of the expert scores (25$^{th}$ to 75$^{th}$ quantile) and the small blue line inside the white tube is the 'middle' value (median) of the expert scores. The blue round dots indicate the extreme highest or lowest expert scores, and the shaded blue colour in the background of the white tubes indicates the overall distribution of the expert scores.

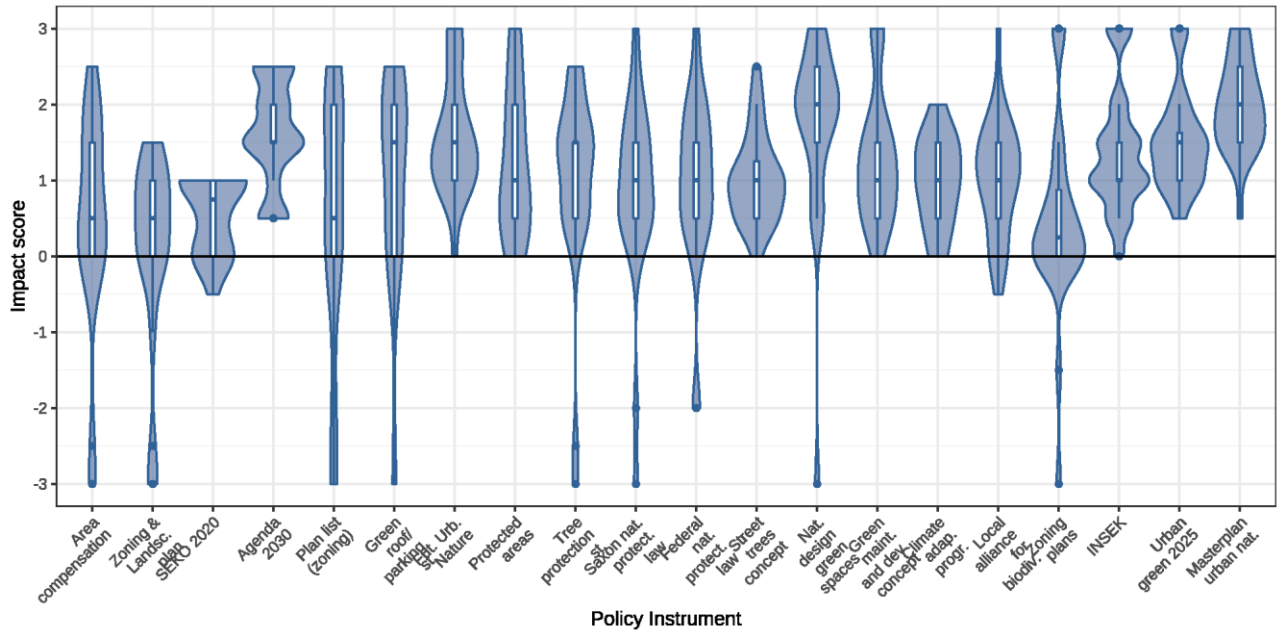


**Figure 19**: Impact of each policy instrument on the city challenges

**Interpretation Figure 19:** The figure shows that the 'nature adopted design of green spaces' and the 'Masterplan on urban nature' have positive (=2) impacts. For the former instrument only one respondent indicated a very negative (-3) impact, and for the latter all reported impacts were slightly positive to very positive. Three instruments score neutrally (=0 and <1), the 'compensation area concept', the 'zoning and landscape plan' and the zoning plans ('Bebauungspläne') with respectively two experts reporting negative (-2) to very negative (-3) impacts.

Finally Figure 20 provides an overview of the impact of each policy instrument on each city challenges. The colour gradient illustrates whether this impact is positive (green), neutral (yellow) or negative (red). The size of the dots provides an indication about the extent to which this impact is highly reliable (bigger dots) or variable (smaller dots), for example due to different city contexts or because of different perceptions among the respondents.

In other words, Figure 20 illustrates whether the policy experts consistently indicated a given impact, or if there were variable answers. The small dots in this figure help to determine for example where follow up discussions with policy experts would be warranted to ascertain why there is no consensus among the policy experts over the impact.

Figure 20 can be read either vertically or horizontally. Vertically it provides a measure of performance for each instrument in achieving positive results for key city challenges. Horizontally it provides insights for each city challenge as to whether they are sufficiently addressed by the policy instruments. For example, a lot of neutral or negative values for a city challenge means this challenge is insufficiently addressed by these instruments or even negatively impacted.

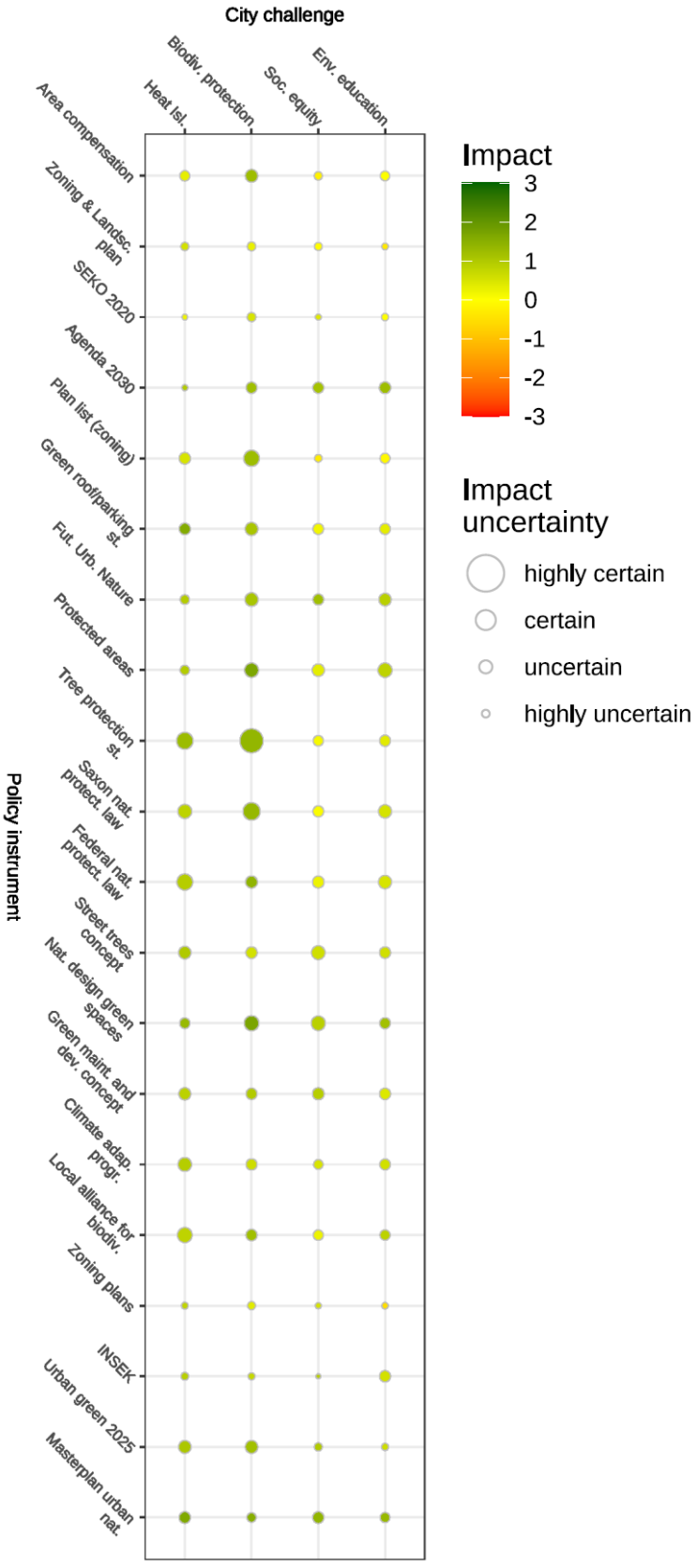


**Figure 20**: nature (positive or negative) and reliability (certain or uncertain) of each policy instrument impact on each city challenge

**Interpretation Figure 20:**

Vertical interpretation (instruments): Overall, there is no instrument that scores negatively on the city challenges. The impact of four instruments is highly uncertain (the two zoning plans, SEKO 2020 and INSEK) and close to neutral. This can be because the impact is variable according to the context of where it has been applied in the city, or because the impact is uncertain due to a lack of knowledge or different perceptions by the experts.

The 'Tree protection statute for Chemnitz' has a positive (=2) and highly certain impact on two challenges, 'biodiversity protection' and 'reduction of heat island effects. However, it scores less on the two other challenges, 'social equity' and 'environmental education', which makes it an example of sectoral policy.

The 'nature design of green spaces' (Naturnahe Gestaltung von Grünflächen) has the most positive impact on all four challenges. The 'Master plan for urban nature' also has a positive impact on all the four challenges but there is more uncertainty about this impact.

Horizontal interpretation (city challenges): The 'biodiversity protection' and 'heat island reduction challenges' appear to be well covered by several policy instruments. However, 'social equity' and 'environmental education' are less so (fewer positive impacts) and the impact of the policy instruments is more uncertain (more smaller dots). This may indicate the need for new or improved instruments targeting these challenges.

## 6.3. Knowledge gaps about impacts

Figure 21 provides an overview of the knowledge gaps reported by the policy experts. This figure is useful to better understand where information is missing on the impact of policy instruments on the city challenges. Dark red cells, for example, indicate that four experts have reported that they didn't know the impact of the instrument on a particular challenge. The percentages on the right and the top of the figure indicate the percentage of these missing impact scores per challenge (right side) and per instrument (on top).

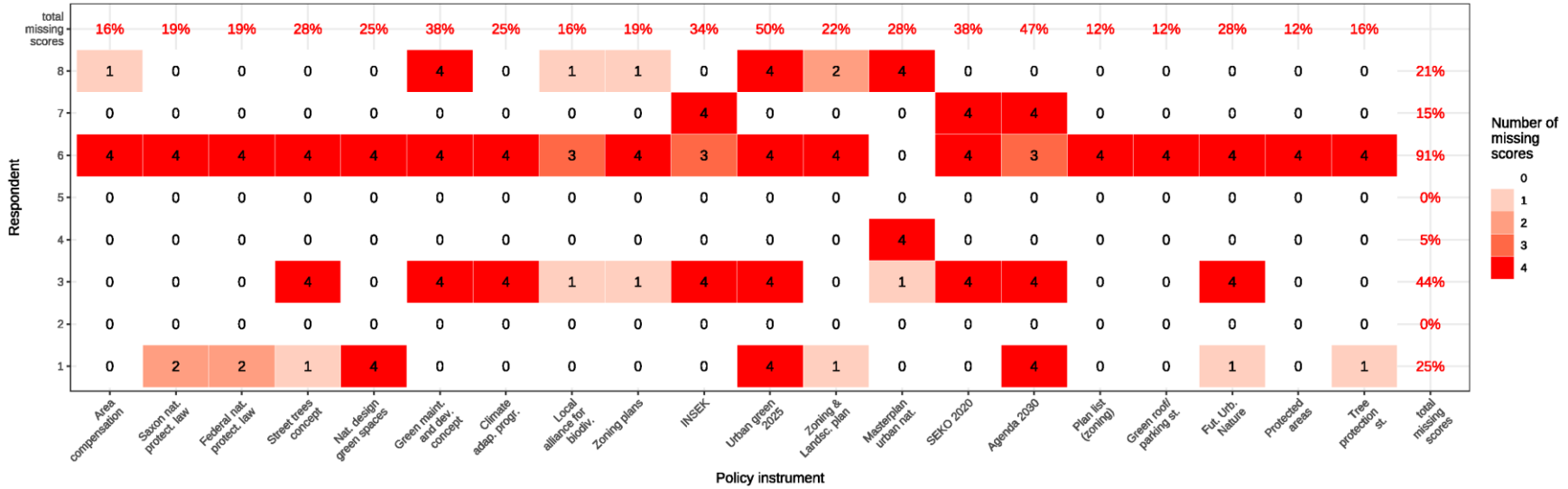


**Figure 21**: number of missing impact scores by policy experts because they reported not to know the instrument impact on the city challenge (number of respondents: 8)

Results from this figure can be interpreted in two ways: high numbers of missing scores can be due to a lack of knowledge on actual impact and therefore warrant research to determine that impact, or they can point to the need to further pursue this analysis and therefore warrant expanding this analysis to include more experts potentially able of addressing the information gap.

**Interpretation Figure 21:** The impact of the 'green space concept urban green 2025' and the 'agenda 2030 for sustainable development' are quite often reported as unknown by the experts compared to the other instruments (respectively 50% and 47% of the reported expert answers was 'unknown'), which still provides a relatively good indication about the impact of these policy instruments.

## 6.4. Coherence of policy instruments

Figure 22 shows an estimation of the coherence of the policy mix. In other words, it helps to determine if the instruments generally work well together, or alternatively if there are many conflicts. This is useful to get a global picture of policy coherence.

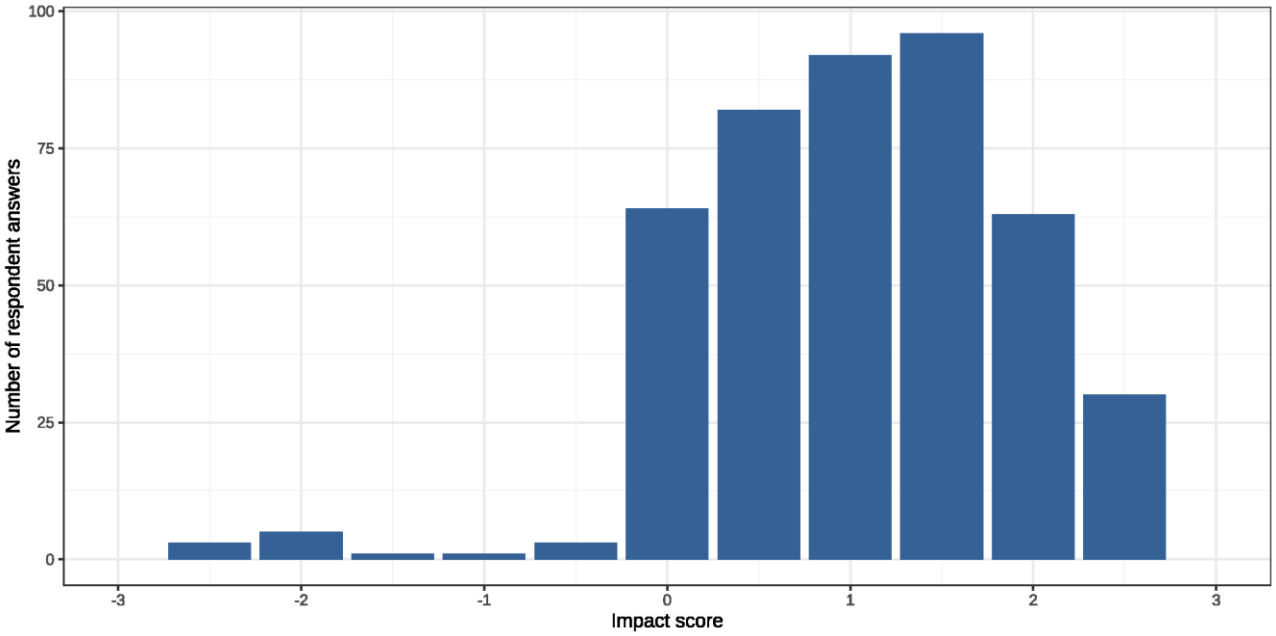


**Figure 22**: total number of policy expert responses reporting synergies (from 0 to +3) or conflicts (from 0 to -3)

**Interpretation Figure 22:** As can be seen in the figure, the policy experts indicated that the policies are having mostly slightly positive (=1), then positive (=2) and neutral synergies (=0). It means that the policy instruments are generally impacting each other in a positive manner. The policy mix therefore is generally quite coherent, even if there may still be some room for improvements.

Figure 23 provides an overview of the synergies and conflicts for each policy instrument towards the others. The colour gradient illustrates whether the relation between two instruments is a synergy (green), neutral (yellow) or a conflict (red). The size of the dots provides an indication about the extent to which this relation is highly reliable (bigger dots) or variable (smaller dots), for example due to different city contexts or because of different perceptions among the respondents.

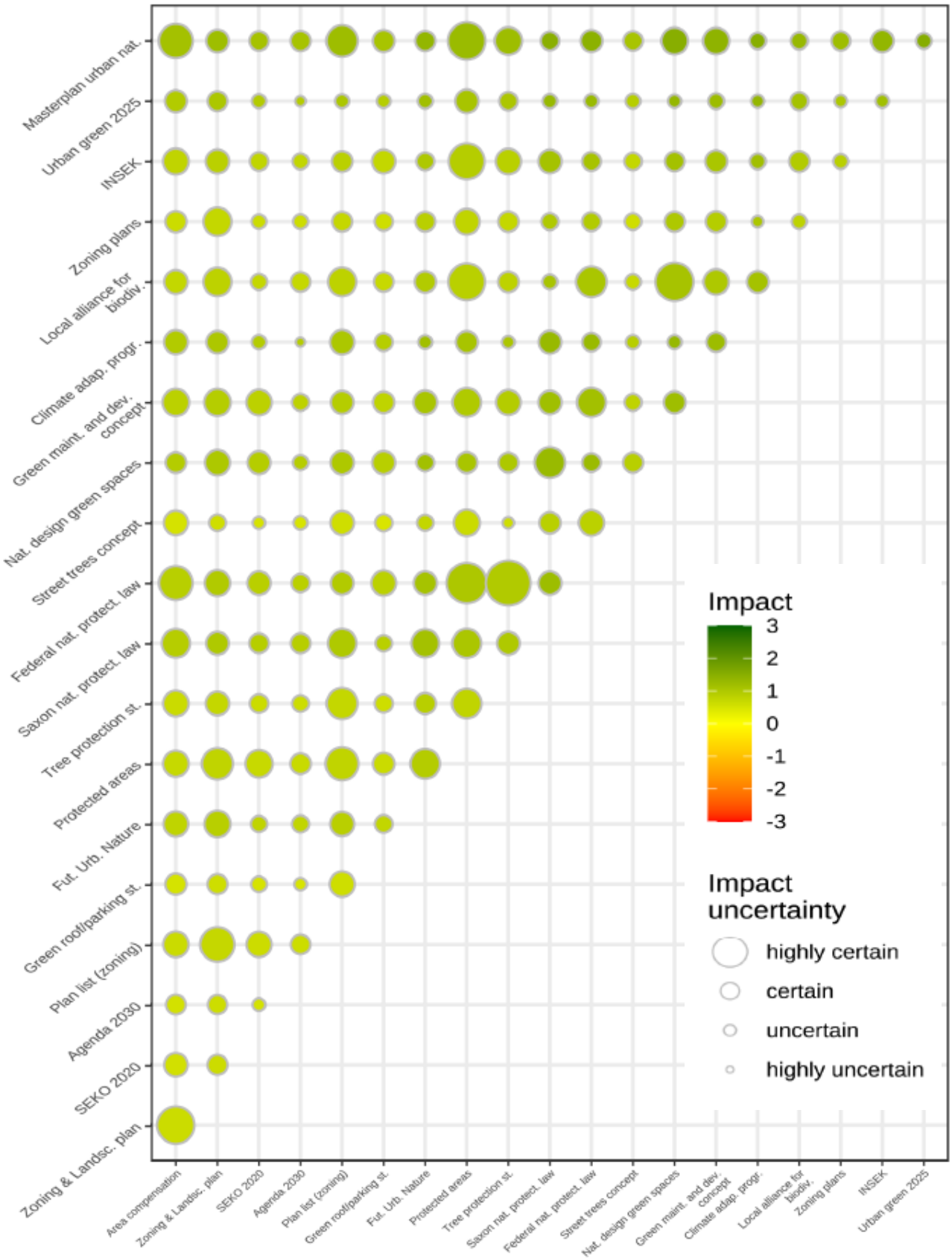


**Figure 23**: Nature (synergy or conflict) and reliability (certain or uncertain) of policy instrument' mutual relation

In other words, Figure 23 illustrates whether the policy experts consistently indicated a synergy or conflict, or if there were variable answers. The small dots in this figure help to determine for example where follow up discussions with policy experts would be warranted to ascertain why there is no consensus among the policy experts over synergies or impacts.

**Interpretation Figure 23:** Most relations between the instruments seem to be well known (certain to highly certain) and are mostly positive synergies. There are also quite some highly certain positive synergies that could prove to be successful examples of highly synergetic instruments (e.g., between the 'federal nature protection law' and the 'tree protection statutes' or the 'nature design of green spaces' and the 'local alliances for biodiversity protection'). While these are strong synergies, it's good to put them in perspective to the contribution of these instruments towards all the challenges. Indeed, these examples tend to focus more on biodiversity and heat island effects (see Figure 20).

The 'Masterplan for urban nature' stands out as the instrument with the strongest positive synergies with all other instruments, albeit with a few uncertain relations with some of these instruments.

## 6.5. Knowledge gaps about coherence

Figure 24 provides an overview of the knowledge gaps reported by the policy experts. This figure is useful to better understand where information is missing regarding policy coherence.

Dark red cells, for example, indicate that five experts have reported that they didn't know the relation between two instruments.

Results from this figure can be interpreted in two ways: high numbers of missing scores can be due to a lack of knowledge on either positive or negative relations between instruments, and therefore warrant research to determine this relation; or can point to the need to further pursue this analysis and therefore warrant expanding this analysis to include more experts potentially able of addressing the information gap.

**Interpretation Figure 24:** The relation of the 'Urban green 2025'' with other policy instruments is quite often reported as unknown by the experts. The relation of this instrument with the rest of the policy mix is therefore slightly more uncertain. Yet, it should provide a good indication of the perceived coherence with other instruments. There are few other relations between instruments that are unclear (e.g., for the link between the Masterplan on urban nature and Future Urban nature - Zukunft Stadtgrün – Städtebauförderung-).

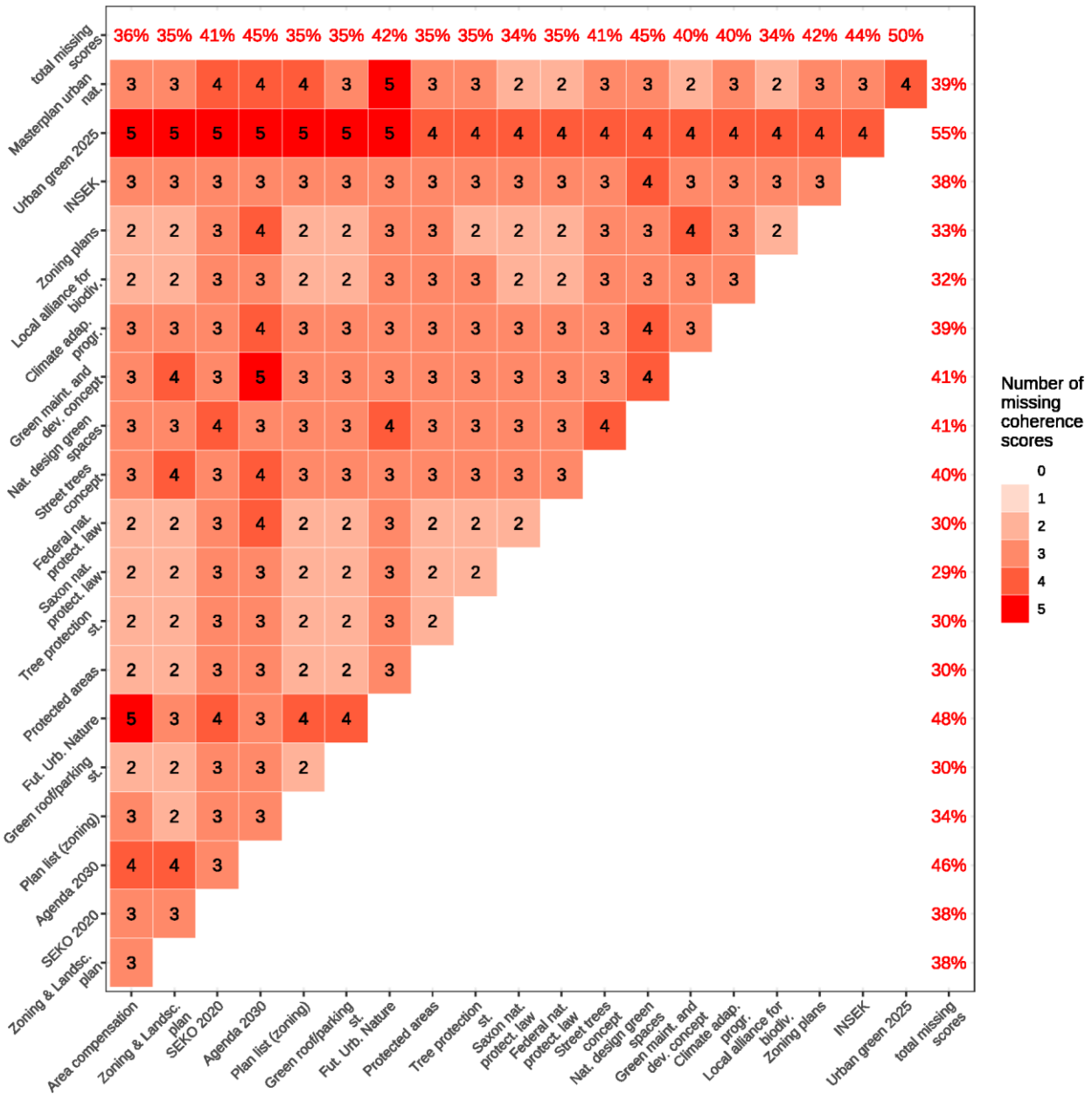


**Figure 24**: number of missing coherence scores by policy experts because they reported not to know the relation between two given instruments (number of respondents 8)

# 7.Portoviejo

## 7.1. Policy instruments

The impact of 11 policy instruments (Table 7) on seven city challenges (Table 8) were evaluated by seven field experts in Portoviejo. For each of the instruments policy experts have been selected that have operational knowledge of their implementation. Their respective names have been kept anonymous.

**Table 7**: List of policy instruments selected for Portoviejo

| Policy Instrument | Description |
|---|---|
| Regulación de Usos y aprovechamiento del Suelo<br>*(Land use regulation)* | Objective(s): Regulations on urban uses and activities on the riverbanks, regulations on the productive capacities of the land to safeguard conservation, ecosystem recovery, environmental protection, land occupation regulation and risk. Risk mitigation zones are determined, and compatibilities of use are defined with categorizations such as: Ecotourism, protection, conservation and agricultural.<br>Operational level: Municipal |
| Regulación de tipología de edificabilidad.<br>*(Regulation of construction typology)* | Objective(s): Regulation of building types and maximum heights permitted on the riverbanks, to safeguard the integration between the river and the city. This to protect the landscape value of the river with permeable buildings, avoiding densification, generating the greatest possible permeability of the land.<br>Operational level: Municipal |
| Corredor del Río - Manual de diseño para Malecón del Río - Parque Las Vegas<br>*(River Corridor - Design Manual for the Malecón del Río - Las Vegas Park.)* | Objective(s): It contributes to the protection of the ecological, cultural and landscape values of the territory. It integrates the ecological protection of aquifers and risks due to the threat of flooding, as it passes through the most consolidated city. The objective is to guarantee the conditions of conservation and sustainable management of the riverbanks, which can be recovered and conditioned to increase green recreational areas, promoting real estate development in their areas of influence and urban tourist attraction. In addition, the parks that make up the corridor will serve as valves to alleviate the pressure of flood risk, replicating the drainage system of the emblematic park of the river corridor "Parque Las Vegas". Finally, there will be an "Agricultural" park, which will contain a great diversity of products, from the point of view of food security, protection of genetic material and productive soils, it is defended as an agricultural space.<br>Operational level: Municipal |

| | |
|---|---|
| Plan de Monitoreo de Riberas y Colinas (Control de erosión, desertificación y degradación)<br>*Riverbank and Hillside Monitoring Plan (Erosion, Desertification and Degradation Control)* | Objective(s): There is a monitoring plan through the river and hills with drones to avoid informal settlements in risk areas, deforestation, preservation of areas declared as protective forest, and identification of non-conservation activities in risk and protection areas.<br>Operational level: Cantonal |
| Plan de Acción Invernal PAI (Monitoreo del Río para dar alertas tempranas de inundación desde el monitorio y la alerta comunitaria)<br>*Winter Action Plan PAI (River monitoring to provide early warning of flooding from monitoring and community alert)* | Objective(s): Execution of actions involving the areas and components of Risk Management such as; Risk Analysis with the identification of areas susceptible to natural and anthropogenic events, Risk Reduction as mitigation actions such as cleaning and clearing of the River, gabion walls and estuaries, protection of riverbanks with rockfill, etc. Recovery as management for humanitarian attention, relocation of houses, Emergency Management as immediate attention in coordination with response agencies.<br>Operational level: Cantonal |
| Plan de Concientización para el Cuidado del Río Portoviejo y sus Riberas<br>*Awareness Plan for the Care of the Portoviejo River and its banks.* | Objective(s): The project consists of sensitization and awareness-raising for the valuation and use of water, the valuation and care of protected areas and fragile ecosystems; comprehensive environmental education on an ongoing basis, framed in socialization, talks and dissemination through social networks.<br>Operational level: Cantonal |
| Sistema de Conectividad Vial (Puentes e interconexiones) (Ciclovías de Ribera)<br>*Road Connectivity System (Bridges and interconnections) (Riverside Bikeways)* | Objective(s): It establishes transversal connections with new infrastructures of bridges over the Portoviejo River and new routes that connect the city in an efficient and compact way. For this reason, connections were proposed that will allow the creation of new economically active zones, generating new transversal mobility alternatives in the city and consequently decongesting vehicular traffic. It includes the connectivity of the river with ecological paths and bicycle lanes.<br>Operational level: Municipal |
| Programa de Cierre de Guías clandestinas de aguas residuales domesticas<br>*Program to close clandestine domestic sewage pipes.* | Objective(s): It consists of permanent controls to identify the connection of clandestine guides to the collectors or directly to the Portoviejo River in the canton of Portoviejo. Once the action is identified, the respective plugging and reconnection to the corresponding system is carried out, and sanctioning processes are carried out against those responsible for discharging sewage and other polluting effluents into the Portoviejo River.<br>Operational level: Municipal |

| | |
|---|---|
| Programa de Control y Sanción de manejo responsable de la basura o desechos de cualquier tipo en el cantón Portoviejo<br>*Control and Sanction Programme for the responsible management of rubbish or waste of any kind in the canton of Portoviejo.* | Objective(s): The GAD Municipality of Portoviejo has a municipal code of the canton of Portoviejo book 2 territorial component chapter 2 of the occupation of public space section of waste as a form of obstruction of public space, which allows for the implementation and execution of control actions and the identification of offenders to apply the respective sanction as indicated in the ordinance.<br>Operational level: Municipal |
| Proyecto de Diseño de Nueva Planta de Tratamiento de Aguas Servidas (PTAR)<br>*Design Project for a New Wastewater Treatment Plant - PTAR.* | Objective(s): The project seeks to replace the current wastewater system (which occupies some 40 hectares) with a modern, compact, environmentally efficient technology and six to eight hectares smaller. The water treatment capacity will be 96 000 cubic meters per day, until 2050.<br>Operational level: Cantonal |
| Plan de Manejo Ambiental Manglar La Boca<br>*La Boca Mangrove Environnemental Management Plan* | Objective(s): The "La Boca Mangrove Management Plan" establishes the principles, technical criteria, and actions for the effective management of the protected area, to guarantee and maintain the conservation values in good condition, in addition to providing ecosystem goods and services for the surrounding populations, which contribute to good living.<br>Also implement guidelines to conserve and manage the biodiversity and ecosystems present in La Boca Mangrove", through the involvement, responsibility and commitment of the competent institutions, communities and user groups in the care and valuation of the environmental services provided by the protected area to obtain a mutual sustainable and sustainable benefit over time".<br>Operational level: Regional |

**Table 8**: List of city challenges and policy instruments for Portoviejo together with the abbreviations used for the PolCA analysis

| Abbreviations | City challenge |
|---|---|
| Nature approp. | Nature appropriation |
| Connectivity | Ecologic connectivity |
| Green space man. | Green space management |
| Drought | Drought (low water levels) |
| Flood risk & permea. | Flood risk (pluvial and fluvial) and soil permeability |
| Water qual. upstream | Upstream issues to water quality (pesticide, erosion) |
| Water restoration | Watershed restoration and water quality (decontamination of natural water sources and recovery of plan and animal species native to the area) |
| **Abbreviations** | **Policy instrument** |
| LU Reg. & dev. | Regulation of land use and land use development |

| | |
|---|---|
| Construction typ. | Regulation of construction typology |
| Design man. | Design manual ofr Malecon del Rio – Las Vegas Park |
| Riverbank & hill monitoring | Riverbank and Hillside Monitoring Plan (Erosion, desertification, and degradation control) |
| PAI | Winter action plan PAI |
| Awareness pl. river | Awareness plan for the care of the Portoviejo River and its banks |
| Road & cycle connect. | Road connectivity system (bridges and interconnections, riverside cycleways) |
| Clandestine water pr. | Clandestine domestic wastewater closing programme |
| Waste pr. | Control and sanctions programme for the responsible management of rubbish or waste of any kind in the canton of Portoviejo |
| PTAR | Design project for a new wastewater treatment plan |
| Env. man. Pl. Manglar la Boca | Environnemental management plan Manglar la Boca |

Regarding Table 8 it is important to note that connectivity was interpreted differently by the policy experts, not as ecological connectivity but as logistical connectivity.

The results of this analysis are presented in two sections: the first relates to the respondents perceived impact of the policy instruments on the selected city challenges and the second to the respondents' perceived synergies and conflicts between the policy instruments. For each section there is a short summary on knowledge gaps identified in the responses from the experts.

## 7.2. Impact of policy instruments on city challenges

Figure 25 shows an estimation of how well the given policy mix performs regarding the city challenges. In other words, it provides an estimation of how well all the policy instruments coherently work together to address all the city challenges. This is useful to get a global picture of instrument versus challenge performance.

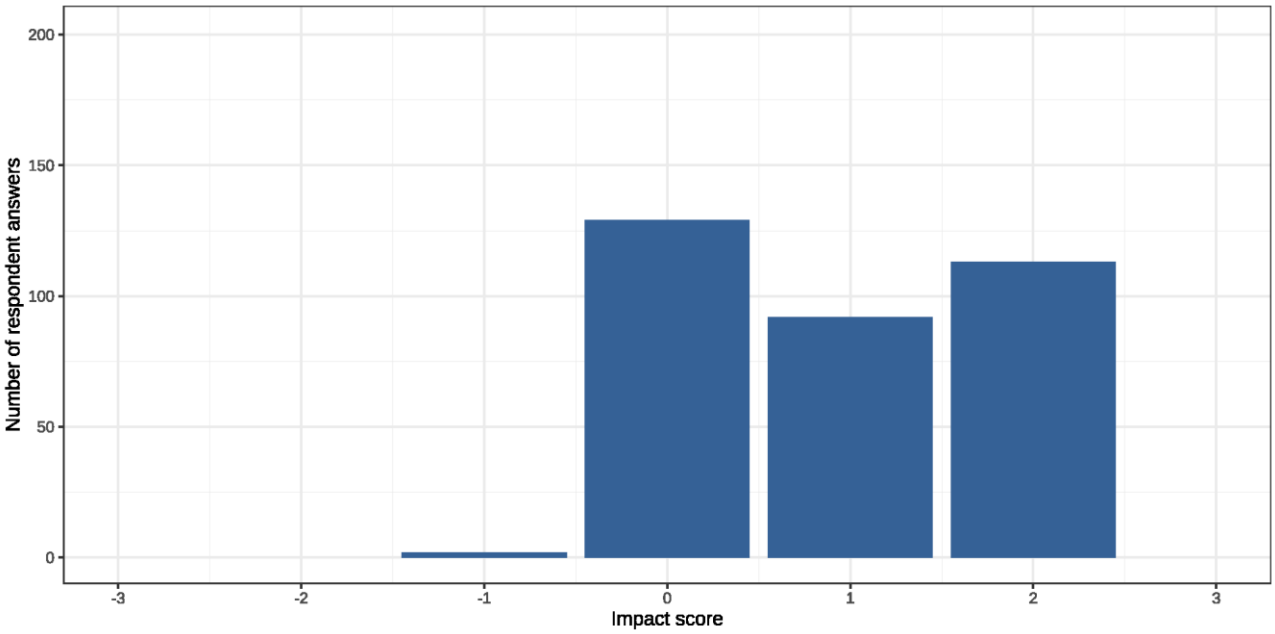


**Figure 25**: Total number of policy expert responses for each of policy instrument impacts (from -3 to +3)

**Interpretation Figure 25**: As can be seen in the figure, the policy experts indicated that the policies are having mostly neutral impact (=0) and a slightly positive (=1) to positive impact (=2). It means that, according to the 7 policy experts, the policy instruments are not adversely affecting the city challenges.

Similarly to the previous figure, Figure 26 shows the impact on the combined city challenges but now for each of the policy instruments separately. In other words, it provides an estimation of the performance of each policy instrument on the city challenges. It helps to distinguish which policy instruments are contributing most to a negative, neutral or positive impact.

The white tube of the violin plot contains 50% of the expert scores ($25^{th}$ to $75^{th}$ quantile) and the small blue line inside the white tube is the 'middle' value (median) of the expert scores. The blue round dots indicate the extreme highest or lowest expert scores, and the shaded blue colour in the background of the white tubes indicates the overall distribution of the expert scores.

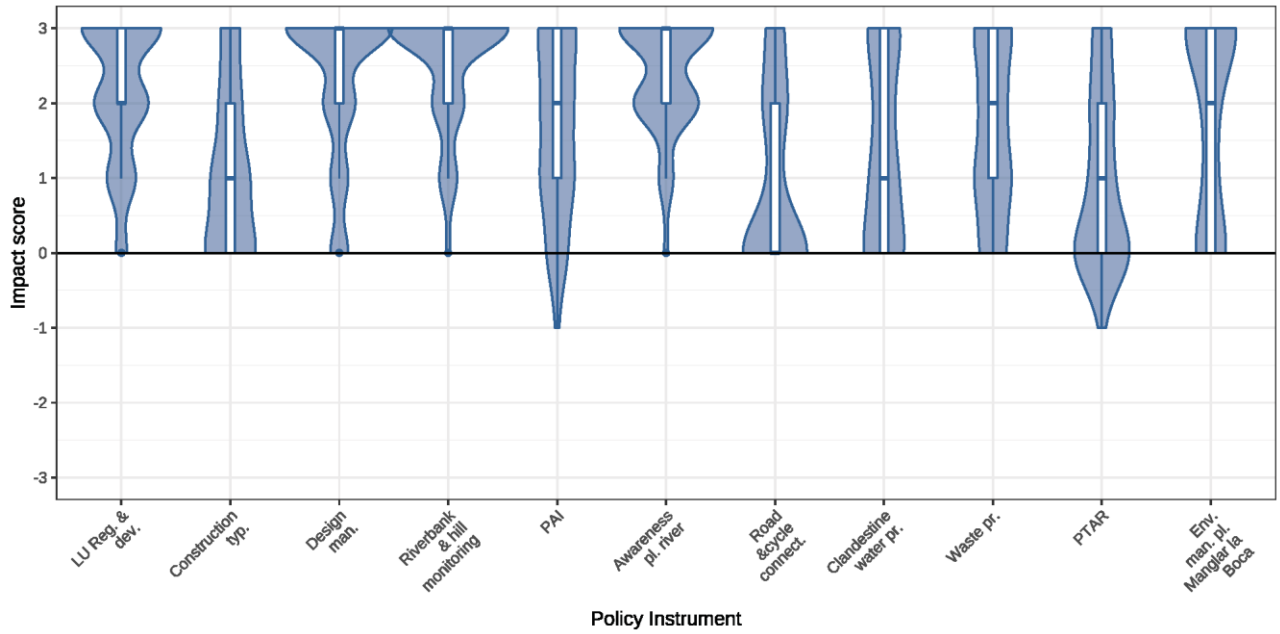


**Figure 26**: Impact of each policy instrument on the city challenges

**Interpretation figure 26:** The figure shows that most policy instruments have a positive (=2) to very positive impact (=3) on the seven city challenges.

Three instruments have slightly positive impacts, the 'regulation for construction type', the 'clandestine water program' and the 'PTAR' and therefore are less effective at addressing the city challenges.

Finally Figure 27 provides an overview of the impact of each policy instrument on each city challenges. The colour gradient illustrates whether this impact is positive (green), neutral (yellow) or negative (red). The size of the dots provides an indication about the extent to which this impact is highly reliable (bigger dots) or variable (smaller dots), for example due to different city contexts or because of different perceptions among the respondents.

In other words, Figure 27 illustrates whether the policy experts consistently indicated a given impact, or if there were variable answers. The small dots in this figure help to determine for example where follow up discussions with policy experts would be warranted to ascertain why there is no consensus among the policy experts over the impact.

Figure 27 can be read either vertically or horizontally. Vertically it provides a measure of performance for each instrument in achieving positive results for key city challenges. Horizontally it provides insights for each city challenge as to whether they are sufficiently addressed by the policy instruments. For example, a lot of neutral or negative values for a city challenge means this challenge is insufficiently addressed by these instruments or even negatively impacted.

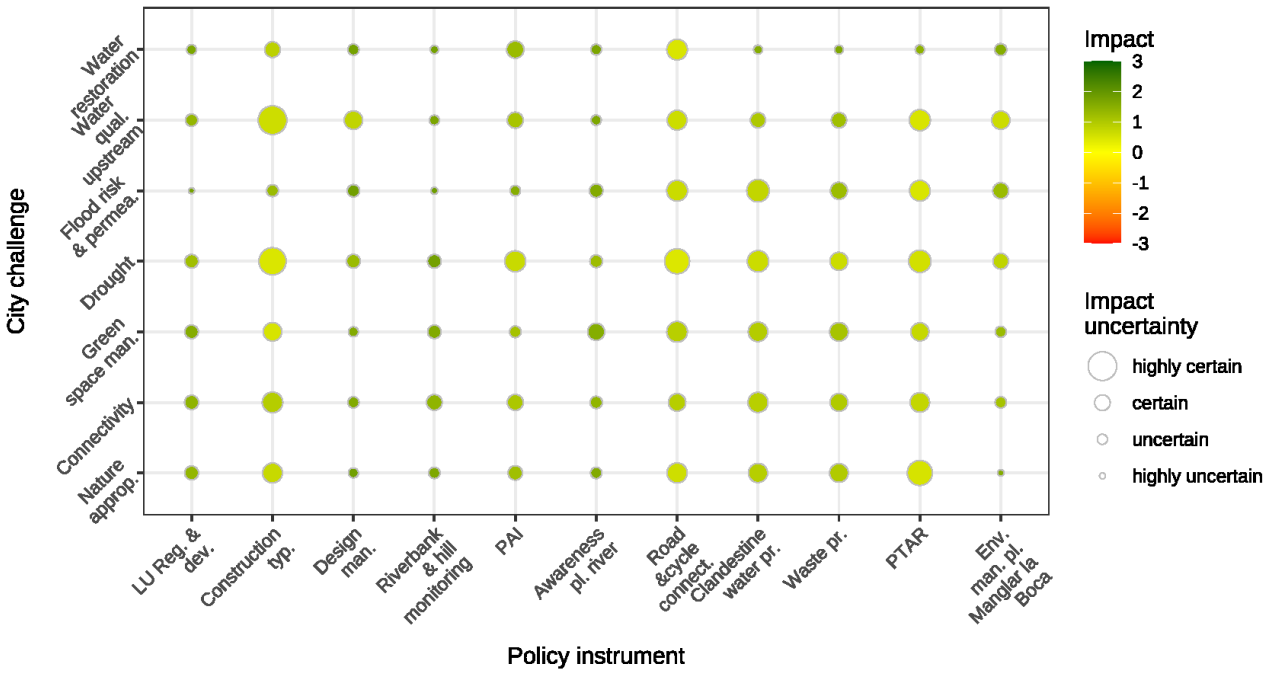


**Figure 27**: Nature (positive or negative) and reliability (certain or uncertain) of each policy instrument impact on each city challenge

**Interpretation Figure 27:**

Vertical interpretation (instruments): Overall there is no instrument that scores negatively on the city challenges. Some instruments such as the 'Awareness Plan for the Care of the Portoviejo River and its banks', the 'riverbank and hill monitoring' and the 'Design Manual for the Malecón del Río - Las Vegas Park' have very positive impacts (between +2 and +3).

For the 'regulation for construction type', the 'clandestine water program' and the 'PTAR', which were identified as less performant compared to the other instruments (see also Figure 26), the impact is mostly certain. This means the policy experts agree that these instruments are less effective at addressing the challenges.

Horizontal interpretation (city challenges): There is quite some uncertainty how instruments impact water restoration. This is reflected by a larger number of small dots for that challenge. However, in general, all the challenges are addressed in a positive manner by the policy mix. The challenge which is the least addressed compared to all others is 'drought' (four of the eleven instruments have a positive impact on it).

## 7.3. Knowledge gaps about impacts

Figure 30 provides an overview of the knowledge gaps reported by the policy experts. This figure is useful to better understand where information is missing on the impact of policy instruments on the city challenges. Dark red cells, for example, indicate that four experts have reported that they didn't know the impact of the instrument on a particular challenge. The percentages on the right and the top of the figure indicate the percentage of these missing impact scores per challenge (right side) and per instrument (on top).

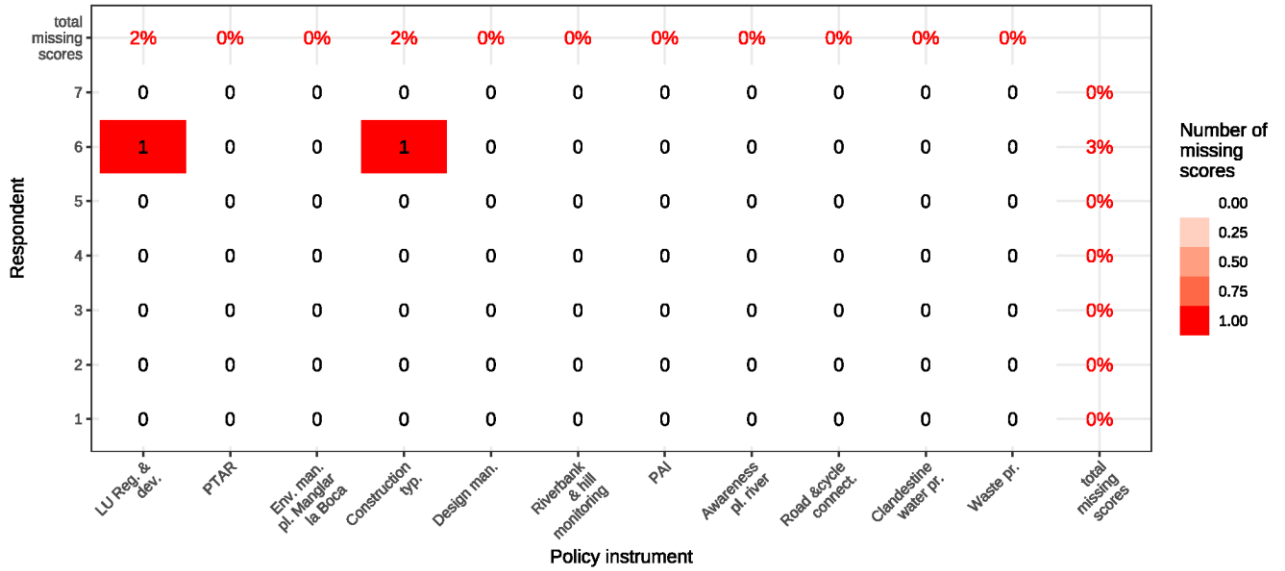


**Figure 28**: Number of missing impact scores by policy experts because they reported not to know the instrument impact on the city challenge (number of respondents: 7)

Results from this figure can be interpreted in two ways: high numbers of missing scores can be due to a lack of knowledge on actual impact and therefore warrant research to determine that impact, or they can point to the need to further pursue this analysis and therefore warrant expanding this analysis to include more experts potentially able of addressing the information gap.

**Interpretation Figure 28:** There are only two respondents that reported not to know the impact of an instrument for any challenge. Therefore, we can conclude that there is no knowledge gap among the policy experts.

## 7.4. Coherence of policy instruments

Figure 29 shows an estimation of the coherence of the policy mix. In other words, it helps to determine if the instruments generally work well together, or alternatively if there are many conflicts. This is useful to get a global picture of policy coherence.

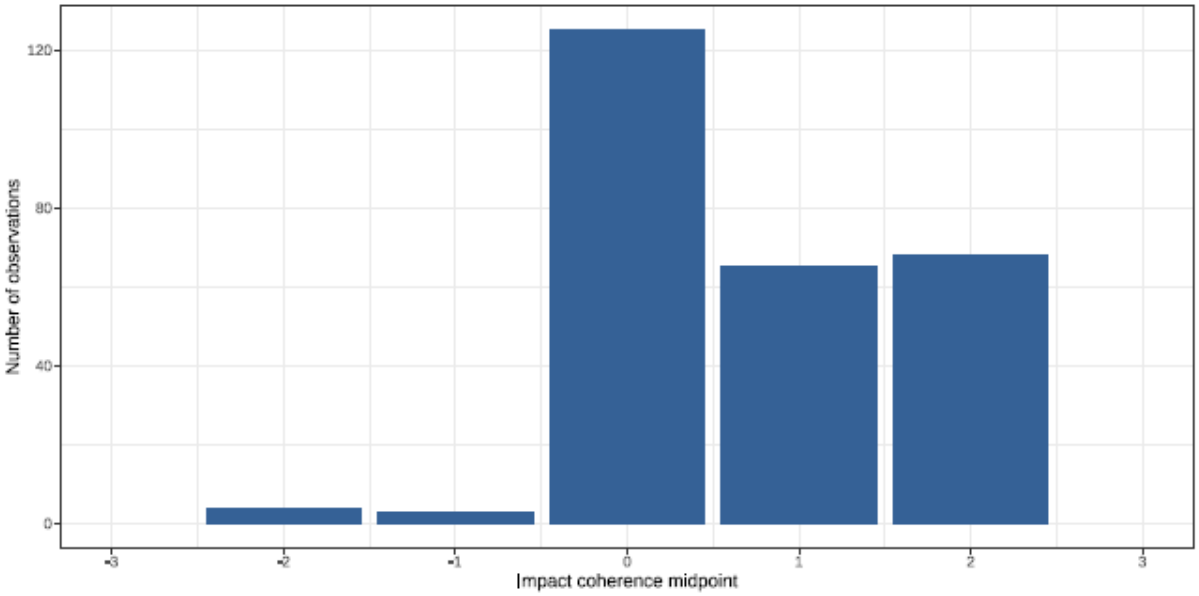


**Figure 29**: Total number of policy expert responses reporting synergies (from 0 to +3) or conflicts (from 0 to -3)

**Interpretation Figure 29:** As can be seen in the figure, the policy experts indicated that the policies are having mostly neutral coherence (=0) up to a slightly positive (=1) to positive synergies (=2). It means that the policy instruments are generally not impacting each other a lot, and when they do, this impact is mostly a synergy. The policy mix therefore is generally quite coherent, even if there may still be room for improvements for instruments with a neutral synergy.

Figure 30 provides an overview of the synergies and conflicts for each policy instrument towards the others. The colour gradient illustrates whether the relation between two instruments is a synergy (green), neutral (yellow) or a conflict (red). The size of the dots provides an indication about the extent to which this relation is highly reliable (bigger dots) or variable (smaller dots), for example due to different city contexts or because of different perceptions among the respondents.

In other words, Figure 30 illustrates whether the policy experts consistently indicated a synergy or conflict, or if there were variable answers. The small dots in this figure help to determine for example where follow up discussions with policy experts would be warranted to ascertain why there is no consensus among the policy experts over synergies or impacts.

**Interpretation Figure 30:** Most relations between the instruments seem to be well known and are positive synergies. Only for the 'La Boca Mangrove Environmental Management Plan' and the waste program (Control and Sanction Program for the responsible management of rubbish or waste of any kind in the canton of Portoviejo) there are more uncertainties about the level of synergy. Nonetheless, these are neutral to very positive synergies.

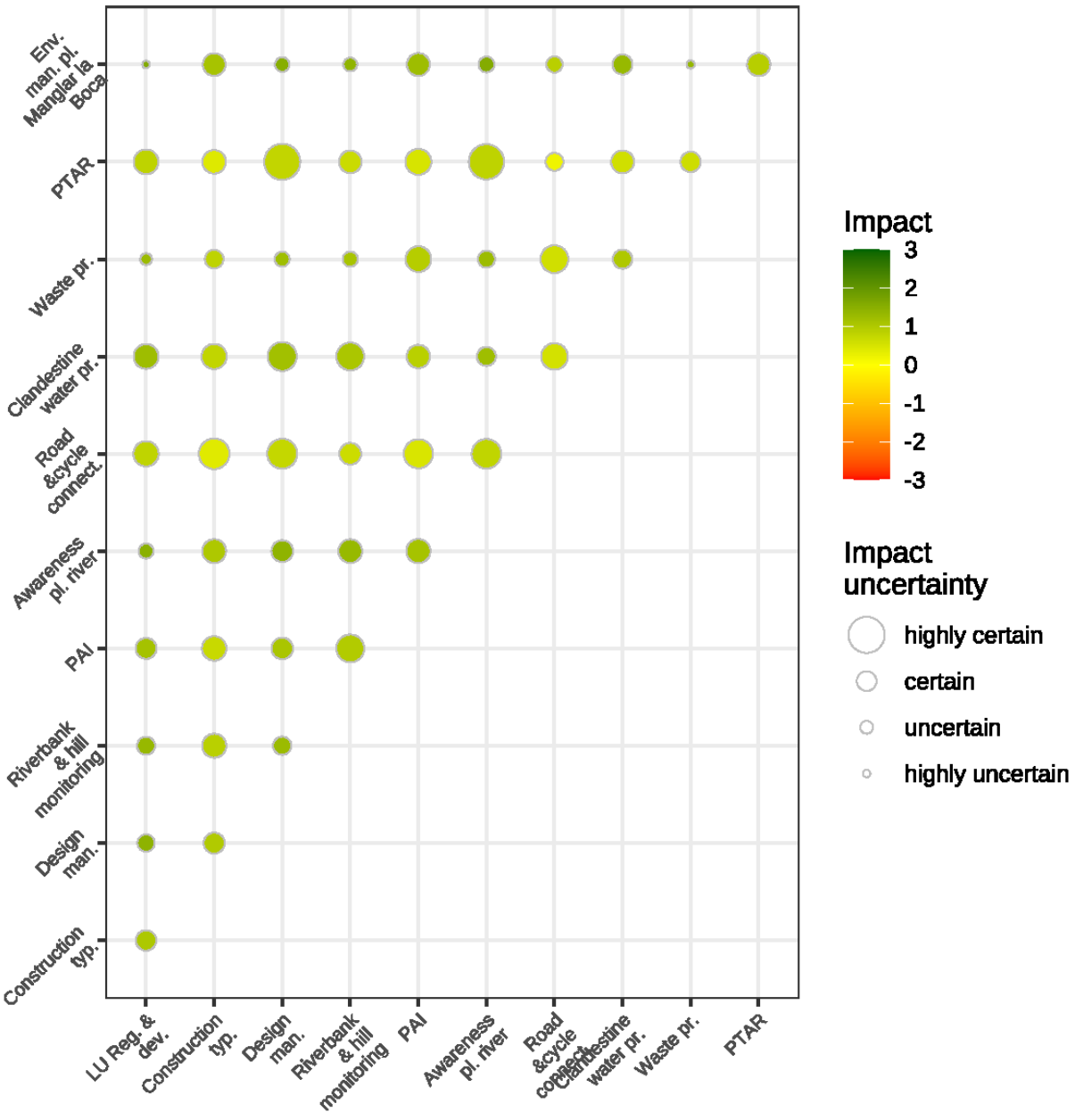


**Figure 30**: Nature (synergy or conflict) and reliability (certain or uncertain) of policy instrument' mutual relation

## 7.5. Knowledge gaps about coherence

No policy experts have reported unknown synergies between policy instruments; hence we can assume that similarly to the impact section (see Figure 28) there is no knowledge gap.

# 8. Envigado

## 8.1. Policy instruments

The impact of ten policy instruments (Table 9) on six city challenges (Table 10) were evaluated by six field experts in Envigado. For each of the instruments policy experts have been selected that have operational knowledge of their implementation. Their respective names have been kept anonymous.

**Table 9**: List of policy instruments selected for Envigado

| Policy Instrument | Description |
|---|---|
| Planes de ordenamiento territorial que incorporen suelos de protección<br>*Land-use plans that incorporate protected soils* | Objective(s): Define land uses, prioritize protected land. Zoning<br><br>Operational level: Municipal |
| Sistema local de áreas protegidas de Envigado SILAPE acuerdo 09 de 2016<br>*Envigado's local system of protected areas SILAPE agreement 09 of 2016* | Objective(s): Define areas for conservation of strategic ecosystems in the municipality of Envigado, mainly rural areas and ecosystems (40% of the municipal territory as a protected area).<br><br>Operational level: Municipal |
| Resolución metropolitana 430 del 2019 (área protegida urbana humedal el Trianión- La Heliodora)<br>*Metropolitan Resolution 430 of 2019 (urban protected area wetland Trianión-La Heliodora)* | Objective(s): Declaration and management plan<br><br>Operational level: Municipal |
| Plan de Gestión Ambiental<br>*Environnemental Management Plan* | Objective(s): Define the environmental management of the municipality<br><br>Operational level: Municipal |
| Plan de ordenamiento y manejo de la cuenca del río Aburrá<br>*Plan for the development and management of the Aburrá river basin.* | Objective(s): Definition of uses and zoning of the basin<br><br>Operational level: Regional |
| Cinturón verde Metropolitano<br>*Metropolitan Green Belt* | Objective(s): Long-term integrated planning and intervention strategy<br>long-term planning and integrated intervention strategy, to consolidate a balanced and equitable territory in the area where urban and rural<br>between urban and rural areas<br><br>Operational level: Metropolitan |

| | |
|---|---|
| Sistema Metropolitano de áreas protegidas -SIMAP-<br>*Metropolitan System of Protected Areas (SIMAP)* | **Objective(s):** Define protected and conservation areas at the metropolitan level<br>**Operational level**: Metropolitan |
| Sistema departamental de áreas protegidas<br>*Departmental system of protected areas* | **Objective(s):** Define protected and conservation areas at departmental level<br>**Operational level**: Regional |
| Plan maestro de zonas verdes y arbolado urbano de Envigado<br>*Envigado's master plan for green zones and urban tree plantations.* | **Objective(s)**: Tree and green space management plan including inventory<br>**Operational level**: Municipal |
| Planes zonales<br>*Zonal plans* | **Objective(s):** Eastern zonal territorial development, based on citizen participation<br>**Operational level**: Municipal |

Table 10: List of city challenges for Envigado together with the abbreviations used for the PolCA analysis

| **Abbreviations** | **City challenges** |
|---|---|
| Connectivity | Ecological connectivity |
| Access Nat. | Access to green spaces |
| Water Q. | Water quality |
| Heat Isl. | Heat island effect reduction |
| Soc. Cohesion | Social cohesion |
| Soc. Participation | (Insufficient) participation of communities to green space management |
| **Abbreviations** | **Policy Instruments** |
| Pl. orden. Territorial | Land-use plans that incorporate protected soils |
| Áreas protegidas SILAPE | Envigado's local system of protected areas SILAPE agreement 09 of 2016 |
| Resolución metrop. 430 | Metropolitan Resolution 430 of 2019 (urban protected area wetland Trianión-La Heliodora) |
| Pl. gestión ambiental | Environnemental Management Plan |
| Pl. orden. Rio Aburrá | Plan for the development and management of the Aburrá river basin. |
| Cinturón verde metrop. | Metropolitan Green Belt |
| SIMAP | Metropolitan System of Protected Areas |
| Sis. Dep. áreas protegidas | Departmental system of protected areas |
| Pl. maestro zonas verdes | Envigado's master plan for green zones and urban tree plantations. |
| Pl. zonales | Zonal plans |

The results of this analysis are presented in two sections: the first relates to the respondents perceived impact of the policy instruments on the selected city challenges and the second to the respondents' perceived synergies and conflicts between the policy instruments. For each section there is a short summary on knowledge gaps identified in the responses from the experts.

## 8.2. Impact of policy instruments on city challenges

Figure 31 shows an estimation of how well the given policy mix performs regarding the city challenges. In other words, it provides an estimation of how well all the policy instruments coherently work together to address all the city challenges. This is useful to get a global picture of instrument versus challenge performance.

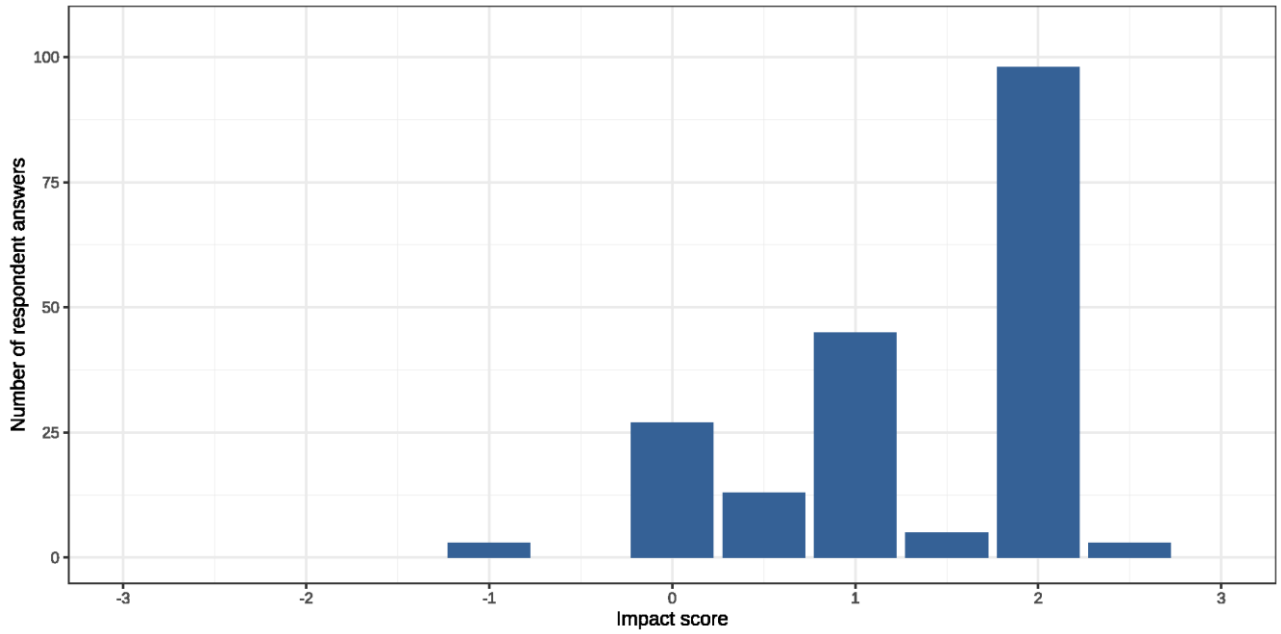


**Figure 31**: Total number of policy expert responses for each of policy instrument impacts (from -3 to +3)

**Interpretation Figure 31**: As can be seen in the figure, the policy experts indicated that the policies are having mostly a positive impact (=2) and a slightly positive impact (=1). It means that, in general, the policy instruments are positively addressing the city challenges. There are still quite some neutral impacts that point out that there is potential for improvement as well.

Similarly to the previous figure, Figure 32 shows the impact on the combined city challenges but now for each of the policy instruments separately. In other words, it provides an estimation of the performance of each policy instrument on the city challenges. It helps to distinguish which policy instruments are contributing most to a negative, neutral or positive impact.

The white tube of the violin plot contains 50% of the expert scores (25$^{th}$ to 75$^{th}$ quantile) and the small blue line inside the white tube is the 'middle' value (median) of the expert scores. The blue round dots indicate the extreme highest or lowest expert scores, and the shaded blue colour in the background of the white tubes indicates the overall distribution of the expert scores.

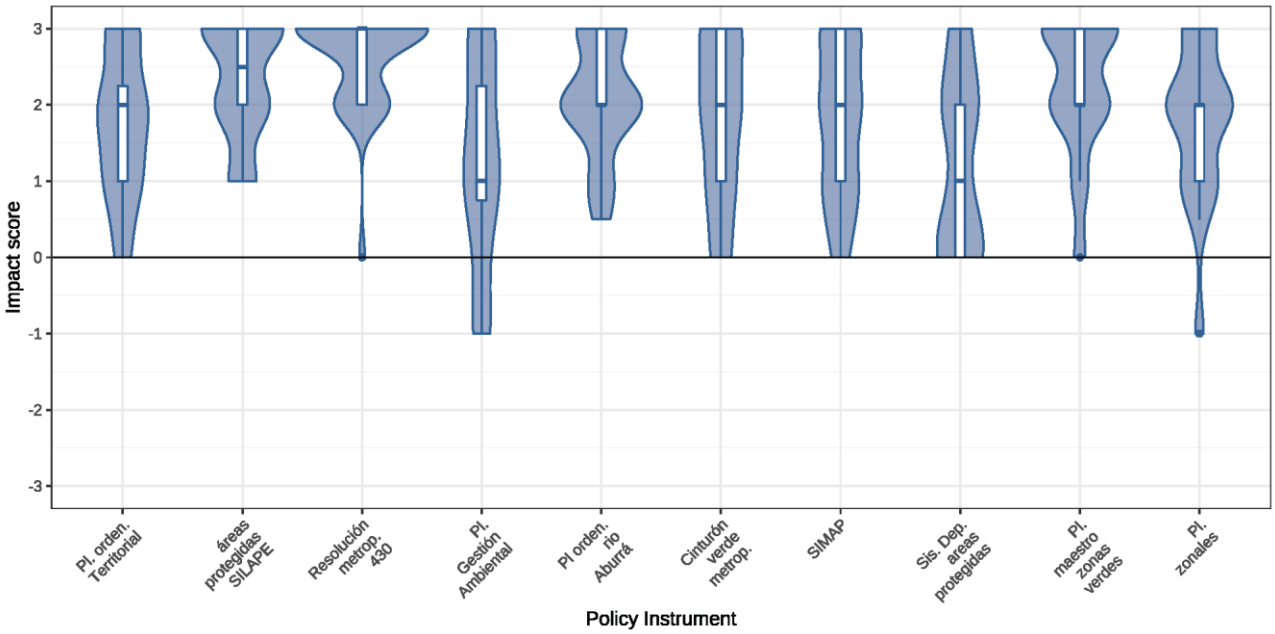


**Figure 32**: Impact of each policy instrument on the city challenges

**Interpretation figure 32:** The figure shows that many instruments have positive impacts. The 'Land-use plans that incorporate protected soils' and Envigado's local system of protected areas 'SILAPE' have the most positive impacts.

Alternatively, the 'Environmental Management Plan' and the 'Departmental system of protected areas' have only slightly positive impacts.

Finally, Figure 33 provides an overview of the impact of each policy instrument on each city challenge. The colour gradient illustrates whether this impact is positive (green), neutral (yellow) or negative (red). The size of the dots provides an indication about the extent to which this impact is highly reliable (bigger dots) or variable (smaller dots), for example due to different city contexts or because of different perceptions among the respondents.

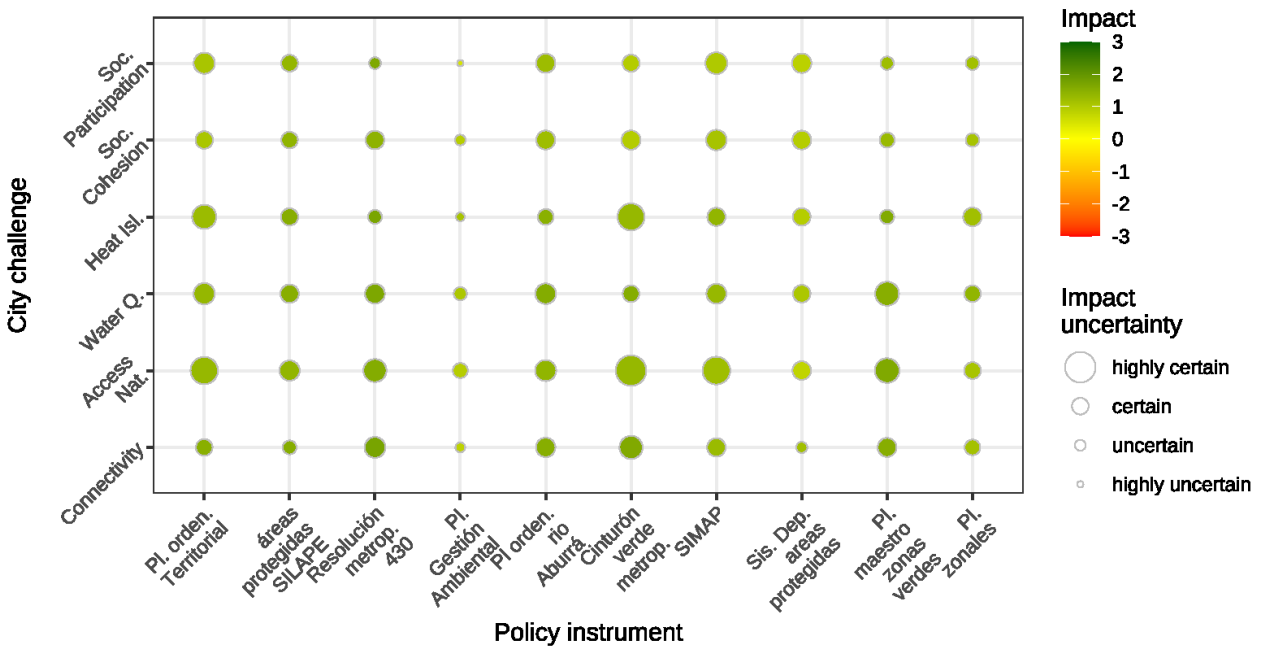


**Figure 33**: Nature (positive or negative) and reliability (certain or uncertain) of each policy instrument impact on each city challenge

In other words, Figure 33 illustrates whether the policy experts consistently indicated a given impact, or if there were variable answers. The small dots in this figure help to determine for example where follow up discussions with policy experts would be warranted to ascertain why there is no consensus among the policy experts over the impact.

Figure 33 can be read either vertically or horizontally. Vertically it provides a measure of performance for each instrument in achieving positive results for key city challenges. Horizontally it provides insights for each city challenge as to whether they are sufficiently addressed by the policy instruments. For example, a lot of neutral or negative values for a city challenge means this challenge is insufficiently addressed by these instruments or even negatively impacted.

**Interpretation Figure 33:**

Vertical interpretation (instruments): Overall, there is no instrument that scores negatively on the city challenges. However, the impact of 'Environmental Management Plan' on each of the city challenges is highly uncertain. This points to either different perceptions on the impact by the policy experts or show that the impact is dependent on the context where the instrument has been applied. The fact that many experts reported that they didn't know the impact of this instrument on the challenges also influences this (see also Figure 34).

On the other hand, the 'Land-use plans that incorporate protected soils' and the 'Metropolitan Green Belt' have positive impacts that are more certain (the experts all agree the impact is positive).

Horizontal interpretation (city challenges): Most of the city challenges seem to be well addressed by the policy mix. Those are least addressed compared to the rest are 'social participation' and 'social

cohesion'. Even if the impact of the policy mix on these two challenges is positive, there is some uncertainty reported by the experts.

## 8.3. Knowledge gaps about impacts

Figure 34 provides an overview of the knowledge gaps reported by the policy experts. This figure is useful to better understand where information is missing on the impact of policy instruments on the city challenges. Dark red cells, for example, indicate that 6 experts have reported that they didn't know the impact of the instrument on a particular challenge. The percentages on the right and the top of the figure indicate the percentage of these missing impact scores per challenge (right side) and per instrument (on top).

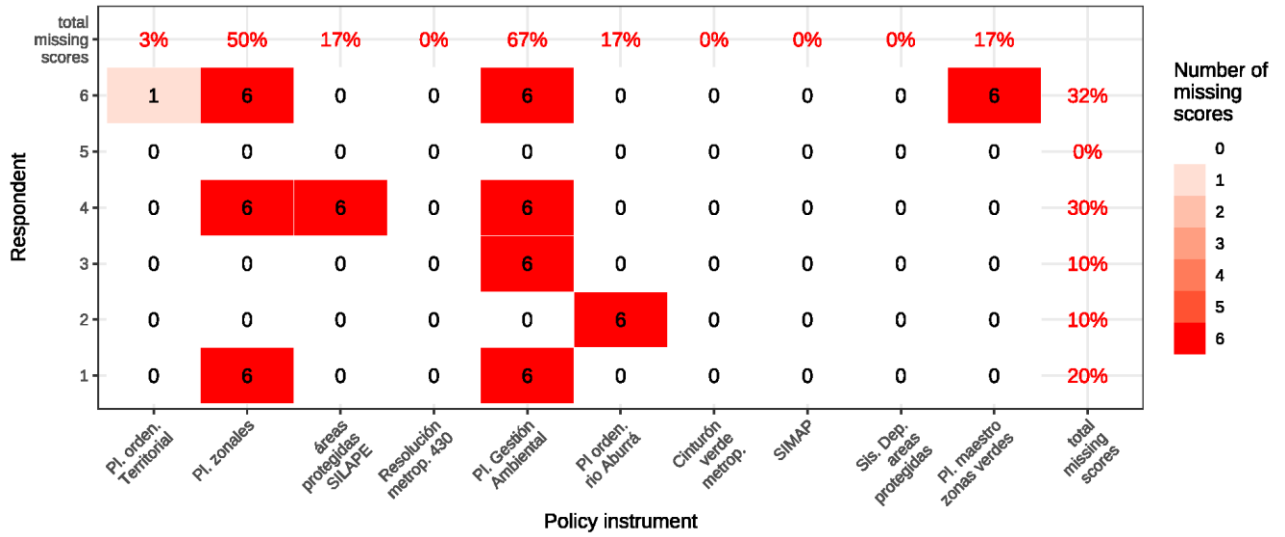


**Figure 34**: Number of missing impact scores by policy experts because they reported not to know the instrument impact on the city challenge (number of respondents: 6)

Results from this figure can be interpreted in two ways: high numbers of missing scores can be due to a lack of knowledge on actual impact and therefore warrant research to determine that impact, or they can point to the need to further pursue this analysis and therefore warrant expanding this analysis to include more experts potentially able of addressing the information gap.

**Interpretation Figure 34:** Most missing scores have been reported for the 'Environmental Management Plan' (67% missing scores) and the 'zonal plans' (50% missing scores). The impact of these instruments is therefore mostly unknown. It may require interviewing additional experts on this instrument or it may be due to current knowledge gaps about the impact.

## 8.4. Coherence of policy instruments

Figure 38 shows an estimation of the coherence of the policy mix. In other words, it helps to determine if the instruments generally work well together, or alternatively if there are many conflicts. This is useful to get a global picture of policy coherence.

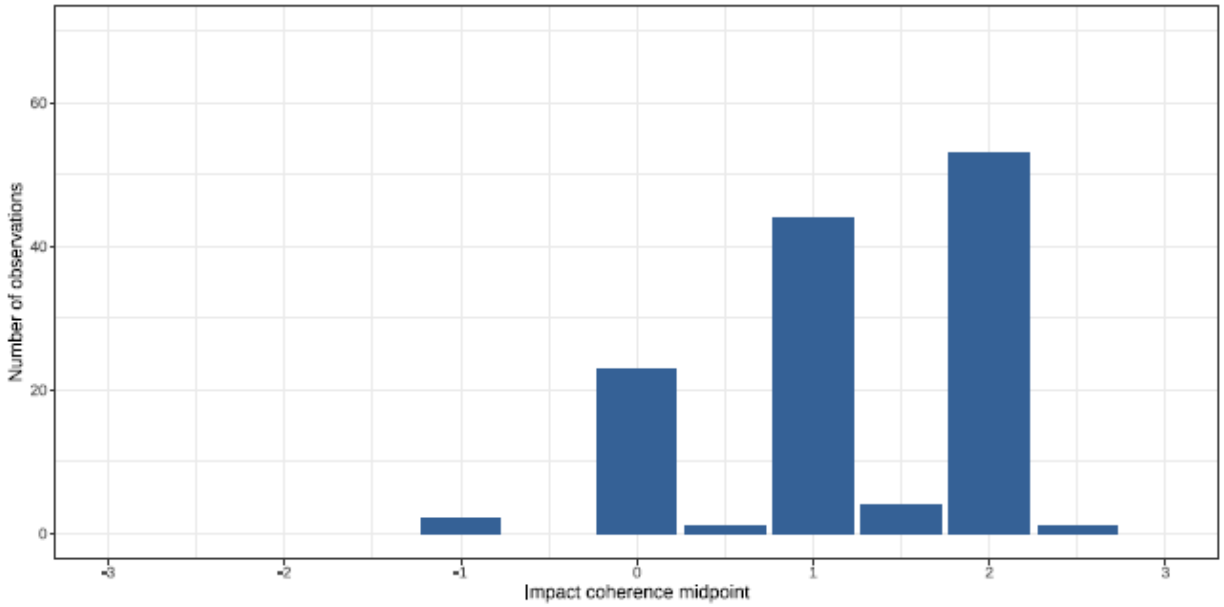


**Figure 35**: Total number of policy expert responses reporting synergies (from 0 to +3) or conflicts (from 0 to -3)

**Interpretation Figure 35:** As can be seen in the figure, the policy experts indicated that the policies are having mostly positive (=2) and slightly positive (=1) synergies. It means that the policy instruments are generally working well together. The policy mix therefore is generally quite coherent, even if there may still be room for improvements as pointed out by quite some neutral synergies (=0).

Figure 36 provides an overview of the synergies and conflicts for each policy instrument towards the others. The colour gradient illustrates whether the relation between two instruments is a synergy (green), neutral (yellow) or a conflict (red). The size of the dots provides an indication about the extent to which this relation is highly reliable (bigger dots) or variable (smaller dots), for example due to different city contexts or because of different perceptions among the respondents.

In other words, Figure 36 illustrates whether the policy experts consistently indicated a synergy or conflict, or if there were variable answers. The small dots in this figure help to determine for example where follow up discussions with policy experts would be warranted to ascertain why there is no consensus among the policy experts over synergies or impacts.

**Interpretation Figure 36:** Most relations between the instruments seem to be well known and are neutral or positive synergies, except for the 'Environmental Management Plan' where there are many uncertainties. These are likely related to a knowledge gap or the need to conduct more interviews with experts (see also Figure 37).

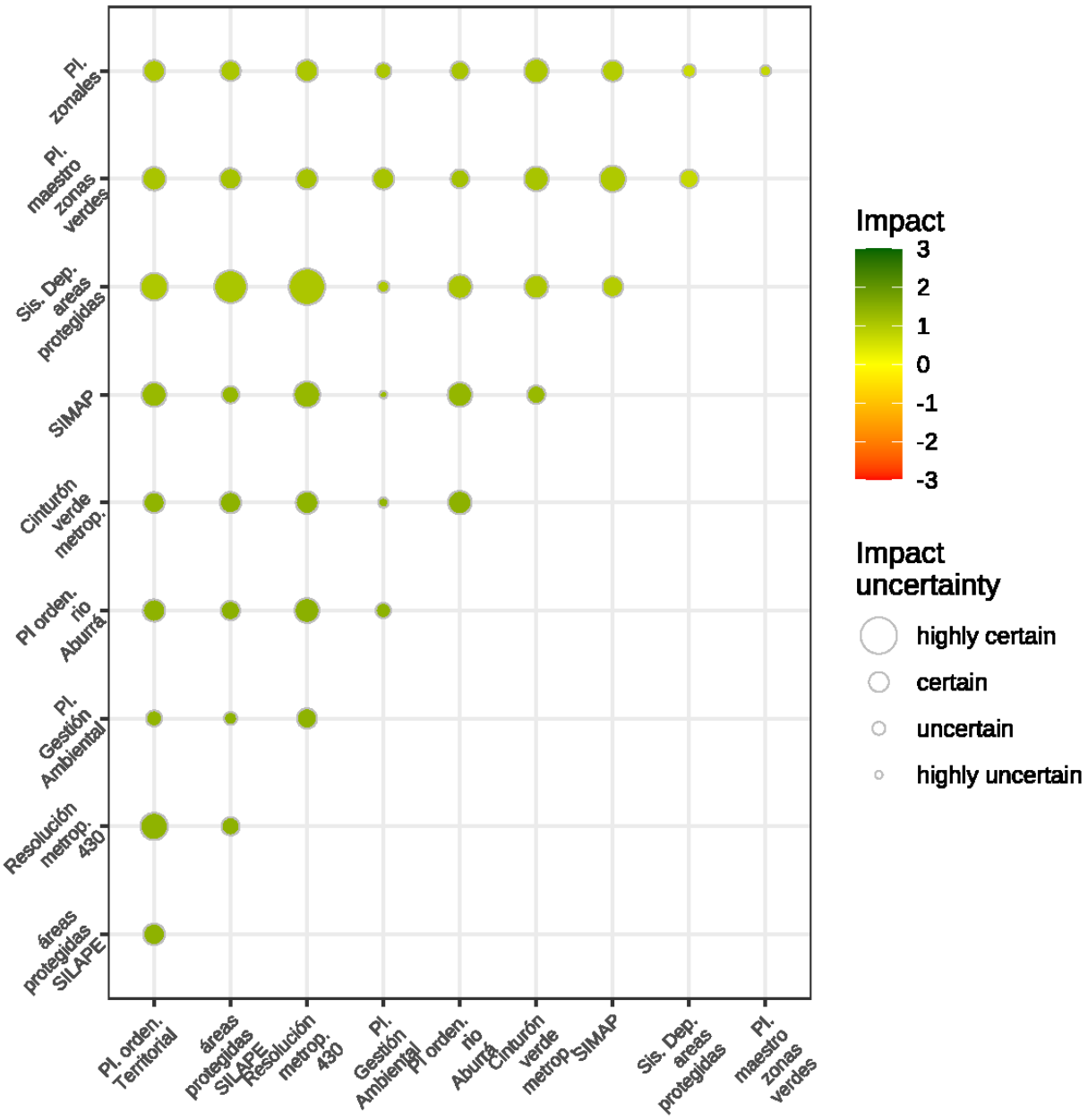


**Figure 36**: Nature (synergy or conflict) and reliability (certain or uncertain) of policy instrument' mutual relation

## 8.5. Knowledge gaps about coherence

Figure 37 provides an overview of the knowledge gaps reported by the policy experts. This figure is useful to better understand where information is missing regarding policy coherence.

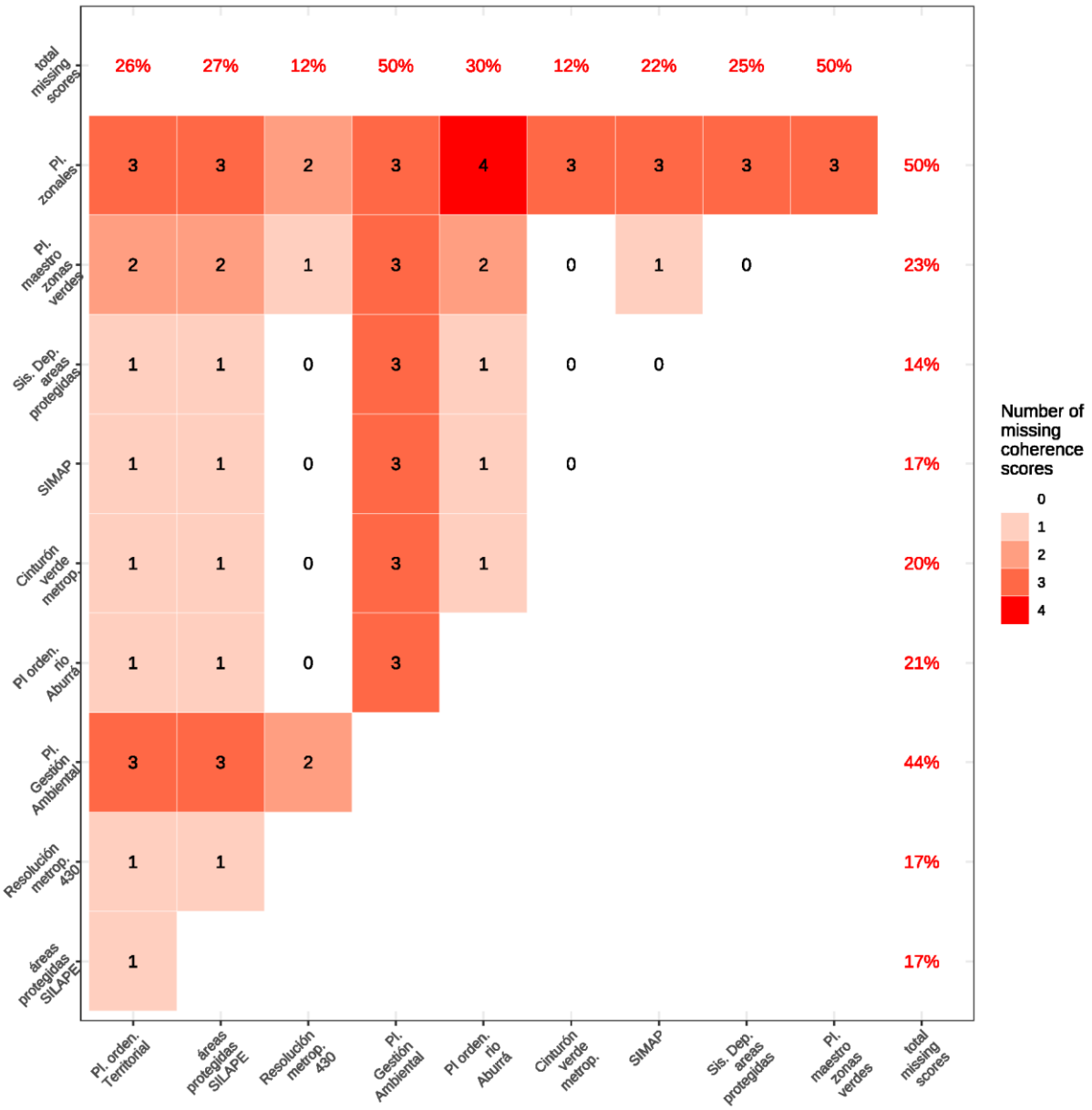


**Figure 37**: Number of missing coherence scores by policy experts because they reported not to know the relation between two given instruments (number of respondents: 6)

Dark red cells, for example, indicate that four experts have reported that they didn't know the relation between two instruments.

Results from this figure can be interpreted in two ways: high numbers of missing scores can be due to a lack of knowledge on either positive or negative relations between instruments, and therefore warrant research to determine this relation; or can point to the need to further pursue this analysis and therefore warrant expanding this analysis to include more experts potentially able of addressing the information gap.

**Interpretation Figure 37:** The relation of the 'Environmental Management Plan' and the 'Zonal plans' with the other policy instruments have been reported by half of the experts as unknown. This points to a potential knowledge gap or the need to interview more experts on these instruments.

# 9.CBIMA

## 9.1. Policy instruments

The impact of ten policy instruments (Table 10) on three city challenges (Table 11) were evaluated during a workshop by eight policy experts in CBIMA. For each of the instruments policy experts have been selected that have operational knowledge of their implementation. Their respective names have been kept anonymous.

**Table 10**: List of policy instruments selected for CBIMA

| Policy instrument |
|---|
| Politica Nacional para la recuperación de la cobertura arbórea y resguardo de las areas de protección de ríos, quebradas, arroyos y nacientes<br>*National policy for the recovery of tree cover and protection of the protection areas of rivers, streams, creeks, and springs.* |
| Decreto de establecimiento del CBIMA decreto N° 40043 de MINAE<br>*Decree of establishment of the CBIMA decree N° 40043 of MINAE.* |
| Plan de gestión local del CBIMA<br>*CBIMA Local Management Plan* |
| Ley para la Gestión Integral de Residuos N° 8839<br>*Law for the Integral Management of Waste N° 8839* |
| Plan regulador de Montes de Oca<br>*Montes de Oca Regulatory Plan* |
| Plan regulador de Curridabat<br>*Curridabat Regulatory Plan* |
| Plan regulador de San José<br>*San José Regulatory Plan* |
| Plan regulador de La Unión<br>*La Unión Regulatory Plan* |
| Ley de la Biodiversidad N° 7788<br>*Biodiversity Law N° 7788* |
| Ley Forestal N° 7575<br>*Forestry Law N° 7575* |

**Table 11**: List of city challenges for CBIMA together with the abbreviations used for the PolCA analysis

| Abbreviation | City Challenges |
|---|---|
| Rec. biosphere & env. edu | Reconnecting with the biosphere and environmental education |
| Health & welfare | Health and human welfare |
| Green space. & access | Green space management and accessibility |

| Abbreviation | City Challenges |
|---|---|
| Nat. tree cover plan & PA | National policy for the recovery of tree cover and protection of the protection areas of rivers, streams, creeks, and springs. |
| Dec. N°40043 MINAE | Decree of establishment of the CBIMA decree N° 40043 of MINAE. |
| Local man. Plan CBIMA | CBIMA Local Management Plan |
| Int. waste man. Law N°8839 | Law for the Integral Management of Waste N° 8839 |
| Reg. plan Montes de Oca | *Montes de Oca Regulatory Plan* |
| Reg. Plan Curridabat | *Curridabat Regulatory Plan* |
| Reg. Plan San José | *San José Regulatory Plan* |
| Reg. Plan La Unión | *La Unión Regulatory Plan* |
| Biodiv. Law N°7788 | *Biodiversity Law N° 7788* |
| Forest Law N°7575 | *Forestry Law N° 7575* |

The results of this analysis are presented in two sections: the first relates to the respondents perceived impact of the policy instruments on the selected city challenges and the second to the respondents' perceived synergies and conflicts between the policy instruments. For each section there is a short summary on knowledge gaps identified in the responses from the experts.

## 9.2. Impact of policy instruments on city challenges

Figure 38 shows an estimation of how well the given policy mix performs regarding the city challenges. In other words, it provides an estimation of how well all the policy instruments coherently work together to address all the city challenges. This is useful to get a global picture of instrument versus challenge performance.

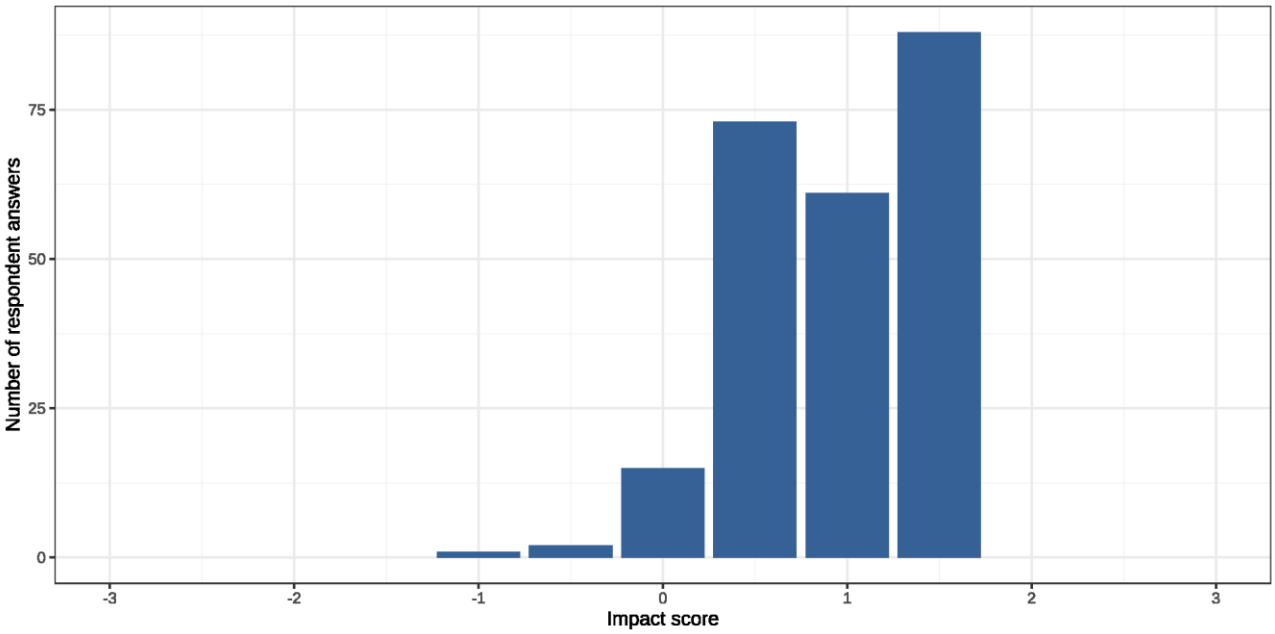


**Figure 38**: Total number of policy expert responses for each of policy instrument impacts (from -3 to +3)

**Interpretation Figure 38**: As can be seen in the figure, the policy experts indicated that the instruments are having mostly a slightly positive impact (=1). It means that the policy instruments are not adversely affecting the city challenges, yet there is room to improve their impact.

Similarly to the previous figure, Figure 39 shows the impact on the combined city challenges but now for each of the policy instruments separately. In other words, it provides an estimation of the performance of each policy instrument on the city challenges. It helps to distinguish which policy instruments are contributing most to a negative, neutral or positive impact.

The white tube of the violin plot contains 50% of the expert scores (25$^{th}$ to 75$^{th}$ quantile) and the small blue line inside the white tube is the 'middle' value (median) of the expert scores. The blue round dots indicate the extreme highest or lowest expert scores, and the shaded blue colour in the background of the white tubes indicates the overall distribution of the expert scores.

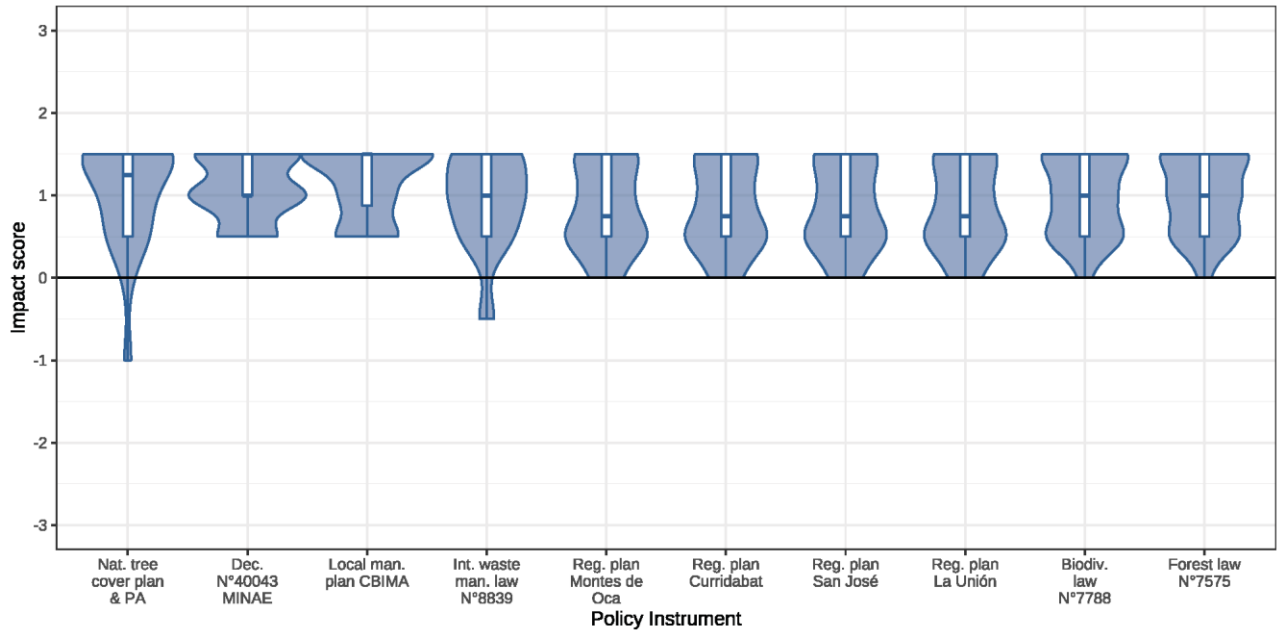


**Figure 39**: Impact of each policy instrument on the city challenges

**Interpretation Figure 39:** The figure shows that similarly to the global overview provided by Figure 38, the instruments all have a slightly positive impact. There is no instrument that has a significatively lower or higher impact compared to the others.

Finally, Figure 40 provides an overview of the impact of each policy instrument on each city challenge. The colour gradient illustrates whether this impact is positive (green), neutral (yellow) or negative (red). The size of the dots provides an indication about the extent to which this impact is highly reliable (bigger dots) or variable (smaller dots), for example due to different city contexts or because of different perceptions among the respondents.

In other words, Figure 40 illustrates whether the policy experts consistently indicated a given impact, or if there were variable answers. The small dots in this figure help to determine for example where follow up discussions with policy experts would be warranted to ascertain why there is no consensus among the policy experts over the impact.

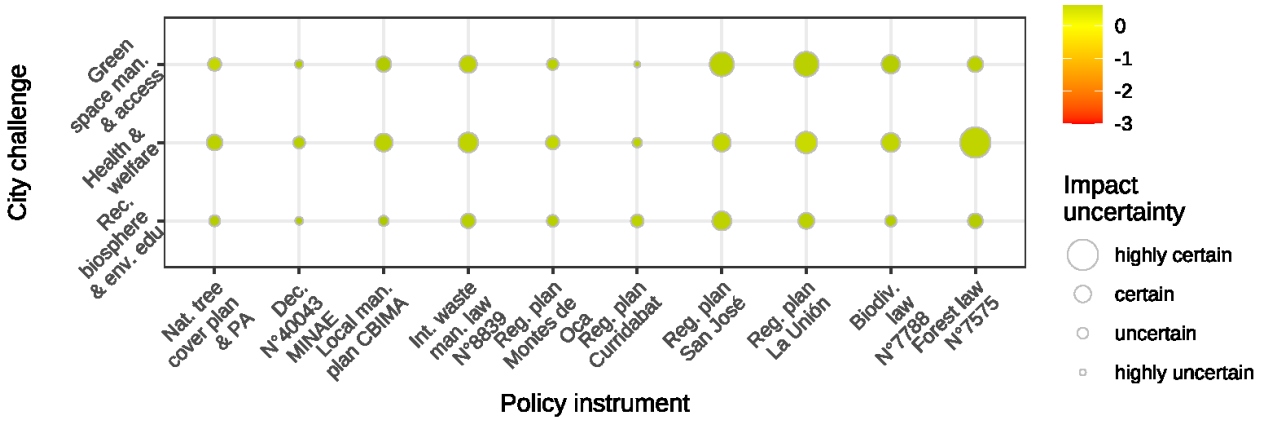


**Figure 40**: Nature (positive or negative) and reliability (certain or uncertain) of each policy instrument impact on each city challenge

Figure 40 can be read either vertically or horizontally. Vertically it provides a measure of performance for each instrument in achieving positive results for key city challenges. Horizontally it provides insights for each city challenge as to whether they are sufficiently addressed by the policy instruments. For example, a lot of neutral or negative values for a city challenge means this challenge is insufficiently addressed by these instruments or even negatively impacted.

**Interpretation Figure 40:**

Vertical interpretation (instruments): Overall there is no instrument that scores negatively on the city challenges. The positive impact of the 'forest law' on health and welfare is reported as highly certain, and likewise, the positive impact of the regulation plans from San José and La Union on green space management and access are also quite certain for all the policy experts.

This is less clear for the regulation plans from Curridabat and Montes de Orca on each of the 3 challenges, and also for the 'Decree of establishment of the CBIMA decree N° 40043 of MINAE'.

Horizontal interpretation (city challenges): The three city challenges identified in CBMI are relatively well addressed by the policy mix. The effect of the policy mix on the 'reconnection with the biosphere' and 'environmental education' is less certain however, yet it is mostly positive.

## 9.3. Knowledge gaps about impacts

No missing score have been reported by the policy experts in CBIMA, which points out that there are no knowledge gaps regarding the impact of the instruments on the three city challenges.

## 9.4. Coherence of policy instruments

Figure 41 shows an estimation of the coherence of the policy mix. In other words, it helps to determine if the instruments generally work well together, or alternatively if there are many conflicts. This is useful to get a global picture of policy coherence.

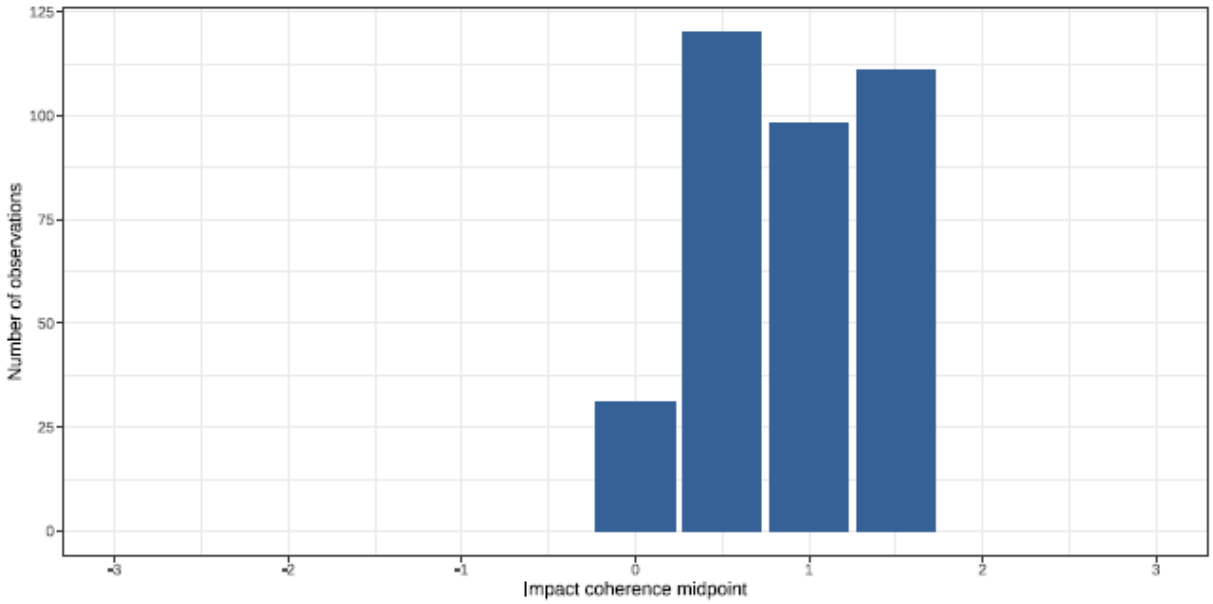


**Figure 41**: Total number of policy expert responses reporting synergies (from 0 to +3) or conflicts (from 0 to -3)

**Interpretation Figure 41:** As can be seen in the figure, the policy experts indicated that the policy instruments are having mostly slightly positive (=1) synergies (=2). It means that the policy instruments are generally not impacting each other a lot, and when they do, this impact is mostly a slight synergy. The policy mix therefore is generally quite coherent, even if there is room to improve synergies.

Figure 42 provides an overview of the synergies and conflicts for each policy instrument towards the others. The colour gradient illustrates whether the relation between two instruments is a synergy (green), neutral (yellow) or a conflict (red). The size of the dots provides an indication about the extent to which this relation is highly reliable (bigger dots) or variable (smaller dots), for example due to different city contexts or because of different perceptions among the respondents.

In other words, Figure 42 illustrates whether the policy experts consistently indicated a synergy or conflict, or if there were variable answers. The small dots in this figure help to determine for example where follow up discussions with policy experts would be warranted to ascertain why there is no consensus among the policy experts over synergies or impacts.

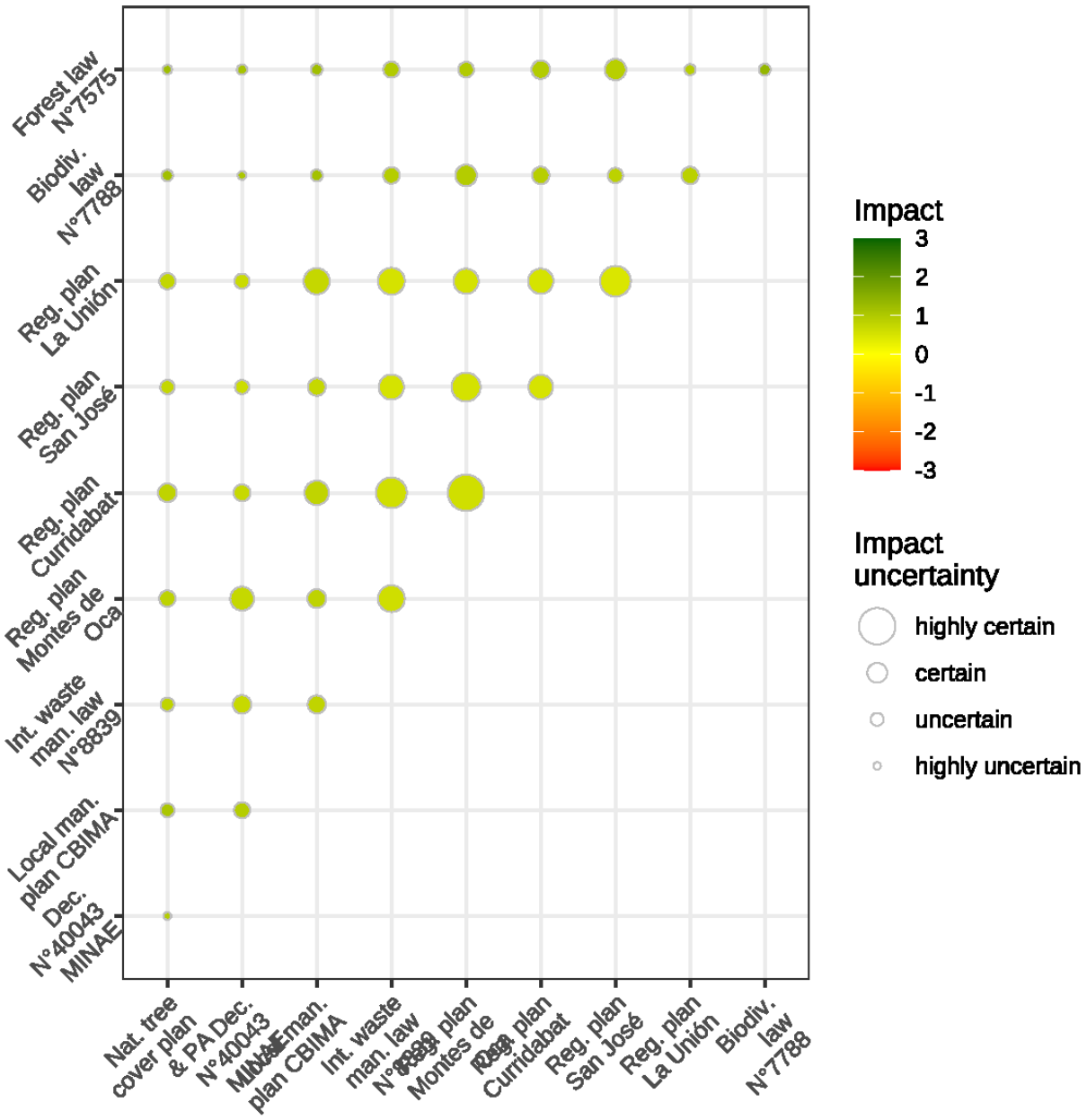


**Figure 42**: Nature (synergy or conflict) and reliability (certain or uncertain) of policy instrument' mutual relation

**Interpretation Figure 42:** Most relations between the instruments seem to be well known and are neutral or positive synergies. However, for the 'forest law' and the 'national tree cover plan' the relation with the other instruments is uncertain to highly uncertain. This means that the synergy is either depended on variable contexts or the experts have different perceptions on the strength of the synergy.

There is one, highly certain, positive synergy between the 'regulation plan from Montes de Oca' and the 'regulation plan from Curridabat'. This could point out to a potential example of a successful synergy between the two areas.

## 9.5. Knowledge gaps about coherence

No missing score has been reported by the policy experts in CBIMA, which points out that there are no knowledge gaps regarding the coherence of the instruments.

# 10. References


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## Project Partners

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