# INGSA INCLUSIVE Project EVIDENCE

## REVIEW

## The impact of Language choice and Culture in Policy and Science Advice in Europe

A view from Linguistics and Translation studies

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## Executive Summary

This review explores factors influencing language choice and the impacts on science-policy dialogues within the European context. Through an analysis of academic studies, policy documents, and publications in different languages, the review shows the important role language plays in shaping policy discussions and outcomes.

Key Findings:

- Language as a Strategic Tool: beyond being a medium of communication, language emerges as an important tool that can either bridge stakeholders in the science-policy ecosystem or create divisive barriers. Language can actively shape relationships and dynamics within the science-policy ecosystem.
- Influence on Policy Framing: the nuances of language choice impact the way scientific data is presented and understood, particularly in policy contexts. In a linguistically diverse region like Europe, this choice can either foster collaboration by embracing linguistic diversity or inadvertently create barriers.
- Overarching Significance: the choice of language in science-policy dialogues affects the foundation of how scientific insights are integrated into policy decisions. Especially in contexts such as Europe, where policies resonate across nations with varied linguistic backgrounds.

In essence, this review shows the criticality of language choice in European science-policy discussions. It shows how explicit consideration of language choices in the sources of evidence and their use, can lead to better-informed and more robust policy outcomes. Future policymaking would benefit from incorporating linguistic assessments, and recognising potential biases a language choice might introduce. Policymakers might consider fostering inclusivity, promoting multilingual representations, and possibly creating linguistic advisory panels to guide communication strategies.

## Contents

## 1. Introduction

The connection between language and culture significantly shapes science-policy dialogues, especially within the linguistically diverse continent of Europe. The importance of language choice extends beyond communication tasks, and extends into questions of cultural identity, inclusion, and policy effectiveness (Márquez & Porras, 2020). Multilingualism in Europe, deeply rooted in its historical progression, presents both a challenge and an opportunity in modern-day science-policy discussions (Bruen, 2005). This review seeks to address the importance of language choice in these dialogues, utilising the form of a systematic review and drawing, primarily, on insights from Linguistics and Translation studies, to comprehend its impact.

### 1.1 Multilingualism in Europe: Historical and Contemporary Views

Europe's historical trajectory has created a rich construct of languages, reflecting the continent's cultural, political, and social heterogeneity (Sonntag & Cardinal, 2015). The Holy Roman Empire's linguistic diversity, the linguistic imperialism of colonial periods, and the subsequent rise of nation-states each contributed to the multilingual character recognised today, with the added challenge of immigration and concerns for heritage languages that stem from outside the Union (Schmidt et al., 2022). Contemporary Europe continues to promote linguistic diversity, with the European Union (EU) itself advocating for multilingualism as a means of preserving cultural heritage and ensuring equal representation within its institutions (Pan, 2008). Along with historical circumstances and economic developments, English has been known as the language of science since the 1960s. In 1995, over 95% of publications were in English, followed by French, German and Russian. This has created a pressure for scientists to publish in English to reach a larger international audience (Tardy, 2004).

Maybe not surprisingly, countries with more than one national language appear to have more of an invested interest in creating dedicated language policies that govern the dissemination of information. Within Europe's diverse linguistic landscape, these may concern topics such as legacy of suppressive regimes and the ensuing linguistic revival, linguistic diversity and identity or bilingualism in education. Movements in regions like Catalonia (Gobierno de España, n.d.) and Ireland (Irish Department of Social Protection, 2023) are pushing for local languages in scientific discourse, echoing broader efforts to enhance policy inclusivity (Byrne, 2020). The stark contrast between Switzerland's multilingualism (Bundeskanzlei BK, n.d.) and Belgium's linguistic divide (Brans et al., 2022) highlights the urgency for inclusive communication strategies in science (Herbinaux et al., 2022). In areas like post-Soviet Ukraine, language policies are pivotal in shaping local identities, but also scientific collaboration and representation at the European level (Denber, 2022). Meanwhile, Finland's bilingualism in scientific contexts underscores the necessity for adaptable language policies (Ministry of Justice Finland, n.d.). Collectively, these instances serve as examples for the critical role of linguistic diversity in creating more inclusive and effective scientific discourse across Europe.

The choice of language in these dialogues can significantly affect operational efficiency, inclusivity, and the democratic nature of scientific exploration and policymaking. It determines who 'has a voice' and who remains unheard (Joint Research Centre, 2022). As such, understanding the historical context of Europe’s linguistic landscape is a vital component in addressing the complexities faced in integrating multilingualism into science policy. This approach is essential for fostering cooperative

international and interdisciplinary research infrastructures, ultimately influencing how scientific knowledge is democratically constructed, shared, and utilised in policymaking across Europe.

### 1.2 Language Choice in Science-Policy Dialogues

Within contemporary science-policy discussions, language assumes an important role. Scientific advice, increasingly pertinent in shaping policies, necessitates clear, accurate, and accessible communication to bridge the gap between scientific evidence and policy decisions for all participants and recipients (Davies, 2021; Orthia et al., 2021; Silvia & Neresini, 2012). The choice of language becomes pivotal in topics such as:

- Facilitating collaborations across nation-states, ensuring that scientific findings and discussions permeate political borders.
- Enhancing communication among practitioners, aiding them in navigating complex scientific and technical jargon.
- Improving practitioners' career opportunities by broadening their reach and understanding, especially concerning grey literature available primarily in local languages.

### 1.3 Rationale for an adapted Systematic Review

The aim of this systematic review is to not only highlight the operational use of language but also address its symbolic role in representing cultural issues within scientific advice contexts. By including studies across multiple languages this review aims to ensure a more comprehensive coverage and diverse representation, avoiding the biases that might arise from a purely Anglo-centric perspective. Due to the nature of the project, an argument will be made to produce a systematic review that is based on PRISMA[1] guidelines but adapted to the needs of the project (Page et al., 2021).

### 1.4 Research Questions and Themes for the Review

The primary research questions (RQs) guiding this systematic review are:

> **RQ1: How does language choice affect the operational use of language in science-policy discussions?**
>
> **RQ2: How is language used as a proxy for different cultural issues in the context of science advice?**

These questions lead to a number of themes that the review will focus on, including the role of language in science-policy interfaces, opportunities and challenges of multilingualism, translation, and cultural nuances. As such, language in science-policy discussions is not a neutral medium. It contains cultural, social, and political undertones, shaping not only the information that policymakers receive and interpret, but also the information that is then put to the public (Mair et al., 2019). The role of language extends beyond simple translation or linguistic comprehension; it involves conveying

[1] Preferred reporting items for systematic review and meta-analysis protocols

scientific data and concepts within culturally relevant contexts that resonate with policymakers' values and belief systems (Scharfbillig et al., 2021). Misinterpretations due to linguistic nuances could lead to policy inefficacies or unintended societal implications. Individuals have their own values and personal histories which shapes how they make sense of the world around them. One policy context could need to be enacted differently, depending on the location, such as with a high socio-economic demographic and one with high local unemployment (Cross, 2009).

Multilingualism in Europe, while a cultural asset, poses unique challenges in science-policy discussions. The multiplicity of languages can lead to information silos, where crucial scientific findings are inaccessible due to language barriers (Joint Research Centre, 2022; Márquez & Porras, 2020). However, it also presents an opportunity for more inclusive and representative dialogues. Countries and institutions can learn from best practices that have been put forth in some places. Policies advocating for language diversity could encourage sharing scientific knowledge published in a smaller language, fostering a more holistic understanding of issues.

One of the pivotal hurdles in multilingual science-policy interfaces is the complexity involved in translating scientific material (Machen, 2018; Stone, 2012). This task is not merely about literal translation but also includes the transposition of cultural meanings, scientific terminologies, and context-specific nuances. Inaccuracies in scientific translation can lead to significant misrepresentations, potentially influencing policy decisions adversely. In 2021, the Virginia Department of Health website (US), used a marketing firm that did not offer translation services to supply Covid-19 and vaccine information to Spanish speakers. They reportedly used Google Translate, and instead of "the vaccine is not required", it read as "the vaccine is not necessary"[2]. There is a need for high-quality, precise translation services and the incorporation of linguists experienced in scientific terminologies to mitigate these challenges.

Language serves as a reflection of culture, and in science-policy discussions, therefore understanding cultural nuances is imperative. When scientific advice is devoid of cultural considerations, it risks alienation, reducing the impact of scientific evidence on policy. Recognising language as a proxy for cultural issues can guide more effective communication strategies, ensuring that the context surrounding scientific data is appropriate and relatable for diverse audiences (Márquez & Porras, 2020).

Focusing exclusively on English language studies and grey literature inadvertently imposes a linguistic hierarchy, marginalising non-English scientific contributions (Finlay et al., 2021; Machado et al., 2016; Márquez & Porras, 2020; Navarro et al., 2017). This practice undermines the EU's principle of linguistic diversity and inclusivity, as well as the key themes addressed in this review. As a result, it was found that including research and grey literature in various European languages is essential to capture a wide spectrum of perspectives and insights, enriching science-policy dialogues.

The interconnection between language and culture is pivotal in shaping effective science-policy discussions in Europe. This review underscores the necessity of recognising the influence of language

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2 https://multilingual.com/google-translate-causes-vaccine-mishap/?utm_source=ZohoCampaigns&utm_campaign=MultiLingual+News+Weekly&utm_medium=email&mc_cid=34a2af6807&mc_eid=537e599128

choices and addressing the challenges posed by Europe's linguistic diversity. Emphasising high-quality translation, understanding cultural underpinnings, and incorporating studies across European languages will enhance the inclusivity and efficacy of science-policy interfaces. Using culturally relevant expressions or metaphors can make communication more engaging and understandable to recipients (Márquez & Porras, 2020). Ultimately, acknowledging and respecting linguistic and cultural diversity in scientific advice is a cornerstone for sound, democratic policymaking in a diverse continent like Europe. Tackling issues such as climate change and environmental degredation needs to be built on value and belief systems of individual nations to be engaging, and successful. Here, the European Green Deal aims for environmentally sustainable behaviour through addressing potentially conflicting values in a positive way (Rahal, 2021; Scharfbillig et al., 2021).

## 2. Methods

This section outlines the methodology employed for the adapted systematic review, detailing the comprehensive approach taken and its challenges to capture a wide array of perspectives on the role of language and culture in science-policy dialogues within Europe.

### 2.1 Eligibility Criteria

The eligibility criteria for sources were formulated to ensure a broad yet relevant scope, acknowledging the historical power dynamics that influence present-day scientific communication. The criteria were designed to be inclusive, considering sources that might be traditionally overlooked due to accessibility issues, language barriers, or alternative publication formats. The methodology, while inspired by PRISMA, was adapted to address the unique challenges posed by the linguistic diversity inherent in European scientific discourse. This adapted approach aimed to ensure that sources that would have been excluded by following a strict PRISMA format were included.

### 2.2 Information Sources

Information sources included both academic literature and grey literature, acknowledging the disparity in accessibility between languages and the fragmented nature of grey literature (Benzies et al., 2006; Rothstein & Hopewell, 2009). The European Commission's documents were a useful source due to their comprehensive coverage and accessibility. CORDIS was used to access EU research results and reports. The review also faced challenges with certain grey literature databases, underscoring the need for a consolidated database and highlighting systemic accessibility issues. It was observed that many of the dedicated grey literature databases are no longer active, and some provided archived content only. For this review, these databases included OpenGrey, EAGLE and GreyNet International. However, grey literature can yield valuable insights and individual institutional and governmental websites were consulted when specialised databases proofed less insightful. It has to be noted that this particular literature review aims to align itself with specific topics and adjacent academic disciplines (Rothstein & Hopewell, 2009). As a result, a considerable amount of grey literature was deemed unsuitable for the review.

### 2.3 Search Strategy

The search strategy was created to be more open than restrictive, incorporating a variety of terms in several European languages to ensure a comprehensive and inclusive approach. The strategy was designed to avoid some Anglo-centric biases (Nzomo et al., 2016; Wong et al., 2023).

A list of keywords based on the two research questions was developed. For the concept of “operational uses of language”, some of these included:

- "language use in science-policy discussions"
- "mechanics of language in science advice"
- "multilingualism in scientific communication"

- "interpreting and translation in science policy"
- "language choices in backstage science-policy discussions"
- "translation of science advice for the public"

For research question two, “Language as a proxy for different cultural issues”, they included:

- "language as a cultural proxy in science advice"
- "impact of language on cultural identities"
- "ethnic communities and language in science-policy"
- "language representation in regional science advice"
- "cultural implications of language in science communication"

In addition, different Boolean Operators here used to combine keywords and phrases to refine the search. The searches where repeated with the keywords translated to German, French, Spanish, Portuguese, Italian, Swedish and Norwegian.

### 2.5 Data Collection Process

Data collection required detailed gathering and interpretation of content while preserving original context and cultural nuances. The process aimed to ensure a diverse dataset for analysis. The languages included in the review were chosen based on the author’s ability to read and understand the languages (Nzomo et al., 2016). This allowed for a review that was not based on machine or human translation mechanisms.

The exploration of these diverse resources revealed information on the interplay between language, culture, and science-policy, highlighting the need for inclusive communication strategies in the scientific domain. The systematic approach showed the challenges posed by language barriers and the importance of considering cultural nuances in science-policy dialogues.

In this section, the outcomes of the systematic review are presented, detailing the selection and characteristics of the studies including an assessment of the risk of bias, and the limitations identified throughout this research.

# 3. Results

## 3.1 Study Selection

Following the search strategy outlined in the methodology, a diverse body of literature was identified, encompassing a range of languages, publication types, and cultural contexts. The initial search yielded a substantial number of studies, of which a significant proportion met the inclusion criteria following a rigorous screening process. These studies were further evaluated for their relevance and contribution to the research questions, resulting in a refined set of primary sources that formed the basis of this review. Study selection aimed to ensure a diverse representation of perspectives, with each source being evaluated for its relevance, contribution to the research themes, and authenticity. Publications since 2000 were considered. Study type and publication location were not included in exclusion criteria to increase the visibility of studies published in languages other than English.

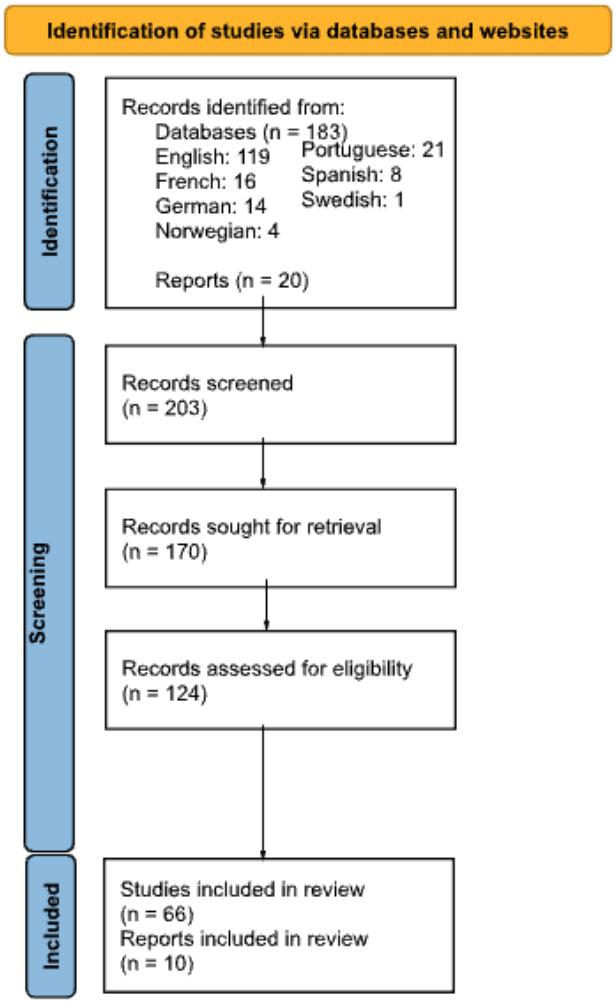


*Figure 1: Adapted PRISMA flow chart.*

### 3.2 Study and Report Characteristics

The studies included in this review varied considerably in terms of their scope, methodology, and linguistic and cultural focus. They ranged from detailed analyses of language use in specific science-policy contexts to broader examinations of the role of language and culture in scientific discourse. Several studies provided insights into the operational use of language in these settings, while others explored the symbolic and representational aspects of language, particularly in relation to cultural identity and inclusivity. The linguistic diversity of the sources was notable, with studies conducted in several European languages, reflecting the multilingual nature of the scientific community in Europe. However, the absence of publications in certain languages was also noted. Based on the search results, no studies published in Italian were found relevant to the topic. Only one study in Swedish, and four in Norwegian were included based on search results.

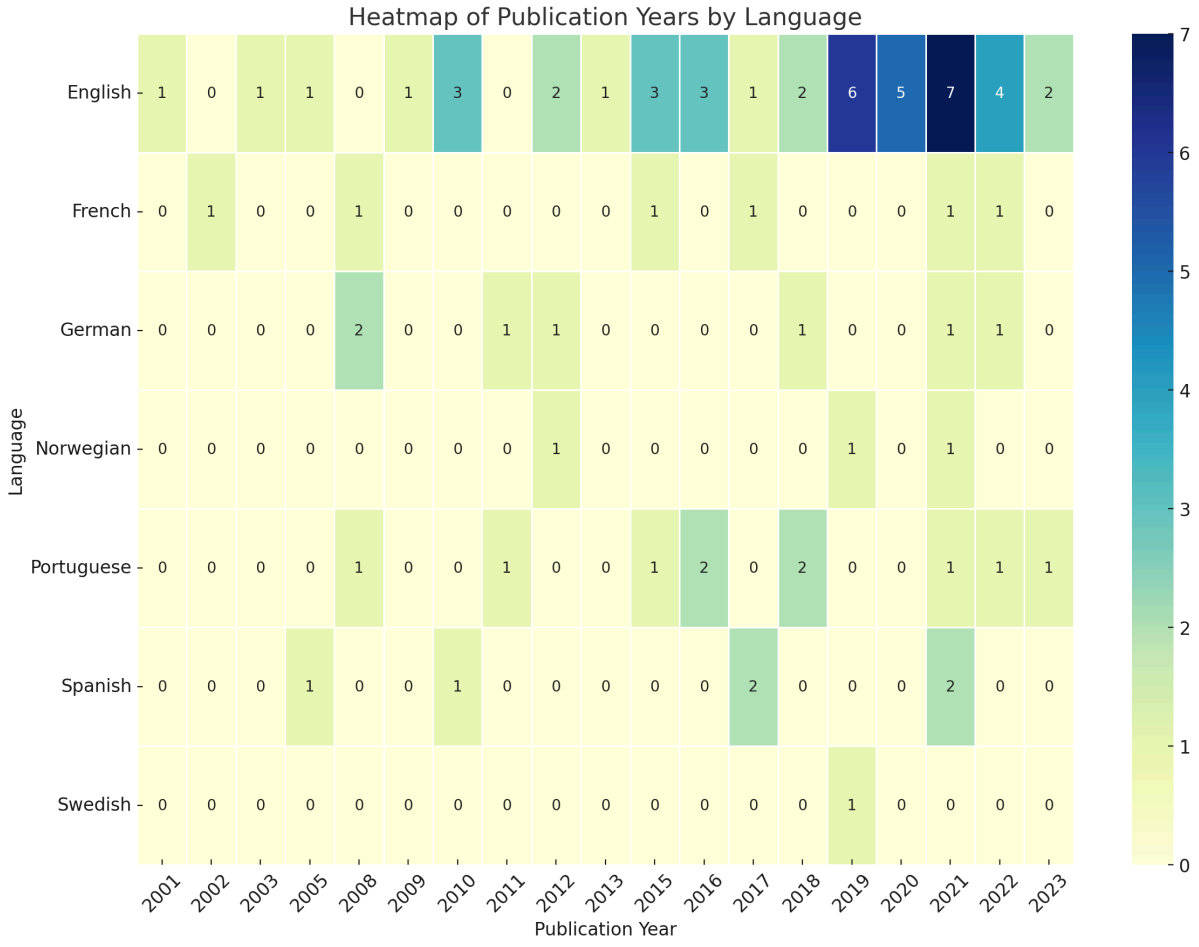


*Figure 2: Distribution of articles across years and languages.*

For the following insights into the studies, an automated method was used. Latent Dirichlet Allocation (LDA) is a statistical model that is instrumental in uncovering the latent thematic structure within a corpus of text, making it a valuable tool for categorising topics in a PRISMA literature review. By analysing the distribution of words across documents, LDA can discern patterns that correspond to topics, which are essentially clusters of terms that frequently occur together. In the following the (translated) titles of the articles were used as a corpus to visualise three potential topics. By providing

a high-level view of the thematic landscape, LDA can aid in the efficient selection and categorization of studies for deeper review, thereby streamlining the workflow and enhancing the comprehensiveness and precision of systematic reviews. In the latter review, sub-topics and themes were identified to provide more qualitative insights to the selected literature.

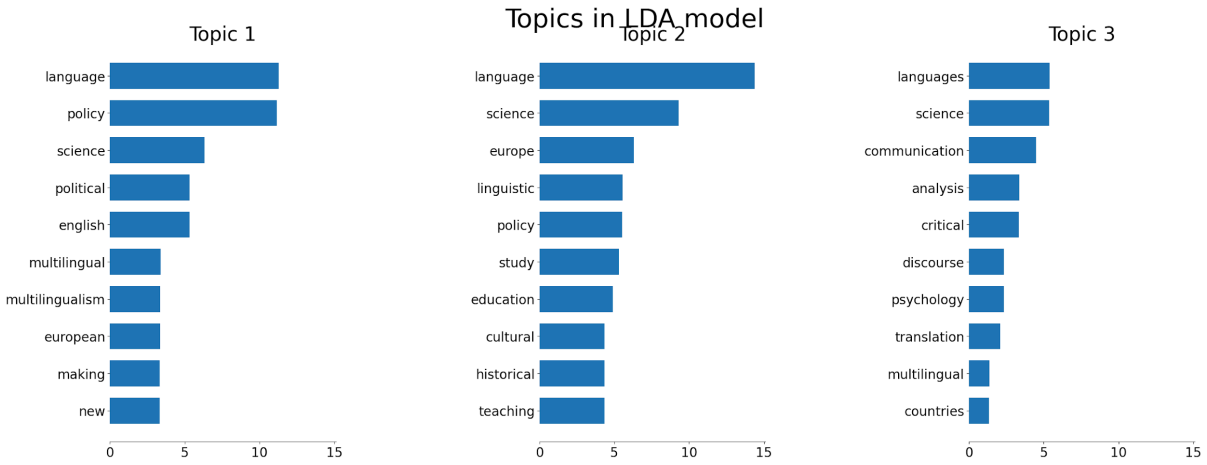


*Figure 3: Possible automatic topic distribution using LDA.*

The three topics derived from the (translated) titles of the articles may be summarised as follows:

- Topic 1 seems to focus on linguistic diversity and education within Europe, with keywords like "language," "policy," "Europe," "science," "education," "diversity," "translation," "study," "teaching," and "new." This suggests a cluster of articles dealing with language policy, translation studies, and the teaching of languages.

- Topic 2 appears to revolve around science communication and political aspects of language, with terms such as "science," "communication," "political," "language," "scientists," "european," "making," "languages," "understanding," and "decision." This could indicate a group of articles discussing how science is communicated in political contexts, possibly in a multilingual European setting.

- Topic 3 likely covers language policy and linguistic analysis in the context of science and education, with words like "language," "science," "policy," "linguistic," "analysis," "education," "languages," "multilingual," "perspective," and "historical." This topic may represent articles that analyse the role and development of language and policy in scientific and educational fields, possibly from a historical or multilingual perspective.

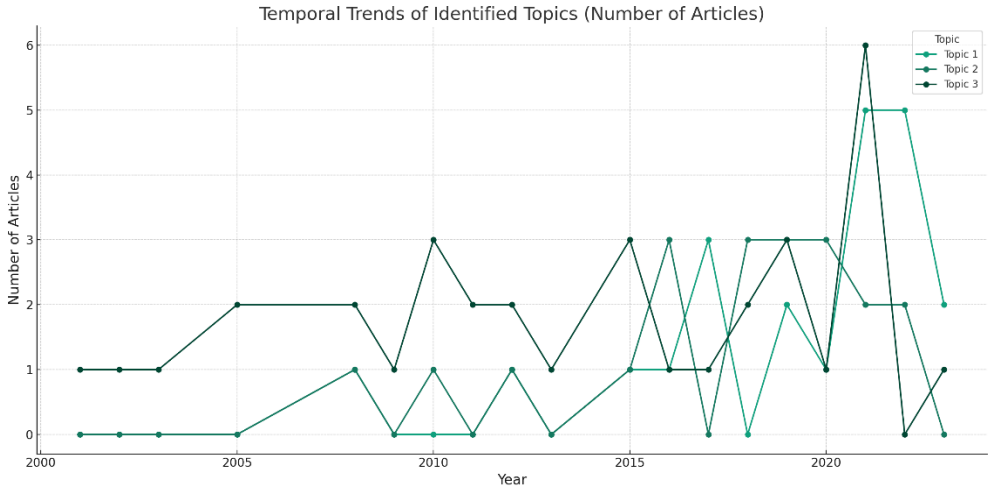


*Figure 4: Temporal trends of articles of identified topics.*

- Topic 1 shows a general upward trend over the years, with some fluctuations. This suggests that discussions or publications related to linguistic diversity and education within Europe have been increasing over time, with some periods of heightened focus.
- Topic 2 has more variability with several peaks and troughs throughout the years. This pattern could indicate that the intersection of science communication and political aspects of language has been subject to periodic interest, possibly aligning with specific political events, policy changes, or shifts in the scientific discourse.
- Topic 3 also exhibits an overall upward trend, with notable peaks in certain years. This could reflect an increasing interest or concern in language policy and linguistic analysis in scientific and educational contexts, with particular years showing a significant surge in attention, possibly due to policy changes, educational reforms, or other influential factors.

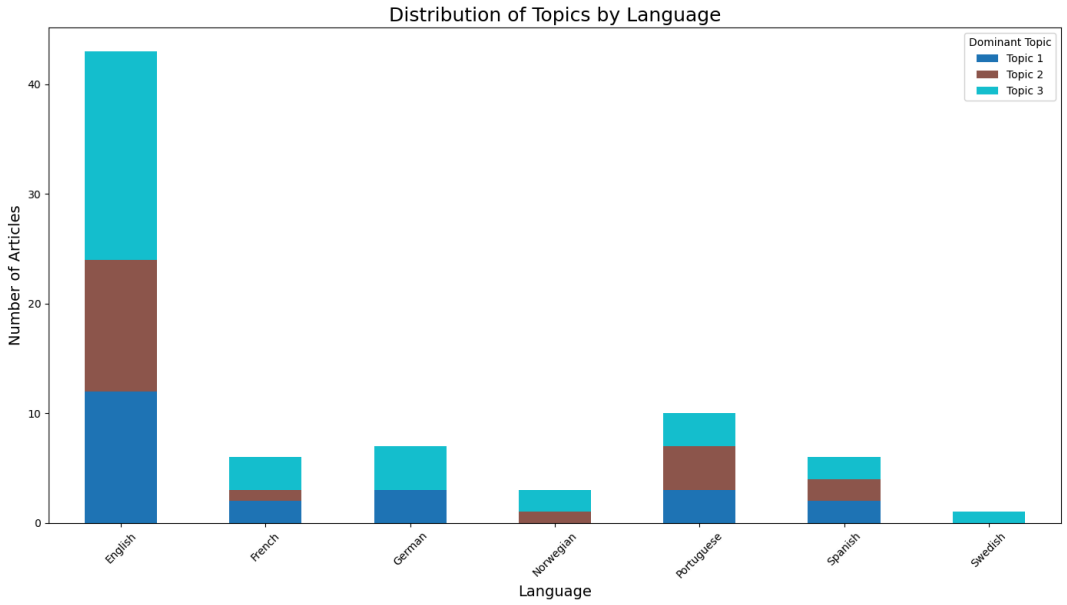


*Figure 5: Distribution of topics across languages*

The stacked bar chart visualises the distribution of the three identified topics across the different languages in the dataset. Each colour represents one of the three topics, and the height of the coloured segments indicates the count of articles for that topic within each language category. It can be observed that for most languages, all three topics are present, with a fairly equal distribution.

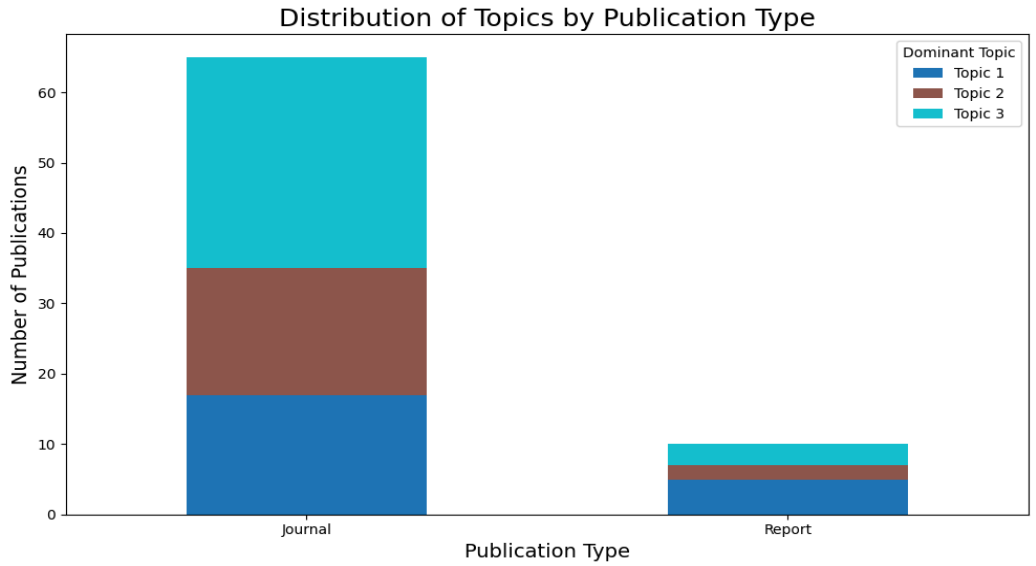


*Figure 6: Distribution of topics across publications*

Each topic appears in both journals and reports, suggesting that the topics covered are relevant across both types of publications. A topic that is more represented in journals might indicate more academic or research-oriented discussions, while a topic prevalent in reviews could suggest practical applications or industry-focused discussions.

### 3.3 Risk of Bias

The risk of bias within the selected studies was considered. One of the primary factors influencing this aspect was the researcher's access to and comprehension of the various languages in which the studies were published. While efforts were made to include a diverse range of languages, the analysis was still predominantly conducted in English, due to the sheer volume of publications and, to a lesser extent, other widely spoken European languages. This focus potentially introduced a bias towards studies accessible in these languages, limiting the scope of perspectives and insights. Furthermore, studies in languages that the author of this review does not have sufficient reading proficiency in were not included.

### 3.4 Limitations

Access to literature in less widely spoken languages was limited, both due to the availability of these studies in public or academic databases and the researcher's linguistic capabilities. This limitation is particularly relevant given the focus on linguistic and cultural diversity in science-policy dialogues, as it suggests a potential underrepresentation of certain perspectives and contexts within the review.

This emphasises the importance of linguistic inclusivity and access in scientific research and highlight potential areas for improvement in conducting future systematic reviews in this field. It also highlights the necessity of developing strategies and resources to support multilingual research practices, particularly in the context of Europe's rich linguistic landscape.

# 4. Discussion

This section discusses the dynamics between language choice and its operational use within science-policy discussions, exploring the cultural, institutional, and communicative dimensions that underpin this relationship. Furthermore, it examines how language serves as a proxy for broader cultural issues, reflecting societal values and influencing science advice. The section is divided into two parts, according to the two primary research questions and the resulting themes within them.

## 4.1 Impact of Language Choice on Operational Use in Science-Policy Discussions

The choice of language influences the operational use of language in scientific and political discussions, particularly in Europe. This choice extends beyond mere communication, also reflecting and shaping political attitudes, identities, and even national policy (Guardiano et al., 2007; Rose, 2008). In scientific discourse, the language employed can either facilitate or hinder the conveyance of information, influencing how discussions are conducted and understood. Europe has been seen to employ a multi-lingual approach, whereas most nation states within the EU utilise a single national language. National languages can help to build a cohesive identity. The EU has created programmes, such as SOKRATES to strengthen the presence of all official and community languages in the EU (Schreiner, 2006). Moreover, learning a second language affects how individuals communicate within academic and professional contexts, potentially altering the expression and interpretation of ideas in science and policy dialogues. Meaning is created through the use of specific words, and these are associated with social and cultural aspects and represented in needs – hunger, heat, work, affection. They define how individuals use them, as well as how they are learned (Rodríguez & Martinez, 2017). The following sections address the themes discussed in the literature for this first research question.

### 4.1.1 Cultural Reflection in Language Use

Language functions as a reflection of societal values and norms. The prevalence of English in scientific discourse, often referred to as the "English Effect," has far-reaching implications, potentially overshadowing other languages and cultural perspectives. Notably, the British Council is still promoting the use of English (British Council, 2013). However, it is acknowledged that establishing English as the language of science originally aimed to serve as a lingua franca to facilitate science exchange. Still, it has been found that this dominance can shape the cultural and social contexts of science-policy dialogues, sometimes leading to disadvantages for non-native English speakers due to linguistic nuances.

In regions like Catalonia, language choice is a reflection of sociopolitical dynamics, often mobilised to assert political attitudes and identities (Byrne, 2020). In Belgium, bilingual universities no longer exist and education is coordinated by the regions instead, leading to the development of distinctive

approaches to disciplines, including political science and policy (Brans et al., 2022). This phenomenon underscores the cultural and political weight that language choice carries, influencing not just communication but also identity expression and group dynamics. The choice of language can have broader social and political implications, affecting the distribution of resources among linguistic groups and the processes of linguistic planning in various contexts (Alarcón, 2005), thereby reproducing status differences and privileges among social groups. In the European public space, language plays a crucial role in political communication. The choice of language can affect understanding and shape power dynamics. Language acts as a form of soft power, influencing how political messages are conveyed and received (Rose, 2008). The use of a lingua franca, such as English, can have both advantages and disadvantages. While it facilitates communication and access to international scientific networks, non-native speakers may feel disadvantaged compared to native English speakers (Guardiano et al., 2007). Within scientific and political discussions, language has a significant impact on the operational language use. The language used in these discussions can shape the expectations and attention of the participants. It should be noted that the bias to produce English output is not limited to academic or policy settings, but also palatable in global mass media. This can mean that scientists working in other languages are not given a voice. The Forbes online science division is currently aiming to increase coverage of science stories from low and middle-income countries (Márquez & Porras, 2020).

### 4.1.2 Institutional Language Policies and Their Influence

Language policies, whether at national, sub-national, or local levels, play a crucial role in these discussions. Historical and political backgrounds often influence these policies, with entities like the European Commission advocating for "mother tongue plus two" to preserve linguistic diversity. However, it has also been criticized for potentially fostering a hegemony of widely used languages and undermining linguistic diversity instead (Tender & Vihalemm, 2009). These policies can significantly impact the inclusivity and comprehensiveness of scientific discussions and policy-making processes.

Language policies within institutions are deeply intertwined with national sentiments and political agendas, influencing educational systems, public discourse, and even the dynamics of nation-state formation (Krzyżanowski & Wodak, 2010). These policies can reproduce differences in status and privilege among linguistic groups, highlighting the need for a broader approach that considers the role of language in politics, including the formulation of policies and the persuasion of political actors (Shore, 2010). However, it is also acknowledged that the unprecedented speed of technological change and skill shortages have contributed to the increasingly complex issue of managing policy issues (European Commission, 2021). This extends to international collaboration. Utilising existing legal or administrative entities to form joint research efforts may be suitable in some cases. Yet others may benefit from creating a bespoke construct that is explicitly tailored to the international collaboration that is envisioned (Organisation for Economic Co-operation and Development - Global Science Forum, 2010). These efforts come with their own challenges as it has been noted that the interface of science to policy may lack skilled or capable people motivated enough to work on overcoming these barriers. However, bridging the gap takes passionate individuals who are willing to work on this area, despite potential resistance from the field. (United Nations Environment Programme, 2020).

### 4.1.3 Navigating Translation and Communication

Translation, essential for bridging linguistic divides between science and policy, presents its own set of challenges, particularly with scientific terminologies. Notably, these are often not addressed in dedicated studies, but rather mentioned as outcomes in adjacent literature. Some studies have been conducted in medical settings, showcasing the need for accurate translation and interpretation. Here it becomes evident that interdisciplinary approaches are necessary, for example, Karwacka (2014) reports on the translation issues of a case in Germany, where 47 patients were harmed in 2007 due to an incorrect translation. The original medical study (Fakler et al., 2007) mentioned the translation error that led to incorrect knee implants in a side note and discussed procedural and policy issues instead.

Misinterpretations can also lead to policy inefficiencies, underscoring the need for effective strategies, possibly including advanced automatic translation, to enhance understanding between scientists and policymakers. Some academic journals have started to provide abstracts translated into other languages through automated tools. This practice could ensure that research findings are not only published or translated into English, but also translated from English into a broader set of languages, fostering multilingual communication between researchers internationally (Márquez & Porras, 2020). Scientific findings and recommendations must be presented in a language understandable to decision-makers to ensure their effectiveness (Buchholz, 2008). This often requires translating scientific findings into the local language to ensure that the information is properly understood by decision-makers in specific use-cases. Medical translation aims to reproduce valid instruments that are culturally adapted to the target audience (Mattern & Ayerle, 2021). However, the terminology used in scientific research may differ from the language used in policymaking, leading to confusion and difficulties in translating scientific knowledge into policy actions. An example is persistence of different terminologies for the same concepts relevant to recommendations, such as micronutrient recommendations. These are established by (inter)national committees of experts and are used by public health-policy decision makers to monitor and assess the adequacy of the diets of population groups and are set by each country. Differing terminology is coupled with different recommendations that are based on the scientific evidence that a country chooses to rely on, further complicating the discourse (Dhonukshe-Rutten et al., 2010).

Language choice sets the tone for discussions, influences the presentation of information, and affects interpretation and understanding (Machen, 2018; Stone, 2012). In the realm of scientific communication, there has been an increase in the use of English as the dominant language since 1967, leading to a decrease in scientific records in other languages and potentially limiting access to scientific information for non-English speakers (Márquez & Porras, 2020). Not only that, but it may also limit publication opportunities for non-English speaking researchers. Some suggestions have included publishing the same work in multiple languages (Moura, 2023; Navarro et al., 2017; Primack, 2001; Rocher & Stockemer, 2017). In political contexts, language plays a crucial role in policy formulation and the persuasion of political actors, necessitating a more comprehensive approach that acknowledges the role of language in politics (Shore, 2010). Politics in individual country contexts has a distinctive and recognisable tone (Certeau et al., 2002). In the European context, the availability of translated materials for all member states also addresses the notion of access for all and linguistic fairness. Economically and socially disadvantaged individuals are often

less likely to speak languages other than their own (Gazzola, 2016). However, it was found during the review that while institutions such as the European Commission often have reviews available in other languages, this is not always the case.


*Figure 7: Example of changing the language for content on the EC website*

Figure 7 shows an example in which the language was changed when reading the details of a review. The reviews themselves are not available in languages other than English, and the content on the page is only available as machine translated content.

### 4.1.4 Embracing Linguistic Diversity and Inclusivity

The choice of language carries implications for inclusivity in science-policy dialogues. The global dominance of English poses a threat to linguistic diversity, highlighting the need to uphold multilingualism and ensure representation of varied cultural perspectives and values in scientific discourse (Márquez & Porras, 2020; Scharfbillig et al., 2021; Souza, 2021).

The debate over language choice also extends to discussions about democracy and multiculturalism (Archibugi, 2005). The dominance of English in scientific communication limits the accessibility of scientific knowledge across nation states, a running theme in this review and underscoring the need for more inclusive language policies that consider linguistic diversity (Ferguson, 2015). The choice of language is not just a matter of power and exclusion; in some contexts, it can be a form of political resistance. Language policies can also have implications for social justice and the recognition of linguistic rights. For instance, the use of Welsh as a language of resistance has been an important component in identity building of language learners past and present (Hodges, 2021). In the context of multilingualism and recognition of minority languages, Souza (2021) discusses how languages spoken by smaller groups of people can gain official status and recognition. Language policies that recognise and support minority languages can contribute to a more inclusive and diverse scientific discourse. Here, it is also notable that Spanish and Portuguese are recognised as the second largest languages of publication after English today, when it used to be German and Russian (Gradim & Piñeiro-Naval, 2019).


*Figure 8: Landing page of the 2023 "European Day of Languages"*

Multiculturalism and the celebration of languages is evident in the Council of Europe's initiative, the "European Day of Languages" as shown in Figure 8. It is made evident that an appreciation for languages is actively constructed. Individuals that have no access to languages other than their own still need to be included in science advice.

### 4.1.4 Conclusion

The choice of language in science-policy discussions is a complex issue with significant operational implications. For the EU, it has been suggested that the approach of full translation and interpretation is both reasonably cost-efficient, and most effective at not disadvantaging anyone (Gazzola, 2016). Overall, language choice reflects political attitudes, influences public and institutional policies, and plays a crucial role in the inclusivity and accessibility of scientific discourse. The nuances of language choice and its impact on various aspects of communication within scientific and political realms highlight the need for a conscious, reflective approach to language use, promoting open, respectful, and productive discussions. Understanding the role of language in these contexts is crucial for effective communication and decision-making in science-policy dialogues.

## 4.2 Language as a Cultural Proxy in Science Advice

Language choice extends beyond operational considerations, serving as a proxy for cultural issues and playing a pivotal role in the inclusivity and diversity of science advice.

Language not only facilitates communication in science advice but also acts as a cultural proxy, reflecting diverse societal values and complexities (Pan, 2008). The nuances of plurilingualism, cultural diversity, and language ideologies significantly influence this role, necessitating a sensitive

approach to language use in science advice as well as science education contexts (Lee, 2003; Lemmi et al., 2019; Vailatti, 2021; Wilmes & Siry, 2018). Language is a powerful tool for the expression and transmission of ideas, knowledge, and experiences, and its use in science advice can play a fundamental role in fostering understanding and addressing cultural issues.

### 4.2.1 Upholding Language Rights and Diversity

Plurilingualism supports the inclusive communication of scientific knowledge, accommodating Europe's linguistic diversity and promoting equitable access to scientific information (Alarcón, 2005; Armand et al., 2008; Wilmes & Siry, 2018). This approach respects cultural differences and acknowledges the intrinsic value of various linguistic traditions in conveying scientific knowledge. Additionally, studies like that of Cruz and Loureiro (2008) or Rødal (2012) emphasise the importance of health professionals acting in accordance with patients' cultural values, highlighting that the concepts conveyed can endorse specific cultural values. In the face of globalisation and the dominance of certain languages in scientific discourse, language rights allow for the inclusive communication of scientific knowledge and promote equitable access to information. Plurilingualism supports Europe's linguistic diversity and respects cultural differences (Márquez & Porras, 2020).

### 4.2.2 Educational Implications of Language Choice

The educational landscape significantly influences societal language attitudes. Promoting plurilingualism within educational systems is crucial for nurturing comprehensive understanding and respect among diverse European citizens (Lee, 2003). Plurilingualism, which is the use of multiple languages, is an important aspect of language education policy in Europe (Wilmes & Siry, 2018). It recognises and values diverse communicative resource use, including the use of different languages, in scientific communication. Plurilingualism allows for a more equitable view of language use and removes the emphasis on the use of discrete sets of national languages. A language-exclusive ideology proposes that a certain language is expected in a science class, while a language-inclusive ideology accepts multiple languages as appropriate for scientific discourse. While the use of mother tongues in science education fosters a deeper understanding, the pervasive use of English as a lingua franca poses challenges, demonstrating the need for a balanced approach in language use for science communication education (Extra, 2016; Lee, 2003; Lemmi et al., 2019). In education, the emphasis on culturally relevant pedagogy and the role of language in shaping educational experiences and outcomes. (Francesco Dotty, 2022; Ribeiro & Schaun, 2015; Siry & Gorges, 2019; Tleuzhanova et al., 2020; Ziegler, 2013). Language influences how students perceive and interpret scientific concepts (Ribeiro & Schaun, 2015). Teachers and researchers act as cultural mediators, using language as a tool to explore cultural issues and promote scientific literacy (Vitti & Azevedo, 2018; Ramos & Guimarães, 2022).

### 4.2.3 Societal Discourses and Roles

In the context of science advice, language is used as a means of communication between scientific experts and policymakers. Scientific institutions in Europe provide advice to government agencies on technical matters. Science advice can also be linked to societal roles, reflecting cultural hegemony, and influencing public policy narratives (Dahan & Guillemot, 2015; Gluckman et al., 2021). The

interaction between scientific and administrative experts in the provision of science advice involves the use of language to convey complex scientific concepts and findings.

The language used in these discourses mirrors cultural norms and identities, shaped by underlying language ideologies that can either be exclusive or inclusive (Lemmi et al., 2019). These ideologies, in turn, affect the reception and interpretation of scientific advice, highlighting the need for science advisors to be adept in culturally sensitive discourse. Communication in science advice is not a one-way street, but rather can act as a bridge to interconnect practices between different actors, such as scientific experts, strategists, or knowledge brokers (Hoppe, 2009). In addition, language is not a prerogative of adults, but pertains to all participants in society, including a country's youth who often have not only specific requirements in policy formulations, but also in the use of language (Akselberg, 2019). One key aspect to consider is the historical institutional analysis of language policy choices at different levels, which highlights the influence of domestic institutional environments, including state, sub-state, and local levels, on language policy decisions and includes participants serving various roles in a society (Royles & Lewis, 2019). The communication of science then also becomes an important driver of democracy, a vehicle to drive trust in science and creates opportunities across Europe. Technology has changed how information is communicated and opened opportunities to share insights, but has also created more ways for mis- and disinformation about contentious issues to be spread. The aim is to provide evidence in response to societal challenges that will help to create science-informed debates as well as policy making (Science Europe, 2022).

### 4.2.4 Engaging Communities and Shaping Perceptions

Community-specific needs and the perceptions of science communication practitioners can influence public trust and policy reception. Effective policy planning and service delivery, aligned with community engagement, are paramount in shaping positive public perceptions. The significance of language in science-policy discussions is often overlooked in the history of science. Language has implications for nation-building, education, publication, and transnational exchanges and how individuals engage with it. Communities are built through aspects, such as a common geography, common values, a shared history, and/or a shared language. Education can often bring those elements together (Gordin & Tampakis, 2015).

The language used in community engagement initiatives significantly impacts public trust and the reception of scientific advice. Science communication practitioners must be mindful of community-specific needs and perceptions, utilising language that resonates with different audiences (Cruz & Loureiro, 2008). This strategy ensures that scientific advice is not only understood but also valued, fostering a collaborative relationship between scientists, policymakers, and the public.

In the context of Europeanisation, the relevance of languages and multilingual communication for social policy and solidarity has been recognised (Marácz, 2016). However, the importance of a multilingual language policy is likely to increase following the UK's withdrawal from the European Union (Gazzola, 2016; Melvina, 2019; Saraceni, 2017).

### 4.2.5 Conclusion

In science advice, language often serves as a cultural proxy, intricately linked to societal values, educational systems, and community engagement strategies. The effective use of language, considering plurilingualism, cultural diversity, and language ideologies, or the beliefs and assumptions people have about languages, is paramount in ensuring that scientific advice is accessible for policy makers and the public, including those from a range of cultural identities. As demonstrated in this section, embracing linguistic diversity and upholding language rights enhances the relevance and reception of science advice across Europe's multifaceted cultural spectrum. There is an ongoing exploration of language's social and cultural practices, reaffirming the critical role of language in various and seemingly diverse fields such as health, education, and teacher training.

### 4.3 Synthesis of Results

The findings underscore the multifaceted role of language in science-policy discussions. Language choice impacts operational efficiency, cultural representation, and the inclusivity of diverse perspectives. The challenges of translation, the nuances of institutional language policies, and the societal implications of language use in educational and community contexts highlight the need for a more integrated approach. The literature shows the profound influence of linguistic and cultural nuances on public engagement, policy implementation, and educational strategies in scientific discourse.

- Language as a Cultural Proxy: in the context of scientific advice, particularly in Europe, language acts as a symbol for various cultural issues. The choice and use of language in scientific discourse can both reflect and shape cultural beliefs and norms, influencing how scientific advice is perceived and implemented.

- Multilingualism and Linguistic Diversity: Europe's linguistic diversity is critical in scientific contexts. The dominance of English in science raises concerns about cultural representation and the need to preserve multilingualism. Ensuring that scientific advice is available in multiple languages is essential for representing different cultural values and perspectives.

- Communication and Understanding in Science-Policy Interfaces: effective communication between scientists, policymakers, and stakeholders is pivotal. Language choice significantly affects the interpretation and translation of scientific findings, impacting the effectiveness and clarity of policy advice.

- Historical and Institutional Influences on Science Language Policies: language policies in scientific advisory contexts have been shaped by historical events and political contexts. The European Union's language policy, for example, has implications for scientific collaboration, education, and transnational exchanges.

- Scientific Communication and Education: the role of language in scientific communication, especially in education, is demonstrated. The importance of teaching science in familiar languages and the challenges posed by the dominance of English in scientific communication are discussed.

- English as a Lingua Franca in Science: the prevalence of English as the dominant language in scientific discourse has significant implications for traditional language policies and the balance with other languages in scientific advice and education.

- Impact on Health and Prevention Campaigns: language is key in health campaigns and public health advice. Studies show the need for culturally sensitive approaches to effectively communicate health information and preventive measures.

- Critical Analysis of Language in Science Advisory Contexts: critically analysing language use in scientific advisory settings is important to ensure inclusivity and avoid biases. This involves understanding how language choices can influence policy recommendations and public perception of science.

### 4.4 Summary of Evidence

Evidence, particularly from non-English studies, provides insights into the cultural dimensions of science-policy dialogues. These studies underscore the importance of linguistic diversity and the nuanced understandings provided by different cultural perspectives. The contrast between academic and grey literature further enriches this understanding, offering a more holistic view of the implications of language choice in science-policy interfaces.

The studies on language choice in scientific argumentation and literacy highlight the broader implications of language use in science. They collectively show the need for communicators to be adept in navigating cultural subtleties to make science more accessible and relatable (Ramos & Guimarães, 2022; Moura, 2023). The choice of language in scientific communication can endorse specific cultural values, affecting adherence to preventive campaigns and the broader understanding of scientific concepts (Cruz & Loureiro, 2008). Professionals in health and education sectors must consider cultural values and employ appropriate language to ensure greater adherence and inclusivity (Valentim, 2018).

Language serves as a critical proxy for diverse cultural issues within the realm of scientific advisory in Europe, reflecting and transmitting cultural values, beliefs, and social norms. It plays a pivotal role in how scientific concepts are communicated, understood, and interpreted, influencing the construction of arguments and persuasion in policy discussions (Cutrera et al., 2021; Shore, 2010)

In scientific advisory, language facilitates the expression of scientific concepts, ideas, and theories, and is instrumental in describing and analysing cultural phenomena. Its use in this context is essential for understanding and interpreting cultural issues, with implications for how individuals and communities engage with scientific advice and information (Kinn-Mikalsen et al., 2021; Selj, 2019).

Language barriers can limit access to scientific advice for linguistic minorities, underscoring the need for multilingual competence in health care and research settings (Rødal, 2012). The provision of translation and interpretation services, culturally sensitive information, and training for professionals can mitigate these challenges, facilitating effective communication and collaboration (Mattern & Ayerle, 2021; Schmidt et al., 2022).

The linguistic landscape of Europe presents both opportunities and challenges. While language diversity enriches cultural expression and scientific discourse, it also complicates communication, necessitating a balance between local languages and lingua franca in scientific publications and discussions (Navarro et al., 2017; Taczman, 2018).

Furthermore, language policies and practices can influence resource distribution among linguistic groups, reflecting political and economic interests (Alarcón, 2005). In the face of globalisation and the modern state's challenges, language planning and policies need to consider the cultural and linguistic needs of diverse populations.

Language is instrumental in communicating scientific knowledge, understanding cultural phenomena, and fostering intercultural communication. Addressing linguistic and cultural diversity, respecting multiple languages and cultural backgrounds, and facilitating communication are crucial for effective

scientific advisory processes. These efforts will ensure that scientific advice is accessible, comprehensible, and culturally sensitive, promoting inclusive and equitable access to scientific knowledge and participation in the scientific discourse. The evidence strongly indicates that for science advice to be effective, it must be culturally and linguistically attuned to the audience it intends to serve. The insights from non-English literature underscore the importance of a strategic, culturally informed approach to science communication, advocating for a shift from a monolingual paradigm to a more inclusive, plurilingual framework that respects and integrates diverse cultural insights.

## 5. Conclusion

This review addressed the complex dynamics between language selection and its profound impact on science-policy dialogues within the European context was conducted. Through an investigation of various communication instances, policy documents, and multilingual interactions, several core themes emerged, underscoring the multifaceted role language plays in this domain.

Firstly, the choice of language is not merely a medium of communication but a strategic tool that can inclusively bridge or divisively isolate stakeholders in science-policy ecosystems. The deliberations highlighted the way language nuances influence the framing of scientific data, the inclusivity of discussions, and the subsequent policy interpretations. Particularly in a diverse linguistic landscape like Europe, the language employed in these dialogues either fosters a collaborative environment by acknowledging cultural and linguistic diversity or creates barriers that could hinder the comprehensive integration of scientific insight in policymaking.

Language choice was also shown to influence the very foundation of how scientific information is perceived, interpreted, and utilised in policy decisions. In the European context, where policies often have wide-reaching impacts across multiple nations with diverse linguistic backgrounds, the choice of language is pivotal. It determines whether science-policy discussions are equitable and inclusive, thereby influencing the efficacy and acceptance of policies among different demographic and linguistic groups.

Policy considerations might incorporate linguistic assessments as a practice. These assessments could recognise and evaluate the diversity of languages within a target population, identifying potential biases and exclusions that may arise from specific language choices. By doing so, policymakers could better ensure that their decisions and communications are accessible and equitable across different linguistic groups, thereby acknowledging the varied language needs and preferences of all stakeholders involved. Future policies could strive for inclusivity, possibly by encouraging multilingual representations and considering the creation of linguistic advisory panels to guide the communication strategies in science-policy interfaces.

In conclusion, the choice of language in science-policy discussions is a critical determinant of the effectiveness and inclusivity of European policymaking. As one moves forward, it is paramount that this aspect is not overlooked, ensuring that the bridge between science and policy is a two-way, accessible, and inclusive path, accommodating the rich linguistic tapestry that characterises Europe.

## 6. References


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