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Worldviews and socio-cultural values of key stakeholder groups that shape decision-making around pollinator conservation across Europe[1]

Deliverable D3.4

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Abstract

- 1. Pollinators provide critical pollination services that support ecosystem functioning and global food and nutrition security. However, wild pollinators face many anthropogenic threats. Mitigating these threats requires an understanding of the worldviews and values of decision-makers involved in pollinator conservation or responsible for creating pressures on pollinators.
- 2. Inspired by the IPBES (2022) and NEP scale frameworks, we investigated the worldviews and values of nature-human relationships and wild pollinators of key European societal actors influencing the status of pollinators. We used a qualitative research design and semi-structured interviews with individuals (27) from key stakeholder groups (business, policy, NGOs and research) to gather in-depth qualitative and interpretative data.
- 3. Irrespective of different worldviews on pollination, all stakeholder groups emphasised that the conservation of pollinators and pollination services is an issue for which all sectors of society are responsible for and should contribute to. Bio-ecocentric worldviews prevailed among most interviewees (76%), with a consensus that all living things have intrinsic value, that there are negative impacts of human activities on nature and biophysical limits to economic growth, and that there is a need for environmental regulation.
- 4.Worldviews were divided between bio-ecocentric and mixed/anthropocentric perspectives on the use of pesticides, the ability of human ingenuity and technological innovation to solve ecological problems, the fundamental resilience of nature to rapid change, and different modes of economic growth (conventional vs. sustainable).
- 5. All interviewees recognised the multiple values that pollinators and pollination provide to nature and human health and wellbeing. Aside from ecological, nutritional, economic and cultural values, interviewees agreed that there exists a moral responsibility to conserve pollinators. Non-use values were highlighted by all stakeholder groups as being at least as important as use-values. Cultural (use) values of pollinators were typically regarded as being less important relative to their nutritional (use) and ecological (non-use) values.
- 6. Public policy instruments are critical to facilitate actions to mitigate pollinator declines and to restore pollinator biodiversity. Ecological, economic and human health aspects are all important levers to catalyse sustained actions for the long-term conservation and sustainable management of wild pollinators.

1. Introduction

Insect pollinators and pollination play a key role in maintaining biodiversity, ecosystem functioning, food security and human well-being (IPBES, 2016). Globally, a large proportion of cultivated and wild plant species depend on pollination by animals, particularly insects, supporting wider biodiversity via a web of trophic interactions connected to plant life (Potts et al., 2016; Ollerton et al., 2011). Crop pollination services provided by insects benefit humanity by increasing and stabilising crop yields (Garibaldi et al., 2013) and improving product quality and marketability traits (Klatt et al., 2014; Gazzea et al., 2023). These benefits have significant economic benefits (Murphy et al., 2022) and nutritional impacts for human health (Chaplin-Kramer et al., 2014; Sluijs et al., 2016). By pollinating wild plants, insect pollinators also contribute indirectly to aesthetic and cultural ecosystem services, such as maintaining wildflower diversity and habitats that produce biodiverse landscapes of amenity or cultural values (Ollerton et al., 2011). Finally, many cultural or spiritual traditions and customs around the world depend on or are inspired by insect pollination (Hill et al., 2019).

Despite these links with human wellbeing, multiple anthropogenic pressures including habitat loss and degradation, pesticide use, and climate change are widely linked to declines of wild pollinators across the northern hemisphere (Dicks et al., 2021; IPBES 2016, Potts et al., 2016; Woodcock et al., 2016). This loss of such a beneficial component of biodiversity has captured public and media attention and that of different stakeholders in scientific, social, business and political arenas.

Policymakers have shown an interest and expressed the need to understand the importance of wild pollinators and their preservation (e.g. FAO Insect pollinators Initiative, Promote Pollinators.org). The European Union has responded through its EU Pollinators Initiative (COM (2018) 395 final) and has mobilized a series of policy measures through the Common Agricultural Policy (CAP) to safeguard wild pollinators (Batàry et al., 2015), including the ban of neonicotinoid pesticides (see Regulation (EU) No 485/2013). A number of countries have also adopted national pollinator strategies, namely Finland[2], France[3], Ireland[4], Luxembourg[5], the Netherlands[6], Spain[7] and the UK[8]. Critics argue, however, that these policy measures lack adequate, measurable targets to safeguard wild pollinators (Cole et al. 2020).

The recent IPBES report on the diverse values and valuation of nature (IPBES, 2022) emphasised the link between worldviews, value perception and nature management actions. Worldviews reflect the subjective understanding of individuals and social groups according to their cultural context and background, knowledge system and language (IPBES, 2022). In turn, the worldview held by an individual may influence value perception and influence attitude and behaviour (Manfredo, 2008; Heberlein, 2012). Spangenberg (2018) showed that scenarios based on a worldview consistent with those of decision-makers are more likely to be perceived as credible and receive fuller attention by them. Earlier, Stigler (1961) argued

[2] http://urn.fi/URN:ISBN:978-952-361-246-4
[3] https://www.ecologie.gouv.fr/sites/default/files/2021.11.21_Plan_pollinisateurs.pdf.
[4] https://pollinators.ie/working-together-for-biodiversity/about-the-aipp-2015-2020/.
[5] https://www.planpollinisateurs.lu/_files/ugd/f9b107_6cbd6b61d2c5444d8dd7346fd2b837ca.pdf.
[6] https://open.overheid.nl/documenten/ronl-b43f1d4f-f527-4b66-939a-361f9a2dd85c/PDF.
[7] https://www.miteco.gob.es/es/biodiversidad/publicaciones/estrategiaconservacionpolinizadores_tcm30-512188.pdf.
[8] https://www.gov.uk/government/publications/national-pollinator-strategy-2014-to-2024-implementation-plan.

that individuals use information in their decision-making if it is perceived to be relevant, and if the cost of searching and evaluating the information does not exceed the benefits. Therefore, unless protecting wild pollinators makes sense to decision-makers, it is probable that measures to arrest causes of their decline and restore populations will not succeed. Thus, a structured understanding of worldviews held by key stakeholder groups is essential because these can influence the perceived value of wild pollinators and decision-making processes to address their decline at various organisational levels.

Here, we provide empirical evidence for the connection between worldviews, value perception and nature management actions conceptualized in the IPBES (2022) report in the context of wild pollinators. We assessed the worldviews and values of key stakeholder groups holding a high level of influence on pollinator-related issues across Europe. We sought to understand what influences the preferences of different key stakeholder groups regarding the benefits of wild pollinators and their management. We focused in particular on different attributes of these benefits that are 'quantitative measures' (e. g. monetary value, crop yields, hectares of habitat) and 'qualitative descriptors' (e.g. expressions, arguments, stories) of 'use' and 'non-use' values concerning wild pollinators (IPBES, 2016). This provides insights into the motivations and behaviours underlying decisions on wild pollinator conservation and allows us to understand better the current lack of momentum for practical pollinator management actions.

We hypothesised that effective wild pollinator management requires understanding i) worldviews regarding human-nature relationships, ii) the trade-offs that stakeholders make between different management objectives and iii) the sociocultural and location-specific influences driving the choices of key decision-makers. From this premise we asked the following research questions:

1) What are the worldviews of key stakeholder groups with respect to wild pollinators? Why do they emerge and how might they vary among groups?

2) What importance do key stakeholder groups across Europe attach to wild pollinators in terms of their contributions to human well-being, focusing on ecological, economic and socio-cultural values?

3) How do worldviews, values and their connections influence decision-making towards wild pollinator management options at individual and/or organisational scales?

2. Theory and methods

2.1. Theoretical and analytical frameworks: worldviews, values and actions

In this paper we use an analytical framework inspired by both the IPBES (2022) and New Ecological Paradigm (NEP) (Dunlap et al., 2000) frameworks to examine the influences of worldviews on values and actions towards pollinators.

IPBES (2022 ch.2, pp. 17) describes worldviews in its framework as "*metaphorical lenses through which individuals and social groups perceive, think about, interpret, inhabit and modify the world. These are informed by one's cultural context and background, knowledge system and language. And also, how individuals and social groups express life goals or guiding principles (e.g. sustainability, justice, prosperity, care, equity, reciprocity and justice)*". This

framework requires the adoption of a sociocultural values approach encompassing anthropocentric, bio-ecocentric and pluricentric worldviews as well as broader values to capture the full complexity of nature-human relationships. According to the IPBES framework, people with an anthropocentric worldview understand nature according to how it affects people, *living from or living in nature*. Bio-ecocentric worldviews emphasize nature's (ergo pollinators) intrinsic worth, its evolutionary and ecological processes, and humans and nature are viewed as cohabiting and indivisible, hence this view encompasses *living with nature*. Pluricentric worldviews focus on human to non-human relationships, including nature's elements and systemic processes as part of exchanges or networks linking nature and humans, in a view reflecting *living as part of nature* (IPBES, 2022; Klain et al., 2017). Given the interconnectedness of ecological, economic and social systems, an individual can hold multiple worldviews relative to the perceived values.

The NEP framework provides statement items as a tool to measure different viewpoints that underlie eco-centric worldviews as opposed to anthropocentric worldviews (Dunlap et al., 2000). For instance, according to the NEP scale (i.e. Dunlap, 2000), eco-centric worldviews reject '*human exceptionalism'*, the balance of nature, the hierarchy of species, and are naturally associated with the idea of limits to economic growth.

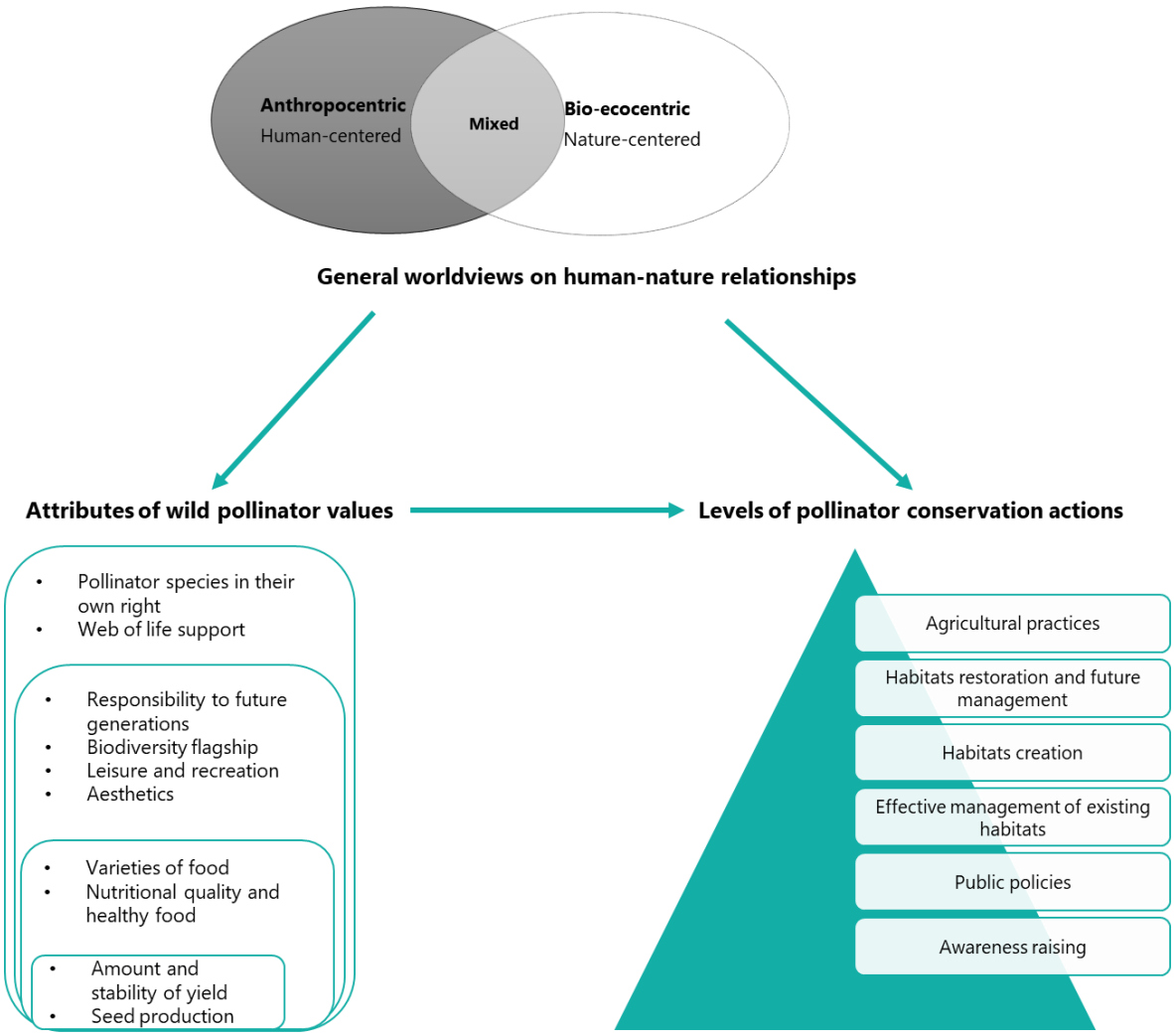
Building on these frameworks, we group worldviews on wild pollinators into three profiles: anthropocentric, bio-ecocentric and mixed worldviews (Figure 1). Bio-ecocentric worldviews (nature-centred), as in IPBES (2022) and in the NEP (Dunlap et al., 2000), emphasise that there is no clear dividing line between humans and the rest of nature; intrinsic value also applies to individual living organisms and therefore to pollinators *per se*. People with such a worldview might stress the need to prohibit any disturbance of the habitats and livelihoods of wild pollinators. In contrast, anthropocentric worldviews (human-centreed) focus on human needs; hence the use values derived from pollinators. In this worldview, the benefits of pollinators (or their lack) are considered as pragmatic instruments of human well-being (e.g., crop production). By mixed worldviews, we refer to embedded values and worldviews in which both human and natural benefits are recognised for social interests (human-nature relationships). The mixed worldview group encompasses sustainable development, including concern for the health and well-being of current and future human societies living as part of nature (IPBES, 2022). People holding such worldviews might emphasise the importance of networks of pollinator benefits and underline the wider benefits of pollinators to human societies and their wider benefits for nature in itself.

In order to develop our list of values associated with pollinators, we carried out two initial consultations with panels of scientific experts. This process helped assess, identify and define the values held by key stakeholders, and delineated more precisely the pollinator benefits defined as quantifiable and qualitative 'attributes' (Table 1). This process allowed us to adapt to the characteristics and realities relevant to key stakeholders across Europe (Christie et al., 2012) and to set hypotheses and inform, test, and improve the survey and interview design (e.g. Hanley et al., 1998; Kenter et al., 2016). To keep consistency in our discussions with different experts, we built on the theoretical attributes of pollinator benefits and values (see Uwingabire, 2021, Ch. 1). As a result of this first (pilot) phase, we identified values and attributes of pollinators (Table 1 and Figure 1).

Table 1. Defining relevant values and attributes of wild pollinator benefits in a European context

Values		*Attributes*	*Description*
Non-use Values	*Intrinsic value*	*Pollinator species in their own right*	The existence of pollinators per se (Uwingabire et al., 2023).
	Ecological value	*Web of life support*	Wider ecological values of pollinators in ecosystems, faunistic and floristic biodiversity (Potts et al., 2016).
	Cultural value	*Responsibility to future generations*	Willingness to preserve wild pollinators for future generations. (IPBES, 2016)
Use-value	*Cultural value*	*Biodiversity flagship*	Pollinators are important to research and education in e.g. ecology, biology, etc. (Hall et al., 2016; IPBES, 2016).
		Leisure and recreation	Pollination contributes to leisure and recreational activities such as butterfly recording, pollinator friendly gardening, etc (Hall et al., 2016, IPBES, 2016).
		Aesthetics	Pollinators contribute to a flower-rich landscapes, to the public and home gardens (IPBES, 2016).
		Art	Pollinators inspire artists (e.g. movies, paintings, etc.).
	Nutritional value	*Varieties of food*	The production of certain fruit and vegetables depends on pollination by pollinators (zucchini, strawberries, etc.) contrary to others (lettuce) (Klein et al., 2007). The degradation of pollinators can change the offering of E.U grown fruits and vegetables in market stands.
		Nutritional quality and healthy food	Pollinator-dependent crops contribute up to 40% of the world's supply of nutrients and around 90% of Vitamin C in crops is produced thanks to insect pollination (Ellis et al. 2015; Eilers et al. 2011).
	Economic value	*Amount and stability of yield*	Insect pollination benefits agricultural yields (about 8 to 10 % of the value of global edible crop production depends on pollinators; Lautenbach et al., 2012)
		Seed production	Pollination impacts on seed production (Potts et al., 2016).

Finally, actions in response to wild pollinator decline can theoretically be linked to key stakeholder perceptions of pollinator benefits (Table 1) and costs from their decline. As such, to better coordinate actions such as public and private policies and different initiatives addressing the issue of pollinator decline, it is necessary to understand the worldviews and values held by key stakeholders in relation to pollinators (Figure 1).



Source: Adapted from IPBES (2022) and NEP (Dunlap et al., 2000)

Figure 1. Conceptual framework of links between worldviews, values & actions regarding wild pollinator decline. This illustrates the overlapping worldviews, the interweaving and interconnectedness of ecological, economic and social systems and the values they bring to nature and people. In addition, it reflects the complementarities in the levels of management of wild pollinators using various public policies and initiatives.

Regarding mitigation of wild pollinator decline, public policies can partly internalise associated private and social costs and can be designed to work through market-based mechanisms. For example, using classical public policy instruments by integrating pollination services into market instruments such as insecticide-use standards, pesticides ban, taxation of pesticide industries, subsidies for sustainable agricultural practices or incentives for the creation and management of wild pollinator, etc. Beyond the market realm, initiatives supporting and co-ordinating various stakeholders (governmental, private and non-governmental organizations) aiming to change consumer and producer habits through education, capacity building and awareness raising are crucial. A co-ordinated approach is important as, governments, agricultural industries, farmers, beekeepers, environmental NGOs and consumers can all be affected by pollinator decline and can produce different, and sometimes divergent,

perspectives on protecting pollinators. For example, public policy limits on neonicotinoid insecticide use in the EU member states have generated divergent views on its justification and implementation (Cole et al. 2020). Whereas reductions in the amount or quality of fruits and vegetables due to pollinator decline might negatively impact consumers, producers may offset this impact through pricing or switching to non-pollinator dependent crops (Kevan et al., 2001). International coordination is important as national boundaries and laws limit range of actions, whereas the environmental problems often have transboundary impacts beyond the reach of individual national policies (UNEP, 2016). In other words, national scale decisions can be heterogeneously felt among stakeholders at different spatial scales – e.g., negative impacts of pollinators decline in Ivory Coast can increase the price of chocolate globally (Murphy et al., 2022).

To conclude, understanding the impacts of pollinator decline perceived by key stakeholder groups operating in different contexts and scales is needed to effectively inform decision-making and account for disparities in outcomes of policies concerning the reversal of wild pollinator declines (e.g. EU Pollinators Initiative, Promote pollinators). Effective decision-making regarding pollinator-related issues may depend on information about the link between stakeholders' worldviews and values of pollinators and views on effective conservation actions (Figure 1). In another words, it is fundamental to understand different individual worldviews in order to generate greater co-operation.

2.2. Method

Following a qualitative research design (Fetters and Molina-Azorin, 2017), we used semi-structured interviews with individuals from key stakeholder groups (Young et al., 2018), to gather in-depth qualitative and interpretative data to understand to the benefits of pollinators. Our interview guide was designed to allow the sharing of general worldviews and perceptions and specific knowledge on wild pollinators values, benefits and conservation based on our analytical framework (see Box 1). We encouraged respondents to express personal beliefs about human-nature relationships by taking a stance on a list of value statements related to the environment, using the 6 points-Likert-like scale. Inspired by the 15 NEP items (see Dunlap et al., 2000) and following expert consultation and piloting, we retained 6 statements and refined their wording to reflect the three worldview profiles (statements 1, 2, 4, 6, 7 and 8) and added statements concerning safeguarding wild pollinators in Europe (statement 3, 5 and 9) (Box 1). These statements were read out to interviewees and we asked them to say whether they agreed with them or not – and importantly asked them why. This allowed for in-depth reflection on the key subject of our work and the expression of worldviews before placing them in the specific context of pollinating insects. The interviewees were free to adapt their scores as the discussion evolved. The interview guide was tested and refined through five pilot interviews.

Box 1: Interview guide

This 9-statement question focuses on general worldviews to which interviewees express their level of agreement or disagreement and explain why. It is adapted from NEP (New Ecological Paradigm) scale items; the approach extensively used to measure beliefs about nature (Dunlap et al., 2000).

1. I would like to know what you think about the following statements. For each one, please indicate whether you strongly disagree, slightly disagree, unsure, slightly agree, strongly agree, or have no opinion.
   Statement 1. When humans interfere with nature it often produces negative consequences.
   Statement 2. Despite our unique abilities, humans are still subject to the laws of nature.
   Statement 3. There are limits to economic growth, even for developed countries like ours.
   Statement 4. Plants and animals have as much right as humans to exist.
   Statement 5. Environmental regulations have placed unfair burdens on industry.
   Statement 6. Human ingenuity will ensure that we do not make the Earth unliveable for humanity.
   Statement 7. The Earth have plenty of natural resources, if we just learn how to develop them.
   Statement 8. Whatever we humans do, nature always comes back to balance by itself.
   Statement 9. We cannot feed the world without using agrochemicals.

This series of follow-up questions aims to understand interviewees specific knowledge about wild pollinator habitats, their status, pollinator alternatives and effective actions to address their decline:

2. Which insects have you encountered recently? What is the first thing that comes to mind when you come across one of them? Which ones you think play a role in pollination and are thus pollinators?
3. What does the term WILD POLLINATORS mean for you?
4. Which habitats do you believe support the most wild pollinator species? Are the habitats you are thinking of similar to conserved areas, or do you think that managed agroecosystems can also be relevant to them?
5. Do you think that wild pollinators in their natural environment are: a) Declining, b) Increasing or c) Stable? What makes you think so?
6. If wild pollinators are declining, is that a problem for humanity? How important are they?
7. Are there any other mechanisms by which some of the services pollinators provide can be ensured? What do you think about wild pollinator alternatives?
8. Should action be taken? If so, what kinds of action? And who should be responsible / pay for it?
9. What is your institution doing currently regarding the management of wild pollinators? What could your institution do in the future?
10. Based on own experience and/or these examples (see Table 1), explain what might be the top three attributes of wild pollinators? Which ones are less relevant?

Our aim was not to gain a representative sample, but rather to find key respondents with high levels of influence on decision-making processes at the EU level (with regard to the conservation of biodiversity and pollinators) who could provide rich information on wild pollinators and represented a diversity of worldviews and socio-cultural aspects across Europe. We carried out online interviews with 27 key stakeholders from 12 European countries (mean duration = 83 minutes, 24 in English, 3 in French, 12/2022-01/2023) comprising representatives from business (5), research (6), policymaking (8) and NGOs (8) (Table 3). We stopped after reaching data saturation (Patton, 2002), in our case when no new aspects relating to worldviews and values with support for pollinator management emerged.

Table 3. Sample description. Codes used to identify interviewees operating in European countries and beyond. The first part refers to the sectors of people we interviewed (Bus for business; Res for research; Pol for Policymaking; Ngo for NGOs). The second part refers to the geographical zone (GEO) (N = northern Europe, S = southern Europe, W = western Europe, CE = central and eastern, EU = European Union, Int = international). Definition of European sub-regions followed EuroVoc, Publications Office of the European Union. Note that sample details can be found in the supplementary material Table A.

Codes	Sector	Geographical zone (GEO)	Background	N
Bus1 to 5_GEO	Business	S, W, EU, Int	Entomology, agronomy	5
Res1 to 6_GEO	Research	N, S, CE, W	Biology, ecology, ecological economics	6
Pol1 to 8_GEO	Policymaking	S, CE, W, EU, Int	Agronomy, entomology, biology	8
Ngo1 to 8_GEO	NGOs	S, W, EU, Int	Entomology, ecology, sustainable business development and policy studies	8
TOTAL				**27**

All interviews were transcribed (after being translated in English where needed), corrected and coded using NVivo software. The codebook of worldviews, values and actions to safeguard wild pollinators (Supplementary Materials Table B) were derived from the analytical framework (Figure 1). To mitigate researcher bias and increase consistency, comparative analyses between co-authors were carried out until an acceptable level of agreement was reached (Fereday and Muir-Cohrane, 2006). Results are illustrated by anonymous statements from interviewees (Table 3), in accord with the ethical consent agreement (Supplementary Materials Box A).

3. Results

3.1. Worldviews held by interviewees

3.1.1. General worldviews held by interviewees

The 27 interviewees, drawn from business, policymaking, NGOs and research, had strong scientific backgrounds in entomology, biology, ecology and agronomy, and their work has exposed them to different types of knowledge and cultures across Europe and beyond (Table 3). Most interviewees agreed that all beings have intrinsic value (statement 4), that there are often negative consequences of human activities on nature (statement 1) and biophysical limits to economic growth (statement 3) and that there is a need for environmental regulation (statement 5). More than three-quarters of interviewees expressed bio-ecocentric views (largely consistent) in response to five statements (1, 2, 3, 4, 5), suggesting that our sample was generally leaning towards this worldview (Table 3; the distribution of responses from our interviewees to each statement can be found in supplementary Materials Figure 2. A). Views expressed for the remaining four statements (6,7,8,9) were more heterogeneous – both within and across stakeholder groups- and thus crucial to understanding differing perspectives on pollinator decline mitigation actions. A variety of worldviews emerged on the use of pesticides (statement 9), human ingenuity including technological solutions to ecological problems (statement 6), the balance of nature (statement 8) and the efficient use of limited resources for a re-visited growth (statement7). Figure 2 shows interviewees' worldviews on the nine statements around general worldviews (Box 1, section 2.3).

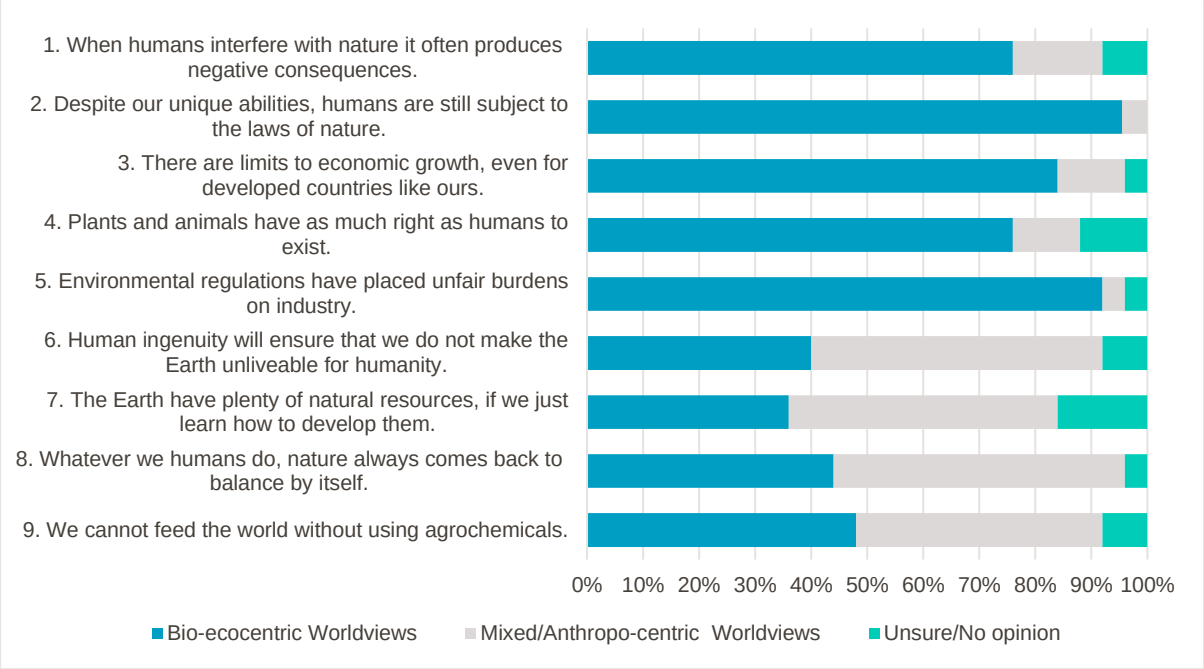


Figure 2. General worldviews held by interviewees on each of the nine statements. Bio-ecocentric worldviews strongly agreed with the first four statements (1,2,3 and 4) and strongly disagreed with the remaining five statements (5,6,7,8 and 9). Other worldviews were grouped together as mixed and anthropocentric worldviews, which, to varying degrees, disagreed with the first four statements (1,2,3 and 4) and agreed, to varying degrees, with the remaining five statements 5,6,7,8 and 9.

While 76% of interviewees agreed that there are often negative consequences of human activities on nature (statement 1), several stressed how human activities had also improved nature: *"In Europe, a lot of landscape elements which are very rich in biodiversity have actually been created by historical agriculture*." (Bus1_W). Regarding the limits to economic growth (statement 3), 84% of interviewees underlined the biophysical limits of the planet:" *there are planetary boundaries to think about at least in the conventional sense of economic growth, in terms, of GDP, so that's about continuous growth which is based on consumption and construction*" (Bus5_W). 76% of interviewees agreed with the intrinsic values of all beings (statement 4): "*we are not that different to inhabitants of the planet*." (Pol7_CE/EU), but not necessary at the same level: "*Humans have the right to use nature, to make use of nature to ensure their life, their survival. I mean, this is what every organism is doing, using other organisms to survive. There is no life which is not interfering negatively with other life*." (Bus1_W). 92% of interviewees expressed a belief that environmental regulations were not burdensome (statement 5), although one interviewee highlighted their weaknesses: "*There's been no regulation in some aspects for some sectors for decades and there's been some regulations put in place, and before we could see the benefits of those regulations, they go even further, and they always focus on politically acceptable topics. There are some areas that are still under-regulated, while some are over regulated."* (Bus4_W/Int). On the specific topic of agrochemicals (e.g. pesticides, fertilizers; statement 9) views were mixed with 44% of interviewees stressing the need for them "*at the moment we are so far that we cannot really go without synthetic products*." (Bus1_W), while others (48%) highlighted the need for broader transformation: "*I think it's a matter of changing our diet. That's the crucial thing. I mean at the moment our diets are heavily reliant on resources and the types of crops we go ahead with rely on those resources, but there are other options. If we had more of a plant-based style, then we could certainly feed the world.* "(Ngo3_W).

Some interviewees believed in the delicate balance of nature (statement 8), where excessive human interference leads to permanent changes in the state of the environment. To justify nature's capacity to balance itself, other interviewees stressed that nature is fundamentally resilient to disturbance given the sophisticated interdependencies within complex ecological phenomena: "*nature will come back whatever we do – it's just how much we are willing to damage it right now*." (Ngo5_S); "*I mean the whole thing about saving the planet, that's not about saving the planet it's about saving us, ourselves*." (Pol7_CE/EU).

Regarding human ingenuity finding appropriate solutions for sustainably using natural resources (statement 7), views were mixed with some hoping that "*with technology with science we can make sure that the earth will be a good place to be, also for the generations after us* " (Bus1_W), while others were more nuanced in their approach: "*I think technology is part of the potential solution to these problems but it's also a driver of this problem. […] I think this is the idea that is blocking much structural change in the way we organize society because we believe that in the end we will come up with some good idea."* (Res4_N/S).

3.1. 2. Worldviews on wild pollinators

The loss of wild pollinators was viewed by some as very severe: *"Without pollination, there's no life.*" (Res4_N/S). There was also recognition of the situation where nature would rebalance itself: "*Nature will buffer the decline or extinction of some of the pollinators still, and it's normal that some species go extinct*." (Pol4_S/Int). Regardless of their 'use' or 'non-use' value, interviewees from all sectors stressed that the decline of wild pollinators should be averted for moral and ethical reasons: "*It doesn't matter if we depend on pollination or not, because on the same grounds, you know, some insects that we are not sure the role they fulfil in a food chain or a system, they can just disappear then because they're not pollinators. So, I think the fact the pollinator is or not doesn't actually matter, we shouldn't have a group of species that are disappearing."* (Bu4_W/Int).

Furthermore, views on wild pollinators included individual perceptions of such insects, their habitats, their status, and alternative means to their pollination benefits. Regarding perceptions of insects, interviewees reported being "*curious*" (Pol5_EU), "*inspired*" (Ngo7_W/S) or "*fascinated*" (Res4_N/S) by their diversity and beauty, and wished to better understand them and their role in ecosystem. Some interviewees also mentioned that they were more positive towards pollinators than other insects: "*I mean, I have to admit, this is also a matter of how I'm trained to interact with different things. Like, if I see a bumblebee, I am very excited. If I see a cockroach, unfortunately, I don't have the same reaction."* (Pol5_EU).

While all interviewees agreed that wild pollinators were declining, some mentioned that they were uncertain about the current status of wild pollinators at more local scales: "*we know this global context of decline but at our scale of territory we are rather discovering it. So, we don't know too much in fact*." (Pol6_W).

3.2. Perceived values of wild pollinator and views on their relevant attributes

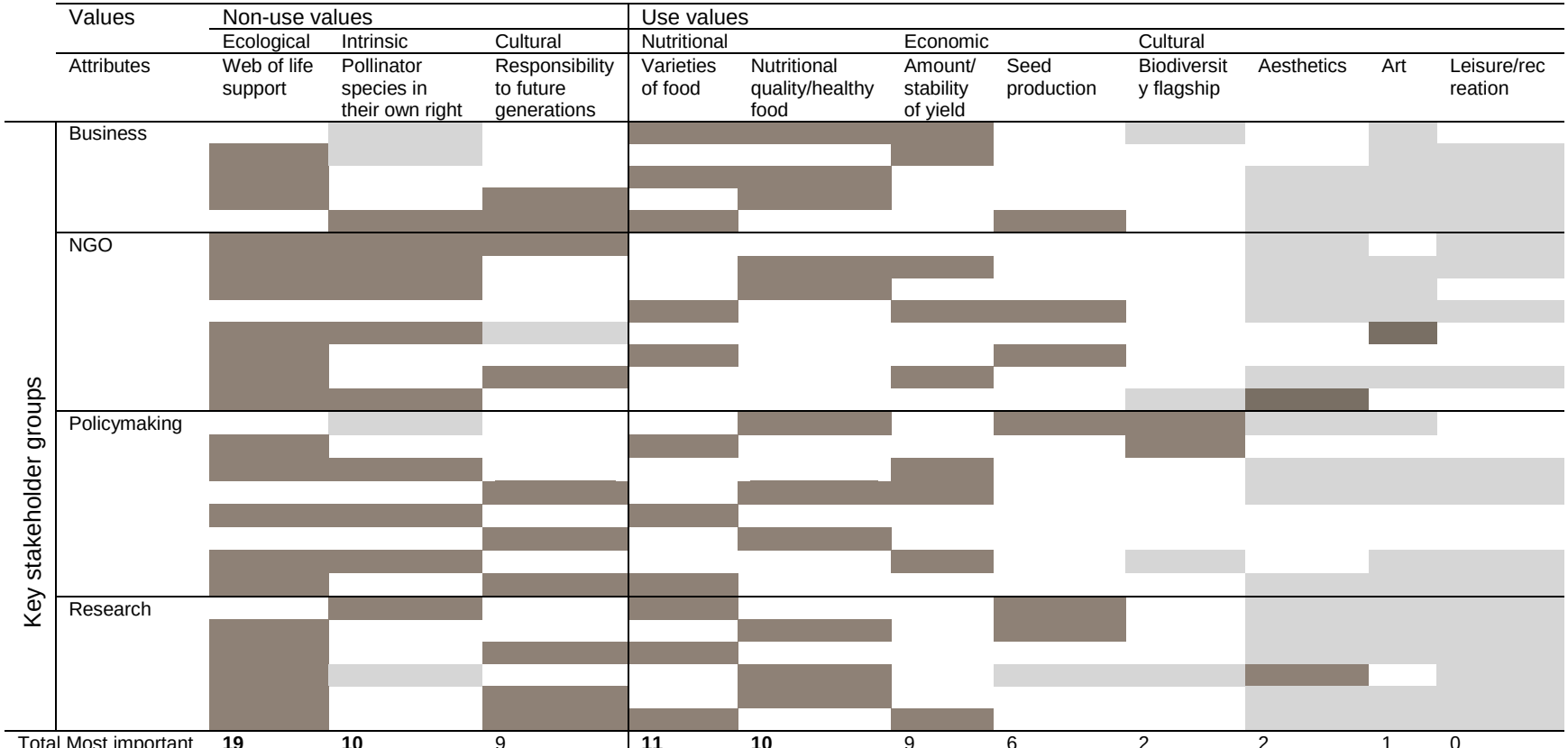
Regarding the importance of wild pollinators are, interviewees mentioned their role for crop production, food security and wider biodiversity of wild plants. More specifically, the wild pollinator attributes mentioned by interviewees included in most cases ecological, intrinsic and

nutritional values, thereby referring to both use and non-use values (Table 1). The most frequent attribute was 'web of life support' (19), followed by their involvement in the production of a variety of human food' (11) and their involvement in the production of nutritional quality and healthy human food (10), and pollinator species in their own right (10) (Table 4).

Most interviewees perceived pollination by wild pollinators crucial from an ecological perspective: "*Insect pollination plays an important role in ecosystem functioning, in food cascades …. It's important for the beginning of life and the functional thriving of ecosystem*." (Res4_N/S). Some interviewees stressed the fact that wild pollinators' decline might lead to a loss in the variety of food: "*We can always rely more on crops that don't need pollinators. But then that means that reduction in a vast range of our diet*. "(Ngo3_W); as well as food quality: "*We would live without pollinators, but we wouldn't have those crops and those agricultural products that bring us our vitamins and minerals, and give us a dietary diversity*." (Ngo4_EU). Most interviewees also stressed the pollinators' right to exist for their own sake: "*I would say pollinator species are important in their own rights because they're important full stop. You don't have to be doing something to be important, they are as important as anything else*." (Bus4_W/Int).

Attributes concerning biodiversity flagship, responsibility to future generations, amount and stability of yield, and seed production relatively received less attention (<10). Leisure and recreation attributes, together with aesthetics and art were perceived as the least important pollinator attributes by interviewees. Interviewees acknowledged these attributes were not crucial to human wellbeing and often perceived cultural values as least important: *"I think that arts and aesthetic is […] also important but these are more like means to express different things" (…).* They tended to be seen as an addition to the key attributes supporting our lives and ecosystems around us: "*Attributes of wild pollinator benefits such as aesthetics of wild flowers embellishes our lifestyle*" (Pol3_CE/EU); *"But the things we should express should be the importance of pollinators in maintaining our different ecosystems and webbing them*." (Ngo2_W).

Table 4. Respondent preferences for wild pollinator attributes. Each interviewee were asked for the three attributes they judged most important and three attributes they judged as less important among the 11 attributes presented. Interviewee' choices are illustrated as dark grey shading = most important attributes of pollinator benefits; light grey shading = least important attributes of pollinator benefits. Rows = an individual interviewee. White areas highlight attributes not mentioned by interviewees as either their most or least important attributes.



3.3. Worldviews on actions aiming at conserving wild pollinators

Most interviewees stressed that the protection of wild pollinators should address two main aims: improving pollinator foraging and habitats and reducing the use of potentially harmful chemicals: ‘‘*We need to ban or severely cut down the pesticides that are harmful to pollinators. We need to stop using so much fertilizers so that our grasslands can become species rich again. We need to manage our forests so that they become more diverse habitats, so that they can support pollinators. We need to grow a greater diversity of crops and create more spaces in agricultural farmlands to support pollinator populations”* (Ngo4_EU). To achieve these aims, interviewees highlighted three guiding principles. First, the need to adopt a different approach to conservation: *“I think there is a danger of treating nature in the idea of fortress conservation, like Nature is something to be conserved, whereas it is a people’s landscape.”* (Bus5_W). Second, acknowledging our limited knowledge about the complexity of nature and the need to provide a basis for decision-making in uncertain yet urgent situations: “*the impact is so huge that we should not even risk it. That's the point: you will never have perfect knowledge to know exactly, you know, if these species go, what's going to happen? Nobody can tell you that. So, we are really working here on precautionary principles.”* (Pol7_CE/EU). Third that safeguarding wild pollinators is a shared responsibility: from governments, to business, farmers and other citizens: “*So it's a collective effort. I don't think there's a silver bullet say it's just the government, or is just land owner, or citizens. It’ s just a collective effort*.” Bus1_W; “*I think it's also a personal responsibility of I don't know parents, and you know, family in general, but schools. And schools are mainly governed by, you know, ministries and higher level*” Res6_CE.
In terms of how we could achieve the above aims, raising awareness, knowledge and capacity building were mentioned by almost all interviewees (25 out of 27). This included the need for “*education, from kindergarten”* (Res6_CE) to training and “*free advice provided to the farmers - high quality advice from on farm visits and things like that to get them producing better quality habitats cause it's not easy”* (Ngo3_W), public awareness and “*capacity development, because there are places where the main impediment for a stronger application of the conservation policies is the shortage of capacity”* (Pol1_Int). Such awareness raising could, according to one interviewee lead to a *“change in our way of consuming and maybe to force people to eat less meat, to eat seasonal foods.* “(Ngo2_W).

Public policies were mentioned by most interviewees (22), emphasising aspects such as pesticide bans, regulations, incentives, subsidies and tax schemes, implying responsibility of industries (polluter pays principle) and governments: “*But the key actions obviously have got to go through policy and legislation. For example, controlling pesticide use that's got to be the legislative approach combined with funding and incentives”* (Ngo4_EU). Better implementation of public policies and law enforcement were also seen as key: “*I'm happy I know that there is a new CAP [Common Agricultural Policy] coming with subsidizing flowers strips as well as hedgerows for growers. And what is needed is also a good planning for this and I feel that this is missing at the moment*” (Bus2_S/Int).

Habitat management for wild pollinators was mentioned by 18 respondents, emphasising their creation, restoration, current and future management at landscape scales: “*if we don't have connection among all these habitats and all these areas there is no point on protecting and conserving some few areas. We need nature everywhere: on managed spaces, on natural spaces, on urban spaces, everywhere we can”* (Ngo2_W). Specifically, habitats deemed to

support the most wild pollinator species included hedgerows, wildflower strips and forest, but also agroecosystems, depending on their management: "*agroecosystems have huge potential to support biodiversity, but whether they do it, it really depends on the management practices…. we have started to show that insects are declining in protected areas specifically.* " (Pol7_CE/EU).

Collaboration and cross-sector cooperation were mentioned by 18 interviewees, who stressed the need for more collaboration between stakeholders: "*I think it [action] has to come from multiple places, and there has to be synergy between different things, because you can't separate pollinators, for example, from agriculture and the way we do it. So, it has to be more connected and integrated with other things that we do"* (Ngo5_S).

Agricultural practices were mentioned by 15 interviewees, who stressed the need for a mosaic of farming landscapes with different features: "*some sustainable farming practices that includes, as I said, like favourably managed, extensive farming, integrated pest management."* (Pol7_CE/Int). The role of farmers was underlined: "*There's a danger in reducing everything to economics but there is space where the farming community has to understand the value of wild pollinators"* (Bus5_W). Some interviewees acknowledged farmers' financial limits and, thus, stressed the role of Agri-Environment Schemes: "*most of the evidence shows that simply having more flowers is enough to support pollinators so that's how we've got to do it and support it through government initiatives, funding of agri-environment schemes. … there should be more pressure put on the farmers to make sure that they do their best.*" (Ngo3_W).

4. Discussion

Through semi-structured interviews we explored the worldviews and the values associated with pollinators of influential European stakeholders.

Our results show that over half of the stakeholders interviewed (in business, research, policymaking and NGOs) have an overlapping worldview (mixed) that is both human-centred and nature-centred. This emphasised the relationship between humans and nature, and valuing pollinators both for their functional role in wider biodiversity and human well-being, and for their intrinsic right to exist. Irrespective of different worldviews on pollinators, all stakeholder groups emphasised that the conservation of pollinators and pollination services is an issue for which all sectors of society are responsible for and should contribute to. Bio-ecocentric worldviews prevailed among most interviewees, with a consensus that all living things have intrinsic value, that there are negative impacts of human activities on nature and biophysical limits to economic growth, and that there is a need for environmental regulation. This result suggests that our sample was generally inclined towards this worldview, perhaps due to the coherence between their level of scientific expertise or background and the topic.

Worldviews were divided between bio-ecocentric and mixed/anthropocentric perspectives on the use of pesticides, the ability of human ingenuity and technological innovation to solve ecological problems, the fundamental resilience of nature to rapid change, and different perspectives on economic growth, where broader transformation were seen as imperative. The stakeholder groups interviewed are close to all the concerns mentioned with a high level of influence because of their activities and involvement with policy-making and public or private

research. This heterogeneity in worldviews highlights the complexity of consensus-building between stakeholders and their different perceptions of the urgency (or need) of implementing pollinator-friendly actions.
In the context of pollinators, we have opted for a framework that includes bio-ecocentric, anthropocentric and mixed worldviews in order to accommodate human-centred or nature-centred views, but also worldviews that admit interdependencies between humans and nature. We recognise, however, that there is a wider range of worldview frameworks in the literature and that further research is needed to appreciate worldviews other than the anthropocentric-bio-ecocentric dichotomy, such as pluricentrism (Klain et al., 2017).

All interviewees recognised the multiple values that pollinators and pollination provide to nature and human health and wellbeing. Aside from ecological, economic and cultural values, interviewees agreed that there exists a moral responsibility to conserve pollinators. Non-use values were highlighted by all stakeholder groups as being at least as important as use-values. Cultural (use) values of pollinators were typically regarded as being less important relative to their nutritional (use) and ecological (non-use) values. While the use values associated with pollinators have received considerable attention in the literature on pollinator valuation to support decision-making (IPBES, 2016), our results show that in reality, many non-use values are not negligible to those interviewed. Thus, arguments in favor of safeguarding wild pollinators that seek to span different worldviews should include their intrinsic value, alongside more quantitative use values.

Interviewees consistently viewed public policy, such as regulation and taxation, as the main action for pollinator conservation in Europe, regardless of their worldviews, and this could be a suitable basis for more interconnected pollinator conservation. As such, although privately owned benefits of wild pollinators can be maintained at the level of their direct users (farmers), some interviewees stressed that government can support private initiatives by limiting threats through, for example, the polluter-pays approach. This is largely consistent with the perception of pollination as a public good that does not have a particular ownership (IPBES, 2016) and current, although marginal, attempts by governments to regulate pollinators. However, apart from the fact that a country's public policy is only applicable at the national scale, the expected policy outputs cannot always be achieved if there is not an implication of the key stakeholder groups (Aoki, 2006). Indeed, public policies focused on individual actions (e.g., incentive-based instruments) are limited. For example, incentive public policies to reduce the agricultural inputs introduced in OECD countries have only partially been used to meet their objectives (OECD, 2008). Also, alternative fertilization or pesticide techniques offered to farmers by the public authorities have not been met with the expected success (Del Corso and Kephaliacos, 2011). Also, almost all respondents emphasized the need to raise awareness, knowledge and capacity building. This tallies with other research showing that knowledge and skills are seen as necessary ingredients for action (Del Corso and Kephaliacos, 2011). Regarded as essential to effective pollinator management (Dicks et al., 2013), collaborative actions that span different actors were also widely mentioned by interviews, regardless of their worldview. Such activities are relatively new as agri-environment management has typically focused on supporting the actions of individuals public and private land owners (Cole et al., 2020; Hall et al, 2016) and may encounter cultural resistance where land owners are not used to collaboration (Ratamaki et al., 2015). As such, respondents may simply not have considered this type of action specifically. Future research could explore this action in more detail, and assess how people

with different worldviews view the prospects of collaborating with different actors (IPBES, 2022).

A limitation of our research is that while we engaged with a wide range of influential stakeholders as per the aim of our research, ultimately our interviewees are mostly directly engaged with biodiversity, often pollinators specifically. While their views are derived from different contexts, they represent a niche group of individuals who interact with national and international level decision-making. Our sample could have benefited from including relevant stakeholders who operate on smaller spatial scales. Stakeholders that can influence land management at different spatial scales may have very different perspectives or objectives on pollinator conservation (Ratamaki et al., 2015). Failure to account for this pluralism of views may lead to unsustainable or ineffective management (Cole et al., 2020). Similarly, a broader survey of the worldviews from the wider public, who may value pollinators but not have direct influence on pollinator management, could facilitate their engagement in decision making around national level policies (MacDonald et al., 2020).

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Supplementary material

Table A. Key stakeholder groups interviewed and their reach

Resp.	Code	Organisation	Background	Key stakeholder group	Geographical exposure
1	Bus1_W	Business	Entomologist, PhD (entomology, ecology, evolutionary biology)	Bayer	Germany
2	Bus2_S/Int	Business	Agronomist, PhD	Syngenta	Greece / Europe, Africa, Middle East.
3	Bus3_W/Int	Business	Entomologist, PhD	Biobest	Switzerland/the US and UK
4	Bus4_W/Int	Business	Entomology, biology: biologist/ Phd in Integrated Pest Management.	Corteva	UK / France / Middle East and Africa
5	Bus5_W	Business	Agricultural Engineering and Sustainable Development	Innocent Drinks	UK
6	Ngo1_W	NGO	Environmental toxicologists and Policy studies regarding biology	Promote Pollinators	Netherlands
7	Ngo2_W	NGO	Entomologist	Anthropologia	France
8	Ngo3_W	NGO	Ecologists / Phd in entomology, specilized in integrated pest management	GWCT (Game and Wildlife Conservation Trust)	UK
9	Ngo4_EU	NGO	Environmental biologist	Institute for European Environmental Policy	Belgium
10	Ngo5_S	NGO	Biodiversity conservation	Global landscapes Forum	Greece
11	Ngo6_W/Int	NGO	Freshwater ecologist	Buglife	UK/ International
12	Ngo7_W/S	NGO	Sustainable Business Development / minor in political sciences	Pollinator Ambassadors	Austria / Spain / Netherlands
13	Ngo8_W	NGO	Environmental science/ sustainability / nature conservation and forestry / I'm doing a Phd on competition between wild bees and managed bees.	Pollinator Ambassadors	England
14	Pol1_Int	Policymaking	Nature conservation and ecology	IUCN	Brussels
15	Pol2_W	Policymaking	Coordinate actions on remarkable natural environments to ensure their long-term preservation	Burgundy Natural Space Conservancy	France
16	Pol3_CE/EU	Policymaking	Agricultural engineer	MAPs	Slovenia / EU
17	Pol4_S/Int	Policymaking	Entomology, PhD	FAO/ IPBES	Italy/ Canada/ Internatinal
18	Pol5_EU	Policymaking	Biologist/ environmental biology / phd on wild bees.	European Food Safety Authority (EFSA)	EU / Greece/ Germany
19	Pol6_W	Policymaking	Biology and Ecology, completed by a background in science didactics and science museography	Dijon Metropole	France
20	Pol7_CE/EU	Policymaking	Biologist / environmental or Ecological economics	EU commission	Brussels / Croatia
21	Pol8_CE	Policymaking	Biology and Ecology with nature conservation	Agriculture Directorate/ Sustainable Agriculture Division/Ministry of Agriculture, Forestry and Food	Slovenia
22	Res1_W	Research	Ecosystem modelling	Reading University	UK
23	Res2_W	Research	Applied ecology / PhD thesis investigated biodiversity, natural pest control, and pollination in UK agroforestry systems	Reading University	UK
24	Res3_CE	Research	Biodiversity and monitoring/protection of pollinators/ pollinators in agriculture	National Institute of Biology	Slovenia
25	Res4_N/S	Research	Ecology / Ecological Economics	Norwegian University of Life Sciences (NMBU)	Norway/Spain
26	Res5_W	Research	Biology and ecology in a master's degree / agroecology / functioning of agroecosystems and “anthropisation” / entomology, more interested in small parasitoid wasps and bees.	Consultant working with INRAe/CNRS/AFB/ Anthropologia	France

28	Res6_CE	Research	Animal husbandry / PhD in economics of the conventional and organic beekeeping	University of ZATA, department of ecology programming, and aquaculture	Croatia

Table B. Codebook

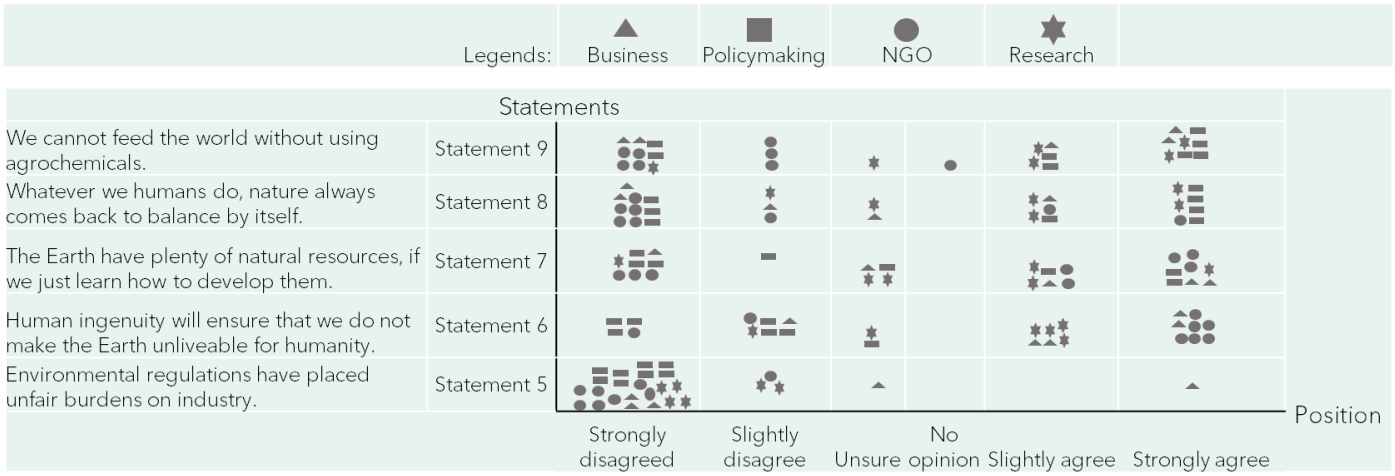
CODE	Description
Worldviews	Worldview reflects subjective understanding of an individual based on their exposure (culture, scientific background, etc.) and thus enhance their sensibility towards nature elements; what humans consider 'good' and 'important' in their experiences and interconnections with nature (IPBES, ch.2).
Anthropocentric Worldviews	Anthropocentric worldviews prioritize people. Specifically, nature is understood based on how it affects oneself, **living from** or **living in** nature (i.e. IPBES, 2022), not other human beings nor nature by its own right.
○ Human domination	Having mastery over nature; putting a hierarchy between human and nature.
○ Human exemptionalism	To perceive human ingenuity and unique abilities as sufficient tools to overcome natural events. (i.e. Statement 2 and 5; NEP; Dunlap et al. 2000). By ingenuity, we refer to any means by which humans can find a solution, such as policies, science and technology, and innovative ideas for improving our interactions with nature.
○ Utilitarian	An individual willing to protect nature benefits for own well-being (see Peter et al. 2021). As such, one maximizes nature elements that provide satisfaction and desirable goods and services and minimizes those that are undesirable (Henry et al. 1992). (e.g.: Q.7). This refers to utility of nature elements to oneself.
○ Demographic concern	Worldview that prioritizes the necessity to meet the demand of a growing human population (e.g., see the Statement 8).
○ Economic lens	This perspective emphasizes the economy as central to the life of every living person and economic growth as essential to social well-being.
Bio-ecocentric Worldviews	Bio-ecocentric worldviews emphasize nature's inherent value and its evolutionary and ecological processes (i.e. IPBES, 2022). This grouping encompasses the new ecological paradigm as in Dunlap et al. (2000), worldviews that emphasize that there is no clear dividing line between humans and the rest of nature; intrinsic worth applies to individual living organisms as well. Human cohabitation with nature is a genuine view point, l**iving with** nature (IPBES, 2022).
○ Intrinsic worth	Individual living organism as well as species and entire biotic communities are worthy in their own rights to exist.
○ Nature resilience	Worldviews that nature is fundamentally resilient to disturbance given the sophisticated interdependencies within ecological phenomena. Phenomena that are complex to comprehend at a given scale and to understand with certainty at universal level.
○ Biophysical boundaries	The biophysical resources are finite in a given temporal and spatial scales, implying ecological and economic limits.
○ Egalitarian	No hierarchy among organisms. Humans are perceived as organisms **living with** the rest.
○ Moral and ethical lens	An inherentist individual who is willing to preserve nature for its own sake (see Henry et al. 1992), and to protect its benefits not only for them but also for other life-forms (including future organisms) (see Peter et al. 2021). Decision-making involves preservation and strong moral and ethical concerns.
Mixed Worldviews	Mixed worldviews focus on relationships between humans and other-than-humans, as well as nature's elements and systemic processes (i.e. IPBES, 2022). This grouping encompasses sustainable development and the new environmental paradigm as in Dunlap et al. (2000), the central concern remains health and well-being of human societies l**iving as part of nature (**IPBES, 2022)**.**
○ Nature balance	The fact that nature is highly delicate and thus excessive human interference with nature results in environmental problems with consequences to human well-being (See Dunlap et al. 2000) (ref to Statements 1 &4).
○ Re-visited growth	Reject the over-exploitation of natural resources (See Dunlap et al. 2000) and prefer an efficient use of the quantity of nature's resources and amenities or services for economic growth and social welfare.
○ Hierarchist	The welfare of human beings takes precedence over those of non-humans and ecosystems (see for

CODE	Description
(Between nature)	example, Peter et al. 2021) but also hierarchists consider different intrinsic value among nature elements.
○ Social lens	Inspired by Henry et al. (1992), this can refer to integrist who sees humans as part of nature and natural system as an open living system with natural self-adjustments. Development means improvement in quality rather than increase in quantity. Decision-making involves consensus-building initiatives, such as green, local (bioregionalist) and collectivity (communitarian) politics, and public policies as tools to address environmental problems.
	Many other pathways referring to other worldviews and knowledge systems found throughout the world including those based on the fulfilment of the collective good quality of life (mostly based on non-anthropocentric worldviews). Advocates participatory politics and, hance, a consistent understanding of sustainability and social justice.
○ Insect perception	The view that people have about the insect in general or about what the insect represents in their environment (e.g., fascinating, curious about what it is, diversity, fear/harm).
○ Wild pollinators	Definition
○ Habitats	Views on habitats that support the most the wild pollinators (native habitat, flourish/flower-rich grassland, forest, environmental-friendly managed agroecosystems)
○ Status	Views on the current state of wild pollinators in their natural environment (declining, stable or increasing).
○ Source of information	Scientific studies, official documents, own experience, etc.
Values	'opinions' or 'judgements' regarding the importance of wild pollinators or pollination.
Use Values	Instrumental values relative to human's welfare.
○ Economic values	Agricultural production referring to financial aspects (amount and stability of yields as well as the shape of products).
○ Nutritional & health value	Human food referring to food security aspects, which include sufficient, safe and nutritious food meeting dietary needs and food preferences for an active and healthy life (i.e. The World Food Summit, 1996).
○ Cultural values	For example, the value society attributes to biodiversity (for us).
Non-use Values	Values with no use to humans
○ Intrinsic values	Pollinators for their own sake.
○ Ecological values	Ecological functions and biophysical structure and processes within and for nature, web-of-life support (for wild plants).
Substitution mechanisms	Substitution mechanism of wild pollinators
○ Alternative	The alternative to wild insect pollination refers to initiatives (e.g. practices, performances, systems, structures, policies, processes, technologies and concepts) that have the potential to sustain or change crop pollination reliance on wild pollinators.
○ No alternative	Profound belief in the impossibility of replacing wild pollinators due to cost, inefficiency, etc.
Actions (current and future)	
○ Agricultural practices	
○ Habitats restoration and future management	
○ Habitats creation	

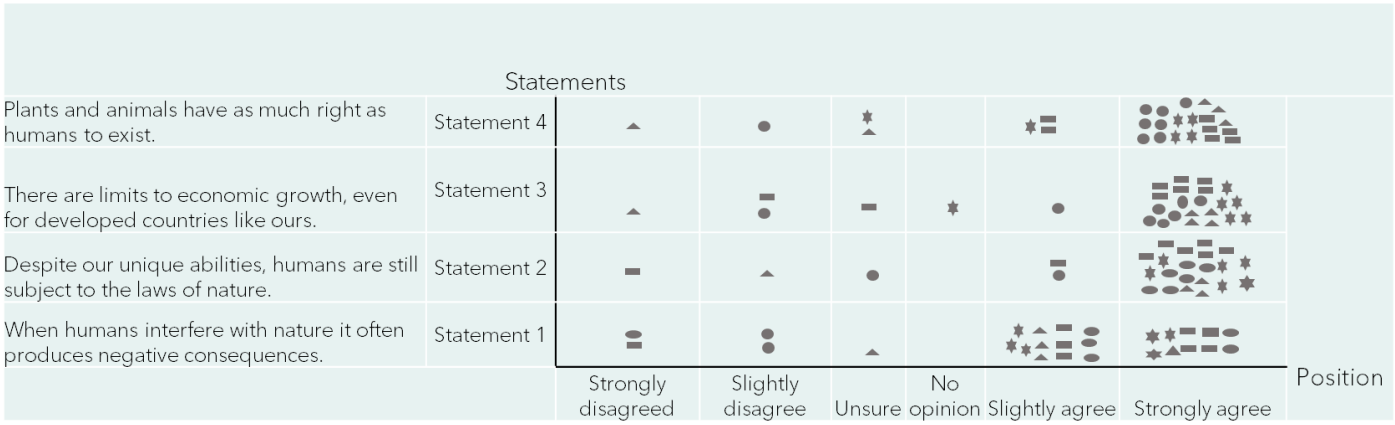
CODE	Description
○ Effective management of existing habitats	
○ Public policies	
○ Awareness raising	
○ Other initiatives	
Responsible persons	
○ Everyone	
○ Governments	
○ Farmers	
○ Industries	
Interviewees' institutions	
○ Current management actions of interviewees' institutions	Beyond the compliance with existing regulations.
○ Future management actions of interviewees' institutions	
Attributes	Wild pollinator values (benefits) can be assessed using various indicators or preferences; namely attributes of wild pollinators. Indicators/attributes are the 'quantitative measures' (e.g., money, hectares) and 'qualitative descriptors' (e.g., expressions, arguments, stories) of specific values. (IPBES, 2022, ch.2)
○ Top relevant attributes	
○ Less relevant attributes	
○ Linkages among attributes	Understand the correlation between wild pollinator attributes, one of which may have an impact on the other, given the interdependencies between ecological and economic mechanisms.
○ Different audiences	Perception of pollinators attributes for different actors. The plurality of pollinator-related values implies acknowledging different sensibility of the actor under consideration. How biophysical, monetary and socio-cultural indicators are understood (assessed, combined or compared) influences whose voices are heard in development and environmental decision-making (IPBES, 2022, ch.2).
○ Q-Methodology Statements	

Supplementary results

Figure 2.A. Interviewees' positions on the nine statements around general worldviews. Bioecocentric, as opposed to anthropocentric worldviews, disagrees with these statements in B agrees statements in B.



A.



B.

Box A. Ethical consent

Information notice and informed consent

Project title: SAFEGUARDING EUROPEAN WILD POLLINATORS (SAFEGUARD)

Researcher in charge of this part of the project:
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Aim of the research project: The SAFEGUARD project aims to contribute to reversing the loss of wild pollinators across Europe through increasing our understanding of the direct and indirect drivers of pollinator declines, environmental, economic and societal impacts as basis for a portfolio of effective policy and practice solutions. Our goal is to inspire the development of management and policy guidelines for the public and private sectors to safeguard wild pollinators and the benefits they provide.
To implement pollinator management effectively, one part of the project (WP3, task 4) aims to understand what worldviews and values key stakeholders hold, why they arise and how they may vary among European countries. The hypothesis for this part of the projects is that effective management requires an understanding of the trade-offs that stakeholders make between different management outcomes and an understanding of the sociocultural and location-specific differences that drive these preferences.

What is expected from you (methodology): As part of this part of the SAFEGUARD project, we are conducting interviews to understand the different worldviews of key stakeholders across Europe and their perceptions of wild pollinators and their conservation. If you agree to participate in our research, you will be asked to engage in an online discussion with us around a few pre-defined set of questions. You will be expected to answer these questions based on your knowledge, point of view and experiences. There are no right or wrong answers. It is purely from your perspective. Our interview should last half an hour or so and will be conducted over Zoom. The interview will be recorded live and on a Dictaphone in order to build up a synthesis from the extracts of our interviews with the different actors.

Your rights to withdraw from the research at any time : Your contribution to this research is voluntary and you can withdraw or end your participation at any time without having to justify your decision. You can do this for all or part of our interview (for example, you can refuse to answer certain questions). Your decision to participate, to refuse to participate or to terminate your participation will not affect your status or your future relationship with INRAE or SAFEGUARD.

Your rights to confidentiality and privacy: Your data will be treated with absolute confidentiality. All your data will be kept on a secure file which is only accessible to the research team. If quotations are to be used in our publications and reports, they will be made using pseudonyms and the generic profession to ensure anonymity in our publications. You can request the destruction of your data at any time.

One copy of this document is given to you, another copy is kept in the file

Possible risks: To the best of our knowledge, this research does not involve any risks or discomfort. However, if you feel any discomfort at any time, please do not hesitate to inform us.

Outreach: This research will be used to inform a larger online survey with stakeholders across Europe during spring 2023. It will also feed in a deliverable for the European Union in August 2023 and will be disseminated at conferences and published in conference proceedings, academic journal articles and scientific books. It may also be used for the writing of press articles for the general public, contributions to university websites (e.g. SAFEGUARD website, laboratory website) or linking the academic community with the general public (e.g. The Conversation). Finally, this research could also be used in interviews or interventions on radio, television or the Web, as part of teaching.

Your rights to ask questions at all stages of the study: You can ask questions about the project at any time by contacting the task's scientific lead by e-mail at juliette.young@inrae.fr.

Your rights to stop participating at any time during this project:
Example : You may, at any time, decide to stop participating in this study by notifying : **Juliette YOUNG** or **Zafarani Uwingabire**, without having to justify yourself and without any prejudice.

Consent to participate
By signing the consent form, you certify that you have read and understood the above information, that your questions have been answered to your satisfaction, and that you have been advised that you are free to withdraw your consent or to withdraw from this research at any time, without the need to justify yourself and without prejudice.

To be filled out by the participant:

I have read and understood the above information and willingly agree to participate in this research.

I give the project team permission to record, which involves voice recording, and transcribe our interview. I understand that I can revoke this permission at any time by notifying the project team by e-mail.

❑ Yes ❑ No

This exchange is a part of the research project and we hope in the future to organise further interviews and activities to complement the information gathered today. I agree to be contacted again to participate in other activities organised by the project team.

❑ Yes ❑ No

Name, First name - Date - Signature

One copy of this document is given to you, another copy is kept in the file