Received: 18 October 2023 | Accepted: 12 March 2025

DOI: 10.1002/pan3.70035

People and Nature

RESEARCH ARTICLE

Worldviews and values of key societal actors influencing decision-making around nature: The case of wild pollinator conservation in Europe

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Funding information
Horizon 2020 Framework Programme, Grant/Award Number: 101003476

Handling Editor: Tobias Plieninger

Abstract

1. Biodiversity is vital for life on earth but faces many anthropogenic pressures. Mitigating these pressures and improving biodiversity status requires understanding the worldviews and values of actors involved in conservation or responsible for creating pressures on biodiversity. This paper contributes to the theoretical understanding of the interplay between worldviews and values and their potential influence on effective policy or practice actions.
2. We investigated the worldviews and values of key European actors influencing a specific component of biodiversity conservation: wild pollinators and pollination. We collected qualitative and quantitative data through in-depth interviews with 27 individuals from business, policymaking, NGOs and research.
3. Bio-ecocentric worldviews prevailed in our sample of interviews, with a consensus over the intrinsic value of all living beings, that human activities are negatively impacting nature, the existence of biophysical limits to economic growth and the need for environmental regulation. Furthermore, anthropocentric and relationship-centred perspectives emerged on the use of pesticides, modes of economic growth (conventional vs. sustainable), the ability of human ingenuity and technological innovation to solve ecological problems and the fundamental resilience of nature to rapid change.
4. Irrespective of overall worldviews on human–nature relationships, all stakeholder groups in our sample agreed on the irreplaceability of pollinators and their many benefits, their decline and that their conservation is a priority for which all sectors of society are responsible and should contribute.
5. Interviewees agreed that in addition to the widely recognised ecological, nutritional, economic and cultural values that pollinators provide, there also exist relational values and moral responsibility to conserve pollinators. Non-use values (e.g. ecological role) were highlighted by all stakeholder groups as being at least as important as use values (e.g. supporting human diets). Cultural use values

(e.g. aesthetic) of pollinators were typically regarded as being less important relative to their non-use relationship-centred and moral values (e.g. responsibility to future generations).

6. *Policy implications*. The diverse values of biodiversity create a complex conservation challenge amid competing societal priorities. The efficacy of public policy instruments critical to facilitate conservation actions can be improved by further integrating ecological, economic, social and moral-ethical levers to achieve the long-term sustainable management of biodiversity.

KEYWORDS
biodiversity, human–nature relationships, IPBES, nature valuation, pollinators

1 | INTRODUCTION

The Convention on Biological Diversity (CBD) and other policy efforts (e.g. the EU Nature Restoration Law Regulation (EU) 2024/1991) strive to enhance biodiversity conservation by civil, government and business actors in the face of competing and entangled societal priorities (IPBES, 2019). Decision-makers pay differential attention to values coherent with their personal worldviews (Spangenberg, 2018; Stigler, 1961). The implication is that unless protecting biodiversity makes sense to key stakeholders (spanning science, business, policy and NGOs), it is unlikely that measures to stop the causes of declines and restore populations will be put forward or succeed. Therefore, ensuring the efficacy of conservation or management decisions and actions requires that the diverse worldviews on nature and its values held by actors involved in conservation and by actors creating pressures on biodiversity are better understood and taken into account (IPBES, 2022).

Worldviews are fundamental beliefs and assumptions that shape how individuals or societies perceive and interact with the world. Worldviews depend on cultural context and background, knowledge system and language (Pascual et al., 2023). Thus, various cultures and groups understand and relate to nature differently, adding complexity to conservation efforts (Descola & Sahlins, 2013; Ducarme & Couvet, 2020; Klain et al., 2017; Peter et al., 2021). Pascual et al. (2023) categorize worldviews as being: anthropocentric (*living from or living in nature*), bio-ecocentric (*living with nature*) and pluricentric (*living as part of nature*). Worldviews influence value perceptions, attitudes and behaviours that impact nature (Heberlein, 2012; Manfredo & Manfredo, 2008; Raymond et al., 2023).

Values specific to nature are understood as judgements regarding the importance of nature in particular contexts (e.g. components of nature, human–nature relationships, well-being) and these can be activated, formed and change via individual, social and socio-ecological processes. A number of 'use' (e.g. food, aesthetic landscapes) and 'non-use' (e.g. species in their own right, responsibility to future generations, 'web of life support') values have been attributed to biodiversity and grouped into *instrumental values* (i.e. means to a desired end, such as ecosystem services), *relational values* (i.e. the meaningfulness of human–nature interactions), *intrinsic values* (i.e. the inherent worth of each element of nature, valued for its own sake, independent of people), *moral values* (i.e. the notions of what is universally right) and *ecological values* (i.e. nature–nature biophysical structure, process and function) (Chan et al., 2016, 2018; Himes et al., 2024; Jax et al., 2018; Klain et al., 2017; TEEB, 2010).

This paper aligns with other studies that aim to support better biodiversity management outcomes by viewing the situation through a pluralistic value lens that includes diverse worldviews, societal groups and approaches in research and practices (Díaz et al., 2019; IPBES, 2022; Raymond et al., 2023; Pascual et al., 2023). Empirical evidence, however, remains understudied regarding the connection between worldviews, value perception and preferred nature management actions. Our paper seeks to address this knowledge gap and contribute to the theoretical understanding of the interplay between worldviews and values and their potential influence on effective policy or practice actions.

Here, we use the case of insect pollinators (bees, flies, butterflies and other groups) in Europe for two principal reasons. First, various studies have shown the pluralistic value of pollinators (Table 1). For instance, pollinators support crop yields (Garibaldi et al., 2013), improve food product shelf life (Klatt et al., 2014) and have impacts on human economies and nutrition (Lautenbach et al., 2012; Uwingabire & Gallai, 2024). By supporting wildflower diversity (Ollerton et al., 2011), pollination of wild plants contributes to biodiverse habitats or landscapes providing aesthetic, amenity or cultural services and values to people (Potts et al., 2016). Other benefits include many cultural or spiritual traditions and customs worldwide depending on or inspired by animal pollination (Hill et al., 2019). Compared to the substantial global literature on pollinators and pollination related to their instrumental values (e.g. IPBES, 2016) and their value to nature as an ecological function (Potts et al., 2016; Vanbergen & Insect Pollinators Initiative, 2013), there is, however, comparatively little published on their relational values (Hill et al., 2019). Second, multiple anthropogenic pressures are threatening plant–pollinator mutualisms worldwide and jeopardising their wide-ranging value (Dicks et al., 2021; IPBES, 2016; Vanbergen & Insect Pollinators Initiative, 2013). Awareness of

TABLE 1 Definitions of different perceived values and attributes of and about wild pollinators. The listed use values are instrumental, whereas non-use values are morally grounded.

Perceived values	Use and non-use values	Type of values	Attributes	Description
Value of pollinators for nature	Non-use value	Ecological value	Web of life support	Pollination by animals, particularly insects, supports wider biodiversity via a web of trophic interactions connected to plant life (Ollerton et al., 2011; Potts et al., 2016)
Value of pollinators as nature	Non-use value	Intrinsic value	Pollinator species in their own right	Importance given to pollinators per se (e.g. existence value of pollinators; Uwingabire et al., 2023)
Value of and about pollinators as culture	Non-use value	Cultural and relational value	Responsibility to future generations	Willingness to preserve wild pollinators for future generations in general or for one's descendants. (IPBES, 2016)
	Use value	Cultural and relational value	Biodiversity flagship	Pollinators are important to research and education (formal and inform) in e.g. ecology and biology. (IPBES, 2016)
			Leisure and recreation	Pollination contributes to leisure and recreational activities such as pollinator-friendly gardening (Hall et al., 2017)
			Aesthetics	Pollinators contribute to flower-rich landscapes, to public and private greenspaces (IPBES, 2016)
			Art	Pollinators inspire artists (e.g. movies, paintings) and many cultural or spiritual traditions and customs around the world (Hill et al., 2019)
Value of pollinators for Society	Use value	Nutritional value	Varieties of food	The production of certain fruit, nuts, seeds and vegetables depends on pollination by pollinators (e.g. courgettes, strawberries, almond, apple) contrary to others (e.g. lettuce, wheat, maize) (Klein et al., 2007)
			Nutritional quality and healthy food	Pollinators impact nutritional quality of foods supporting good human health (Chaplin-Kramer et al., 2014). Pollinator-dependent crops contribute up to 40% of the world's supply of nutrients and around 90% of Vitamin C supplied from these crops (Ellis et al., 2015)
		Economic value	Amount and stability of crop yields	Insect pollination increases and stabilises yields of pollinator-dependent crops (Garibaldi et al., 2013) and improves product quality and marketability traits (Gazzea et al., 2023; Klatt et al., 2014). These benefits have economic profits which account for ~8%–10% of the value of global edible crop production worldwide (Lautenbach et al., 2012; Murphy et al., 2022)
			Seed production	Pollination impacts seed production (Potts et al., 2016)

this issue raised pollinators to the forefront of biodiversity policy across Europe during the past decade. For instance, the EU Pollinators Initiative provides a strategic framework to address the decline of wild pollinators as part of the EU Biodiversity Strategy for 2030 (EU Commission, 2023a). Additionally, the 2013 neonicotinoid pesticide regulation (EU No 485/2013) was implemented to protect pollinators in the European Union (EU Commission, 2023b). Most recently, the European Union adopted a Nature Protection Law (Regulation (EU) 2024/1991), which contains a specific stipulation (article 10 'Restoration of pollinator populations') to reverse wild pollinator decline and establish monitoring of their populations. Yet despite these policies, gaps between the framing of policy and pollinator management actions on the ground remain. Our premise is that an understanding of the worldviews and nature-related values shared by different stakeholders, working at a relatable scale (e.g. the EU) and cultural context, has the potential to trigger a multi-actor consensus to improve pollinator biodiversity. This understanding of perspectives on pollinators can facilitate dialogue, fostering mutually acceptable actions or reframing challenges in constructive ways (e.g. Satterfield, 2004). It can also shed light on whose worldviews are included or excluded and which values take precedence in decision-making at the European level.

Given our premise we addressed the following research questions:

Q1 What are the worldviews of key stakeholder groups holding a high level of interest and influence on nature overall and wild pollinator-related issues specifically at a European scale?

Q2 What values do key stakeholder groups across Europe attach to wild pollinators in terms of their ecological, economic and sociocultural importance?

Q3 How do interlinkages between worldviews and values potentially influence decision-making on biodiversity management actions?

2 | THEORY AND METHODS

2.1 | Theoretical and analytical frameworks: Worldviews, values and actions

To address our questions, we developed an analytical framework (Figure 1) inspired by and integrating elements from the IPBES conceptualisation of nature's diverse values (IPBES, 2022; Pascual et al., 2023). To capture the complexity of human-nature relationships, we constructed a framework linking worldviews (a), sociocultural values (b) and management actions (c) relevant to pollinators (Figure 1). Our framework opens up novel ways of relating to pollinators, is adaptable to various contexts, and allows exploration of a broader range of worldviews and values currently lacking in assessments of pollinators and pollination valuation.

2.1.1 | Worldviews

Bio-ecocentric (nature-centred) worldviews are grounded in an ethical stance towards nature, emphasising its non-use values to human (e.g. intrinsic and ecological values) and stressing the need to prohibit disturbances affecting species and their habitats (Dunlap et al., 2000; Pascual et al., 2023). Anthropocentric

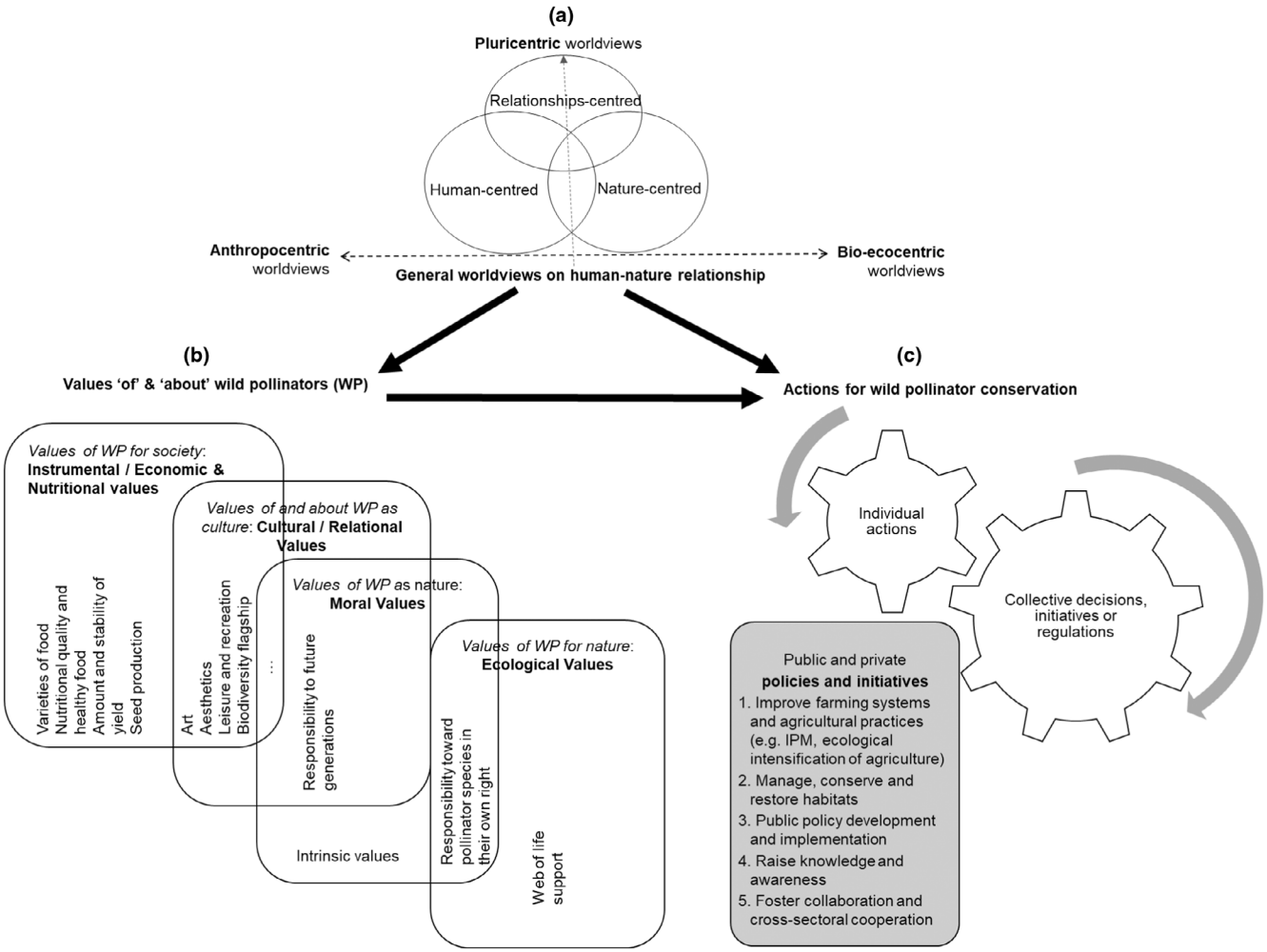

FIGURE 1 Conceptual framework of links between worldviews, values & actions regarding wild pollinator decline. This illustrates the overlap in worldviews and the interconnectedness of ecological, economic and social systems (a). Bottom left (b) portrays perceived values of or about pollinators (adapted from Chan et al., 2018). General worldviews on how humans relate to nature and specific values to wild pollinators are not mutually exclusive (e.g. moral values can overlap across ecological, intrinsic, relational and economic values). There is no hierarchical function of the values boxes. Classification is shaped by individual perceptions of these specific values and the level of recognition of their importance, from the level of individual production to that of food consumption, through the cultural and educational levels within human society and, in a broader sense, at the level of all living beings. Bottom right (c) reflects the various public and private policies and initiatives affecting individual or collective actions (Díaz et al., 2019) that focus on the management of wild pollinators (Dicks et al., 2016) or biodiversity broadly (IPBES, 2022).

(human-centred) worldviews focus on human interests, needs and use values or benefits of species, habitats or ecosystem processes as pragmatic instruments of human well-being. Pluricentric (relationship-centred) worldviews go beyond the bio-ecocentric and anthropocentric positions. It centres on the interconnectedness of humans, nature and other living beings, recognising that our well-being is deeply linked to the health of ecosystems; thus, it perceives the values of nature to both non-human and human social and societal interests (i.e. Himes et al., 2024). Worldviews remain dynamic, and any individual can hold multiple worldviews relative to the perceived values of interconnected ecological, economic and social systems.

2.1.2 | Perceived values of pollinators

To conceptualise the perceived values of pollinators, we drew upon existing literature on pollinators and pollination (Chaplin-Kramer et al., 2014; IPBES, 2016; Lautenbach et al., 2012; Potts et al., 2016; Sluijs & Vaage, 2016; Uwingabire et al., 2023; Uwingabire & Gallai, 2024). Based on the literature, we discussed a candidate list of pollinator values likely to be held by key stakeholders in Europe and delineated precisely the 'attributes' of and about pollinator values (Table 1). We focused on values of and about pollinators using specific attributes that are 'quantitative measures' (e.g. monetary value, crop yields, area of habitat) and 'qualitative descriptors' (e.g. expressions, arguments, stories) of perceived values. This allowed us to encompass perspectives that go beyond the dichotomy between instrumental (use values) and non-use values (intrinsic and ecological values) of pollinators and include relational and moral values centred on ethics, responsibility, irreplaceability and care (Chan et al., 2016; Klain et al., 2017). It also allowed us to adapt to the characteristics and realities relevant to key stakeholders across Europe and inform, test and improve our interview design (e.g. Kenter et al., 2016).

2.1.3 | Actions for wild pollinator conservation

We drew on Dicks et al. (2016) and IPBES (2016); IPBES (2022) to contextualise stakeholders' policy and practice actions for pollinator conservation and inform our interview design (Box S1). These actions were grouped into five key categories, providing a framework that can potentially be applied to broader biodiversity conservation efforts: (1) improving farming systems and practices (e.g. ecological intensification of agriculture, integrated pest management); (2) habitat management, conservation and restoration; (3) public policy development and implementation; (4) improving knowledge and awareness; and (5) promoting collaboration and cross-sectoral cooperation (see details in Dicks et al., 2016)—all aimed at strengthening pollinator biodiversity outcomes. These actions influence both individual and collective decisions (Díaz et al., 2019).

2.2 | Method

2.2.1 | Sample design

Our sampling was purposive (Etikan et al., 2016) targeting key stakeholders from a sample of organisations (Table 2) with high levels of

TABLE 2 Sample description.

Codes	Sector	Geographical zone	Background	*n*
Bus1 to 5	Business (multinational agri-food industries)	S, W, EU, Int	Entomology, agronomy (MSc-PhD)	5
Res1 to 6	Research (universities, institutes, consultants)	N, S, CE, W	Biology, ecology, ecological economics (MSc-PhD)	6
Pol1 to 8	Policymaking (European Commission, intergovernmental and national agencies)	S, CE, W, EU, Int	Agronomy, entomology, biology (BSc- MSc-PhD)	8
Ngo1 to 8	NGOs (nature conservation, think tanks)	S, W, EU, Int	Entomology, ecology, sustainable business development, and policy studies (BSc-MSc-PhD)	8
Total				27

Note: 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 (N = northern Europe, S = southern Europe, W = western Europe, CE = central and eastern Europe, EU = European Union, Int = international). Definition of European sub-regions followed EuroVoc, Publications Office of the European Union. *n* = the number of interviews conducted. Further Sample details can be found in the Table S1.

influence on and/or interests in European policies related to biodiversity including pollinator conservation/management. These organisations therefore either directly or indirectly play a role by pushing for or pushing back against conservation measures, or through their organisational activities contributing to pressures on pollinator biodiversity. Our assumption was that these key stakeholders could represent a diversity of worldviews on nature and pollinators, who could provide rich information on wild pollinators and their values, and who had direct or indirect influence on decision-making processes at the EU level. It should be noted, however, that this purposive sample may not necessarily reflect the worldview, values and positions of the wider population.

We initially scoped candidate key stakeholder groups from a larger stakeholder mapping exercise done in the H2020 Safeguard project by researchers including IPBES expert authors, NGOs and policy think tanks (Kinneen et al., 2022). From this scoping exercise, we identified target institutions and sent 50 invitations for interviews, either to personal contacts, where we had recommendations, or through their organisations. These were mainly people in senior positions with a strong background knowledge of pollinators, often scientific. We then used a snowball sampling approach and contacted other people suggested by interviewees to broaden our sample. The process resulted in online interviews carried out in December 2022 and January 2023 (mean duration = 83 min, 24 in English, 3 in French) with 27 individual key stakeholders comprising representatives from business (5 multinational agri-food industries), research (4 universities, 1 institute, 1 consultant), policymaking (1 European Commission, 4 intergovernmental and 3 national agencies) and NGOs (5 national and 1 international conservation NGOs, 2 international think tanks) (Table 2). The background of respondents revealed that current science policy networks focussed on pollinators at the European scale are not diverse in terms of disciplinary background and the majority have a high level of education (Table 2).

2.2.2 | Data collection

Following a qualitative research design (Fetters & Molina-Azorin, 2017), we used semi-structured interviews with individuals from our key stakeholder groups to gather in-depth qualitative and interpretative data (Young et al., 2018). The aim was to encourage respondents to express personal beliefs about human–nature relationships within our theoretical framework. We constructed our interview guide as open-ended questions, including the use of statements to initiate in-depth qualitative discussions with respondents to capture different worldviews and value perceptions on human–nature relationships overall and concerning pollinators specifically (Phase 1 and Phase 2, Box S1). The form of the statements was inspired by the 15 items from the NEP scale (the New Ecological Paradigm; after Dunlap et al., 2000) and, following piloting, we retained six NEP statements that were likely to detect different worldviews in our sample and refined their wording to reflect the three worldview profiles (bio-ecocentric, anthropocentric, pluricentric) within our theoretical framework (Statements 1, 2, 4, 6, 7 and 8). For instance, according to the NEP scale (Dunlap et al., 2000), bio-ecocentric worldviews reject 'human exceptionalism' and the hierarchy among species, see the balance of nature as being threatened by human activities, and are naturally associated with the idea of limits to economic growth. We added statements concerning major anthropogenic causes of pollinator decline, their mitigation and concerning socio-economic or political domains the participants were associated with (Statements 3, 5 and 9) (Box 1; Phase 1, Box S1). Each statement was read aloud to interviewees, who were then asked to share their thoughts and explain their reasoning. These statements provided interviewees with an opportunity to express their underlying worldviews. We complemented our qualitative analysis with a quantitative approach to assess the proportion of respondents who agreed (and/or disagreed) with each of the nine statements and the respondent's preferences on perceived values of pollinators. We asked interviewees to indicate their level of agreement, or had no opinion, using a 5-points scale (Box 1), which allowed us to assess the proportion of respondents who held bio-ecocentric worldviews or distancing from that position for each statement (Figure 2). The interviewees were free to adjust

BOX 1 The nine statements used to identify interviewee's general worldviews on human–nature relationships[1]

1. When humans interfere with nature it often produces negative consequences.
2. Despite our unique abilities, humans are still subject to the laws of nature.
3. There are limits to economic growth, even for developed countries like ours.
4. Plants and animals have as much right as humans to exist.
5. Environmental regulations have placed unfair burdens on industry.
6. Human ingenuity will ensure that we do not make the Earth unliveable for humanity.
7. The Earth have plenty of natural resources, if we just learn how to develop them.
8. Whatever we humans do, nature always comes back to balance by itself.
9. We cannot feed the world without using agrochemicals.

[1]Interviewees were asked to express what they think about each statement, explaining why and their level of agreement (strongly disagree, slightly disagree, unsure, slightly agree, strongly agree or have no opinion). Agreement with Statements 1–4 and a disagreement with 5–9 indicated a bio-ecocentric view of the world. Adapted from NEP (New Ecological Paradigm; Dunlap et al., 2000) used to measure beliefs about nature. See Supporting Information for complete interview guide (Box S1).

their scores as the discussion evolved. We also asked each interviewee to provide the three most (and least) relevant attributes (Table 1) from the various values they believed wild pollinators have or provide, directly or indirectly. These were each classified as having 'use' or 'non-use' value (Table 1). We stopped conducting new interviews after reaching data saturation (Patton, 2002), that is when no new aspects relating to worldviews and values with support for pollinator management emerged.

2.2.3 | Ethics approval and consent to participate

Due to the nature of the target interviewees, that is decision-makers at the EU public policy and practice scale as key informants, no formal ethical committee approval was deemed necessary. However, to ensure that our work met appropriate ethical standards, we provided each participant with a complete information notice and consent form (Box S2).

2.2.4 | Data analysis

All interviews were transcribed (after translation into English where required), corrected and coded using the NVivo software. Our codebook of worldviews, values and actions to safeguard wild pollinators (Table S2) was derived from the analytical framework (Figure 1). To mitigate researcher bias and increase consistency, comparative analyses between co-authors U.Z and Y.J were carried out until an acceptable level of agreement was reached (Fereday & Muir-Cochrane, 2006). Results are illustrated by anonymous statements from interviewees (Table 2), in line with the ethical consent agreement.

3 | RESULTS

3.1 | What are the worldviews of key stakeholder groups with respect to nature overall and wild pollinators, specifically?

There was a high degree of congruence between interviewees' worldviews and the values they associated with wild pollinators, but for clarity of presentation, we report below the worldviews and values separately.

3.1.1 | Towards bio-ecocentrism: Nature-centred worldviews

Twenty-one of the 27 interviewees expressed consistent bio-ecocentric views in response to five statements (1, 2, 3, 4, 5;

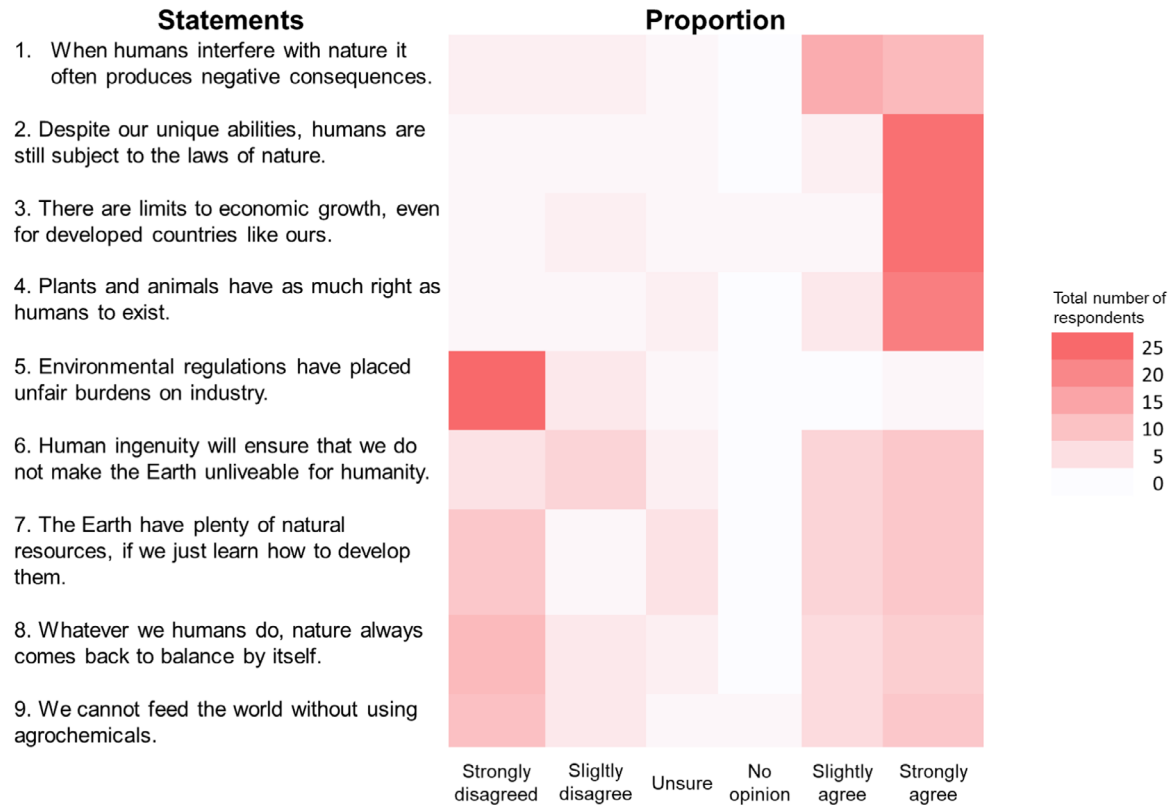

FIGURE 2 The proportion of respondents who agreed (and/or disagreed) with each of the nine statements. People who held bio-ecocentric worldviews strongly or somewhat agreed with the first four statements (1, 2, 3 and 4) and strongly or somewhat disagreed with the remaining five statements (5, 6, 7, 8 and 9).

Figure 2; Figures S2A,B). Views expressed for the remaining four statements (6, 7, 8, 9) were more heterogeneous, both within and across stakeholder groups, but four to 10 of the 27 interviewees maintained their worldview towards bio-ecocentrism (e.g. four respondents for Statement 6 and ten respondents for Statement 8; Figure 2; Figure S2A).

Twenty interviewees agreed with the intrinsic value of all living beings (Statement 4, Figure 2): 'we are not that different to [sic] inhabitants of the planet'. (Pol7_CE/EU), but not necessarily an equivalence: '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).

Of the 27 interviewees, 21 agreed that human activities often have negative consequences for nature (Statement 1, Figure 2), although an interviewee stressed that human activities had also improved biodiversity: 'In Europe, a lot of landscape elements which are very rich in biodiversity have actually been created by historical agriculture'. (Bus1_W).

Interviewees (25 of 27, Figure 2) expressed the view that environmental regulations were not burdensome (Statement 5), although one interviewee highlighted their varied impacts: 'There's been no regulation in some aspects for some sectors for decades [...] they always focus on politically acceptable topics. There are some areas that are still under-regulated, while some are over regulated'. (Bus4_W/Int).

The biophysical limits of the planet to support current economic growth trajectories (Statement 3, Figure 2) were underlined by 22 of 27 interviewees. Moreover, 10 of the 27 interviewees with a bio-ecocentric worldview believed that nature is delicate (Statement 8) and that excessive human interference leads to environmental degradation in the short term. However, most respondents recognised that nature is resilient in a longer term (Statement 2): 'nature will come back whatever we do is just how much we are willing to damage it right now' (Ngo5_S).

3.1.2 | Towards anthropocentrism: Human-centred worldviews

Eight of the 27 interviewees held anthropocentric worldviews on each of the four statements (6, 7, 8, 9) where more heterogeneous worldviews emerged (Figure 2; Figure S2A). An emphasis was placed on the importance of biodiversity on social well-being: 'We should understand that biodiversity is crucial for our well-being'. (Ngo1_W). Some interviewees pointed to difficulties around degraded natural resources (Statement 7): 'We need to face the truth and reality. That means our comfortability will be affected. Yes, you will not just be able to consume however you want to whatever levels you want. You will need to restrain yourself'. (Pol7_CE/EU).

On the specific topic of agrochemicals (e.g. pesticides, fertilisers; Statement 9) views were split (Figure 2), with eight of the 27 interviewees stressing the need for them 'at the moment we are so far that we cannot really go without synthetic products' (Bus1_W).

Eight of the 27 interviewees stressed the ability of human ingenuity and technological innovation to solve ecological problems: 'we will be able to use our creativity and our technical skills in such a way that in the end we will be able to make sure that we do, and will, survive somehow' (Ngo1_W). To justify nature's capacity to maintain an equilibrium (albeit in the longer term), seven of the 27 interviewees expressed that nature is fundamentally resilient to disturbance given the sophisticated interdependencies within complex ecological phenomena: '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).

Some views stressed that nature would rebalance itself, for example with the decline of pollinators: '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).

3.1.3 | Towards pluricentrism: Relationships-centred worldviews

Of the 27 interviewees, nine to 15, depending on the statement, held nuanced worldviews that tended towards pluricentrism while remaining primarily relational. For example, some interviewees emphasised that humans are part of nature—interconnected and spiritually linked to the environment: 'We are connected to the rest of the world. we are really bound by the environment that we exist in' (Ngo5_S). Relationships-centred worldviews often underlined human–nature interdependences and relationships between generations: 'I feel that as a mother that I'm not leaving the planet the way I would want for my children and their children' (Res1_W).

Some interviewees also proposed a rethink of current economic growth models, which are not sustainably compatible with the complex relationships they are grounded in. For example, of the 27 interviewees, 11 highlighted the need for broader societal transformations: "I think it's a matter of changing our diet. That's the crucial thing. [...] If we had more of a plant-based style, then we could certainly feed the world" (Ngo3_W).

Concerning the capacity of human ingenuity to find appropriate solutions for sustainably using natural resources (Statement 7), views were heterogeneous (Figure 2), but revealed the relational perspective in terms of societal reorganisation. Some hoped 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).

3.2 | What values do key stakeholder groups across Europe attach specifically to wild pollinators?

All interviewees mentioned the important role of wild pollinators to nature and human health and relations and well-being (Figure 3). Most stakeholder groups recognised non-use values as being at least as important as use values (Figure 3). Interviewees perceived cultural (use) values of pollinators as being of less importance for human life than nutritional (use), ecological (non-use) and cultural (non-use relational) values such as our responsibility to future generations (Figure 3). More specifically, wild pollinator attributes mentioned by interviewees included ecological, intrinsic, relational and nutritional values, thereby referring to both use and non-use values (Table 1, Figure 3). Attributes most frequently referred to wild pollinator roles in 'web of life support' (19 interviewees), the production of a variety of human food (11) and healthy food of high nutritional quality (10) and pollinator species in their own right (10) (Figure 3).

3.2.1 | Value of pollinators for nature: Ecological values

Nineteen of the 27 interviewees (Figure 3) perceived pollination by wild pollinators as 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). Their loss was viewed by some as a very severe risk for nature: 'without them [Wild pollinators] the wild plants will disappear' (Ngo4_EU). No interviewee selected 'Web of life support' attribute as among the three least important attributes of pollinators.

3.2.2 | Value of pollinators for society: Economic and nutritional values

All interviewees acknowledged the importance of pollinators for human society. Some interviewees stressed that wild pollinators' decline might lead to a loss in the variety of available foods: '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 reductions in nutritional quality of human diets: '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). No interviewee selected the attributes 'variety of food' and 'nutritional quality food' as being among the three least important. In contrast, while the economic value of pollinators and pollination to society via their role in supporting the amount and stability of crop yields and seed production were typically chosen among the most important attributes, they were also mentioned as among the least important for some interviewees (Figure 3).

3.2.3 | Value of pollinators as nature: intrinsic values

Many interviewees (Figure 3) also stressed the pollinators' right to exist for their own sake: 'I would say pollinator species are

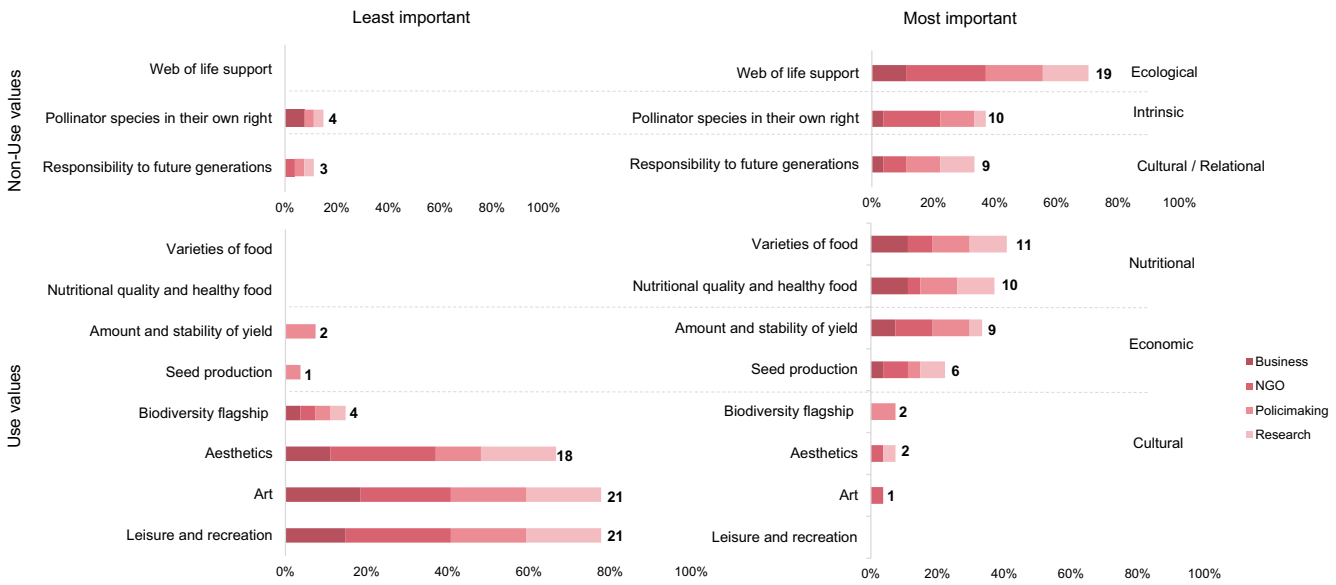

FIGURE 3 Respondent preferences for benefits attributable to wild pollinators. Each interviewee was asked for the three attributes they judged most important and three attributes they judged as less important out of the 11 attributes of wild pollinators they were presented with (Table 1). Interviewees' choices are shown (%, number of respondents adjacent to each bar) grouped according to the least important (left panels) and most important (right panels) and by the categories 'use value' (lower panels) and non-use values (upper panels). These value categories are further subdivided as per (Figure 1 and Table 1).

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). Regardless of their 'use' or 'non-use' values, interviewees from all sectors stressed that wild pollinator decline should be averted for ethical reasons: 'It doesn't matter if we depend on pollination or not, because [...] 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). Few respondents placed the 'Pollinator species in their own right' attribute on their least important list (Figure 3).

3.2.4 | Value of and about pollinators as culture: cultural and relational values

A relational value, in the sense that pollinator conservation is part of our collective responsibility to future generations, was a relatively prominent attribute, tending to be considered among the most important by nine respondents (Figure 3): 'Respecting wild pollinators can remind us of our responsibility to future generations' (Pol3_CE/EU).

Many viewed pollinators as having a pivotal or irreplaceable value to people and ecosystems: 'I don't think I would have the same kind of happiness seeing an artificial bee as to a real bee' (Ngo8_W). Most respondents also stressed that pollinators substitute can't be a viable solution to explore: 'We can't replace wild pollinators entirely' (Ngo8_W).

The selection of the attribute of pollinators being used as a biodiversity flagship was more equivocal, being selected as being among the most and least important attribute (Figure 3). Views about pollinators underlined their cultural use value in education for example: 'I'm pointing them out like to my kids and get trying to get them interested in the different colours and sounds and the senses of the world around us. And teaching them about food webs and things like that' (Res1_W).

Attributes linked to cultural use values such as leisure and recreation, aesthetics and art were perceived to be the least essential by these interviewees to human life (Figure 3). These tended to be seen as additional to more essential attributes supporting our lives and ecosystems: 'Attributes of wild pollinator benefits such as aesthetics of wild flowers embellishes our lifestyle' (Pol3_CE/EU).

Other perspectives on pollinator values emerged, for example: 'wild pollinators are important for people to (re)connect with nature' (Ngo5_S). There was little mention by interviewees of potential disservices or negative outcomes linked to wild pollinators. Apart from a single mention of how diverse wildflower habitats, should these be introduced on farms for pollinators, might complicate agricultural or horticultural seed production (for seed companies) (e.g. potentially by diluting pollinator visits to the crop).

3.3 | How do interlinkages between worldviews and values potentially influence decision-making on biodiversity management actions?

3.3.1 | Perspectives on action to conserve wild pollinators

Interviewees stressed that the protection of wild pollinators should aim to improve habitats and foraging resources for pollinators and reduce the use of potentially harmful chemicals: 'We need to ban or severely cut down the pesticides that are harmful to pollinators. [...] stop using so much fertilisers so that our grasslands can become species-rich again. [...] manage our forests so that they become more diverse habitats, so that they can support pollinators. [...] grow a greater diversity of crops and create more spaces in agricultural farmlands to support pollinator populations' (Ngo4_EU).

To achieve the above aims, the following actions were stressed:

1. *Public policy development and implementation*: Public policies were mentioned as key actions by 23 of the 27 interviewees with emphasis on 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 subsidising 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).
2. *Managing, conserving and restoring habitats*: Habitat management for wild pollinators was mentioned by 19 of the 27 respondents, emphasising their current and future creation, restoration and management up to 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). Habitats deemed to support many 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).
3. *Improving farming systems and agricultural practices*: Enhancing farming systems and agricultural practices to create habitat mosaics in farmed landscapes were mentioned by 15 of the 27 interviewees, with one emphasising the need for: 'some sustainable farming practices [...] like favourably managed, extensive farming,

integrated pest management' (Pol7_CE/Int). The important 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, funding and stimulating their activity for the environment by making Agri-Environment Schemes financially attractive: '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. *Raising knowledge and awareness*: 25 of the 27 interviewees mentioned raising awareness, knowledge and capacity building as crucial for long-term results. Public awareness 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). Capacity building was highlighted '…because there are places where the main impediment for a stronger application of the conservation policies is the shortage of capacity' (Pol1_Int). This combination of building awareness and capacity 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).
5. *Collaboration and cross-sectoral cooperation*: Greater collaboration and cross-sector cooperation were mentioned by 18 of the 27 interviewees as key to successful conservation of pollinators: '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).

3.3.2 | Worldviews and values relative to wild pollinator management actions

Regardless of their prevailing worldview, most respondents' preferences reflected a mix of use and non-use values regarding wild pollinators, with a consensus that enforcing and implementing public policies should be a key action for their conservation. Those with a bio-ecocentric worldview did not focus exclusively on the non-use values of wild pollinators. To illustrate these patterns, we focus on interviewees' worldviews based on Statements 6, 7, 8 and 9, where there was greater heterogeneity of thought (Figure 2), and on the selected attributes of pollinator values deemed most important (Figure 3), in relation to the key actions identified in their responses (Section 3.3.1 above).

Specifically, four distinct patterns emerged regarding the links between worldviews, values and actions (Figure S3). First, interviewees holding nature-centred worldviews on the four statements, for example, the technological innovation limits (Statement 6) preferred attributes with ecological and nutritional values: 'it's not just about our own crops, but the food supplies for many other organisms' (Ngo3_W) and emphasised the role of public policies (pesticides ban, regulations, conditioned (or not) incentives and subsidies, tax schemes) and their stringent application: 'most of the evidence shows that simply having more flowers, diversity flowers is enough to support pollinators so that's how we got to do it and support it through government initiatives, funding of Agri-Environment Schemes' (Ngo3_W).

Second, some of the interviewees with human-centred worldviews selected the top three attributes of pollinators use values as the most important, for example: 'one is definitely nutritional quality and healthy food, another one is varieties of food, and the third one I would choose is amount and stability of yield because this is the way how they are directly contributing to our everyday life by making possible the production of quality fruits and vegetables' (Bus1_W); but moral concerns remained present: 'I would see it as a moral responsibility of humanity to conserve nature (wild pollinators) as much as possible and to use it in a responsible and sustainable way' (Bus1_W); and promoted actions geared towards the development and implementation of public policies, while putting an emphasis on the role of collaboration and cross-sectoral cooperation: 'this is something where the different stakeholders in the society have to collaborate to be successful' (Bus1_W).

Third, one of the interviewees who held anthropocentric worldviews underlined, for example, demographic concerns ('we have to have very intensified agriculture. And so, we need fertilisers and we need, pesticides, etc'. (Ngo1_W)) yet, classified the three attributes of pollinators with non-use values as most important to him while his worldviews remained human-centred: 'they're vital for human life. If we do not have enough pollinators to keep our ecosystems going then we will suffer from that very much'. And added: 'aesthetics and leisure and recreation, they have less to do with the essential prerequisites for the continuation of our life. Whereas the other ones like the web of life support and future generations etc is very directly connected to the essentials of the continuation of life' (Ngo1_W). For this respondent, public policy was the key action needed.

Fourth, interviewees with a relationship-centred worldview selected attributes of pollinators with both use and non-use values as the most important, and while recognising the importance of public policy development and implementation, they also highlighted points centred on relational and precautionary perspectives that could serve as overarching guiding principles for decision-making on policy and practice actions. First, these interviewees highlighted the need to adopt a different approach to conservation by tapping into human–nature relationships and connectedness: '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, they acknowledged our limited knowledge about the complexity of nature, while still needing to provide an informed basis for

decision-making in uncertain but 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, they stressed that safeguarding biodiversity such as wild pollinators is a shared responsibility that must tap into human-human relationships across society and sectors: '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' (Bus5_W).

4 | DISCUSSION

In this paper, we provide insights for scientists and decision-makers by identifying shared perspectives and areas of disagreement among stakeholders involved in debates around pollinators and biodiversity conservation. By identifying these areas of consensus or divergence, our analysis can inform the development of effective and implementable strategies to engage multiple actors in the collaborative safeguarding of pollinators and wider biodiversity.

4.1 | Broader relationships-centred worldviews spanning instrumental, intrinsic, and moral values may stimulate implementable conservation outcomes

The key informants interviewed were all stakeholder groups close to the issue of biodiversity and wild pollinator conservation with a high level of influence because of their activities and involvement with policymaking, public or private research, and NGOs in Europe. Our results reveal an apparent consensus among these key informants that ecological, economic, human health and ethical aspects are all important levers for the conservation and sustainable management of wild pollinators. On the other hand, considering actions specific to wild pollinator conservation, we found areas of disagreement among them concerning pesticide use and economic growth as contributing pressures, and the scope for technological innovation to solve the problem. The heterogeneity in worldviews on major causes of pollinator decline (e.g. pesticides; Dicks et al., 2021; IPBES, 2016; Potts et al., 2016) highlights the complexity of consensus-building between stakeholders given different perceptions of the urgency (or need) of implementing pollinator-friendly actions. Regulations and incentives-based public policy were prominent in interviews as key actions to safeguard pollinators. Such worldviews align with the literature on social costs that are generated by actions of business firms which have negative consequences on society (Coase, 1960) and more generally market-based environmental policy instruments (Stavins, 2003).

Existing literature has shown the prevalence of instrumental and intrinsic values being promoted to foster conservation action (IPBES, 2022). Our results suggest that relational and moral values towards both nature and people are important to stakeholders engaged in action to conserve wild pollinators. We found that relationships-centred values between humans and pollinators (e.g. irreplaceability) and between humans via pollinators (e.g. showing pollinators to their children) linked to morality were rated highly, and thus, could form potential levers to action, if further mobilised. For instance, Jax et al. (2018) take a relational values perspective to suggest that conservation messages will often be more effective when emphasising personal, collective and reciprocal value relationships with wildlife in ways that increase a sense of belonging and self-efficacy. Also, while values centring on culture were disregarded by most participants in our sample, they may speak to some constituencies and are known to be essential for pollinator conservation (Hill et al., 2019). Our findings indicate that a pragmatic approach acknowledging a diversity of values may be more effective in reaching diverse people and thereby improving pollinator conservation outcomes.

In this sense, stakeholders working towards pollinator conservation may disproportionately focus on a single aspect, such as either non-use intrinsic values or instrumental use values (e.g. ecosystem services and nature's contributions to people, Muradian & G'omez-Baggethun, 2021) because they are under the impression these attributes can trigger actionable responses from decision-makers. It is likely that a more flexible and mixed approach that encompasses relational, alongside instrumental and intrinsic, arguments may deliver improved outcomes. Such a mixed approach would be consistent with evidence in literature focusing on human–nature relationships from ethics in sustainability (e.g. Becker, 2023), care ethics from feminist philosophy (Code, 1987; Held, 1995, 2006; Robinson, 2011), morally grounded environmental stewardship (Bennett et al., 2018) and virtue ethics like the concept of eudaimonia (Cafaro, 2015; de Knippenberg et al., 2018). Although intrinsic and instrumental values are critical to conservation, restricting thinking only to these values may miss a fundamental basis of concern for nature that can improve outcomes (Chan et al., 2016).

Incorporating relational-centred worldviews and values (e.g. moral responsibility) alongside instrumental and intrinsic values in debates on protecting pollinators may present opportunities to welcome diverse stakeholders into a safer place for discussion. This may have implications for conceptual frameworks of human–pollinator relations, research and conservation practice (IPBES, 2016; Kremen et al., 2007; Kuldna et al., 2009). Integrating the moral relations between humans and non-humans in new frameworks describing interdependencies among people, pollinators and pollination would capture the recognition of intrinsic pollinator rights, their irreplaceability and likely ineffectiveness of their substitution. For researchers and practitioners working on the practical conservation of pollinators and pollination, it would be beneficial to go beyond their own worldviews and values regarding human–nature relationships to consider such deeper aspects (e.g. ethical dimensions, morality)

in addition to ecological and instrumental perspectives, and thereby influence decisions and actions more profoundly.

4.2 | Caveats & future research perspective

Our analytical framework spanned the continuum of bio-ecocentric, anthropocentric and pluricentric worldviews, thereby accommodating nature-centred and human-centred perspectives, but also human–nature interdependencies and relationships. Given the prevalence of a preference for ethical and moral considerations in our sample and an acknowledgment of the importance of both use and non-use values, it may be useful to identify more relation-centred values based on pollinators to further clarify how this perspective can support decision-making.

We noted how the interviewees all shared similar backgrounds, having strong scientific training in entomology, biology, ecology and agronomy, and their work has exposed them to different types of knowledge and cultures across Europe and beyond (Table 2). Except for a few points of contention, this limited the diversity of worldviews and values expressed in our sample; however, it also revealed key information about the profiles, worldviews and values shared among the actors of key influence in the European debates on pollinators. Furthermore, a caveat is that while our author group is multi-disciplinary, spanning the natural and social sciences (ecology, political science and economics), we acknowledge that our own worldviews will have influenced the design and interpretation of our research on the worldviews and values held by participants.

Purposively, we targeted key informants (Etikan et al., 2016) from science, business, policy and NGO institutions possessing a high level of influence and directly engaged with biodiversity, often pollinators specifically, at the EU level. Our interviewees were identified based on a mapping exercise carried out by a wider research consortium and based on their experiences of who was considered a key decision-maker. Respondents' knowledge about our subject was self 'deterministic' in selection based on initial selection and choice within institutions. This lack of diversity among the sample of stakeholders may reflect the structural marginalization of diverse ways of knowing and relating to nature in conservation-related agendas (Turnhout et al., 2012). A caveat is therefore that our results represent the worldviews and values of individuals from organisations that already interact with national and international level decision-making. Our study design therefore excluded other important stakeholder groups with lower influence but high interest, such as individual farmers, consumers and local businesses 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 (Ratamäki 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). Therefore, future research could build upon our study by expanding the range of stakeholders with different levels of interest and influence across levels of environmental governance.

5 | CONCLUSION

Our novel analysis of the worldviews and values of influential European stakeholders regarding the conservation of biodiversity, using the example of pollinators, produced several key learning points regarding the intricate relationships between people and nature. Our findings underscore the widespread recognition among interviewees of the manifold values that species, such as pollinators, confer to both ecosystems and human societies, encompassing ecological, economic, relational and moral values. These collectively serve as potent motivators for the long-term conservation and sustainable management of not only wild pollinators but also overall biodiversity in Europe. Beyond their instrumental and intrinsic values, our findings show a consensus among engaged actors centring on the ethical imperative to conserve pollinators, while culture remains undervalued.

We also reveal areas of contention among key stakeholders at the European level, notably concerning pesticides, technological innovation and economic growth based on natural resources in relation to actions affecting wild pollinators. Such disagreements underscore the complexity and challenges inherent in devising effective strategies for pollinator conservation amidst competing interests and priorities. Public policy instruments were recognised as pivotal in driving collective action to mitigate species decline and restore biodiversity. Consequently, the ethical foundations of these initiatives may serve as key levers for engaging diverse stakeholders in biodiversity conservation.

AUTHOR CONTRIBUTIONS

Zafarani Uwingabire and Juliette C. Young designed the conceptual framework, developed the methodology, conducted the data collection and analysis, and drafted the original version of this paper. Adam J. Vanbergen, René van der Wal and Florence L. P. Damiens provided critical feedback on drafts and improved the final MS, while Tom D. Breeze provided feedback on the first draft.

ACKNOWLEDGEMENTS

We thank Lois Kinneen, Deepa Senapathi and colleagues for their considerable work in compiling the Safeguard stakeholder map, allowing the identification of the key informants. We thank the interviewees for their time and knowledge. We thank the editors and reviewers of People and Nature for their constructive comments on an earlier draft. This project received funding from the European Union's Horizon 2020 research and innovation programme Safeguard project (www.safeguard.biozentrum.uni-wuerzburg.de) grant/award number: GA 101003476.

CONFLICT OF INTEREST STATEMENT

None of the authors have any conflicts of interest to declare.

DATA AVAILABILITY STATEMENT

This manuscript does not include any data.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Table S1. Key stakeholder groups interviewed and their reach.

Table S2. Codebook.

Table S3. Respondent preferences for wild pollinator attributes.

Figure S1. General worldviews held by interviewees on each of the nine statements.

Figure S2. Interviewees' positions on the nine statements around general worldviews.

Figure S3. Interviewees' worldviews, values, and effective actions to safeguard wild pollinators.

Box S1. Interview guide and relation to research questions.

Box S2. Consent form.

How to cite this article: Uwingabire, Z., Vanbergen, A. J., Damiens, F. L. P., Breeze, T. D., van der Wal, R., & Young, J. C. (2025). Worldviews and values of key societal actors influencing decision-making around nature: The case of wild pollinator conservation in Europe. *People and Nature*, *7*, 1366–1381. https://doi.org/10.1002/pan3.70035