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PERSPECTIVE

Rethinking individual relationships with entities of nature

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Abstract

1. Recognizing variation in human–nature relationships across different contexts, entities of nature and individual people is central to an equitable management of nature and its contributions to people, and to design effective strategies for encouraging and guiding more sustainable human behaviour.
2. We complement the broader Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) conceptual framework by zooming in from relationships between people and nature to individual relationships with entities of nature (IREN), and introduce a new typology that categorizes those relationships based on individual attitude, behavioural preference and behaviour towards an entity. These three dimensions illustrate if an individual perceives the entity to provide mainly positive, negative or no contributions; prefers to have a mainly positive, negative or no impact on the entity; and performs mainly actions with positive, negative or no impacts on the entity.
3. The IREN typology defines 17 overarching relationship types, including not only types where attitude, behavioural preference and behaviour are all negative (intolerance), all neutral (indifference) or all positive (stewardship), but also types where the valence of some dimensions diverges. Among those, we integrate and redefine established types like tolerance, and introduce new ones like ambivalent opposition, which is highly relevant for the management of overabundant or invasive species.
4. Combining attitude, behavioural preference and behaviour to categorize different IREN types can help detect inequalities in the benefits and detriments individual people receive from different entities, and signal societal conflict potential or misalignment of behaviour with conservation goals. Combining those three dimensions also indicates the relative importance of goal-oriented motives

like the desire to optimize an entity's perceived contributions, moral motives like the desire to act righteously and implementation barriers preventing individuals from acting according to their preference.

5. By adding an individual- and entity-specific perspective, the IREN framework and typology can encourage more equitable approaches to managing the benefits and detriments people derive from nature, and assist the development of more effective strategies for aligning human behaviour with conservation and sustainability goals.

KEYWORDS
attitude, behaviour, human–nature relationships, human–wildlife relations, nature's contributions to people, relational values, sustainability, tolerance

1 | WHY WE NEED TO ZOOM INTO CONNECTIONS BETWEEN NATURE AND PEOPLE

Reciprocal relationships between nature (underlined terms are defined in the glossaries in Table 1 and Table S1) and people are central to the present and future state of nature and to a good quality of life on earth, as illustrated by the conceptual framework of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES; Díaz et al., 2015). Nature's contributions to people (NCP), both positive and negative, affect quality of life directly (Díaz et al., 2015, 2018). Human behaviour can cause changes in nature and thus, affect quality of life indirectly (Brauman et al., 2020). Ongoing environmental crises and biodiversity loss demonstrate the urgency of mitigating and reverting detrimental human impacts on nature (Díaz et al., 2019; Ginkel et al., 2020). Simultaneously, rising concerns about justice issues in conservation research and practice highlight the need for a more equitable management of people's behaviour impacting nature, and of the benefits and detriments they derive from it (Colloff et al., 2017; Ellis et al., 2019; Wyborn et al., 2021). In the following, we outline how zooming in from people to individuals and from nature to entities of nature (henceforth, entities) can aid the achievement of this dual goal.

Zooming into nature acknowledges that entities differ regarding the suite of contributions they can provide, with a higher propensity for positive contributions in some entities and a higher propensity for negative ones in others (Figure 1a). Vice versa, the impact of human behaviour varies across entities (Ellis et al., 2021). Impacts on nature as a whole are usually challenging to assess due to complex system dynamics (Clayton et al., 2016; Colloff et al., 2017), and they cannot be measured with classic scientific methods when nature is viewed as possessing personhood (e.g. Mother Earth). Concentrating on a specific entity can both reduce complexity and allow qualitative, local-context-based impact assessments for entities like sacred sites or nature spirits. Finally, an entity-specific perspective takes into account that how an entity is conceptualized has ramifications for the perception and valuing of its contributions (see next paragraph). For example, the contributions of more tangible entities such as a local wolf population are usually perceived more strongly than the contributions of psychologically distant entities such as wolves as an abstract idea (Slagle et al., 2019).

Zooming into people recognizes that NCP reception and impacts on quality of life, and people's psychological and behavioural responses to them, vary across individuals and the contexts they operate in (Figure 1b). The geo-ecological context determines if an entity occurs where the individual lives. The political-economic context regulates who has legal access to the entity, whether programmes or infrastructure exist that reduce exposure to a hazardous entity, and how human assets are involved in NCP co-production. Individual context (e.g. means of livelihood, social status) further influences personal access and exposure to an entity (Clayton et al., 2016). For instance, people living in the Northern Hemisphere will experience elephants only indirectly (e.g. on television) or infrequently (e.g. on holiday trips), whereas people in regions where elephants live may have frequent direct contact with them (Figure 1b). Geo-ecological, political-economic and individual context also affect how dependent on certain positive contributions or how vulnerable to certain negative contributions someone is (Brauman et al., 2020; Clayton et al., 2016), which may change over time (Rasmussen et al., 2017). For example, food security influences vulnerability towards negative impacts of elephant crop raiding (Salerno et al., 2020); and dependence on the positive contributions of working elephants is greater in a subsistence than in a profit-oriented setting (Maurer et al., 2021).

Socio-cultural and psychological context influence what contributions someone receives from an entity, to what extent they are aware of those contributions, how strongly they value or disdain them and how they respond to them (Gunton et al., 2017; Hill et al., 2021; Pascual et al., 2017; Peter et al., 2021). Culture plays a central role here, because it coins images, norms and practices regarding entities of nature (Batavia et al., 2020; Muradian & Pascual, 2018). For example,

TABLE 1 Glossary (Abridged. See Table S1 for more detailed definitions and additional terms)

Term	Definition *in this article*
Action	A single behavioural act, for example signing a petition, buying something or killing an animal (see Montaño & Kasprzyk, 2015; Slagle & Bruskotter, 2019)
Attitude	An individual's overall tendency to evaluate something (here, an entity of nature) as good or bad (Fishbein & Ajzen, 1975)
Behaviour	A *suite of actions* performed or not performed by an individual, which determine whether the individual has a positive, negative or no impact on an entity of nature (see Text S1)
Behavioural preference	An individual's general preference to have a positive, negative or no impact on an entity, irrespective of perceived feasibility
Entity (of nature)	Any concrete or abstract part of nature, encompassing, for example species, landscapes, plants, animals, nature spirits and nature as a whole
Entity integrity	Entity intactness or soundness. Indicators and perception of entity integrity can vary with knowledge and value systems (see '*Behaviour*' section in Text S2)
Entity's contributions to the individual (ECI)	The subset of nature's contributions to people provided by a specific entity of nature to a specific individual
Eudaimonia	'Flourishing' or 'living a good life' rooted in living in harmony with one's values (Chan et al., 2016; Winkler-Schor et al., 2020)
Individual	Any individual human
Individual quality of life	The extent to which an individual perceives that they have a good quality of life
Nature	Includes various concepts of nature used in different knowledge systems. 'Nature' can pertain not only to 'all that is not a human artifact' (Ducarme et al., 2021), to biodiversity, natural resources or natural heritage, but also to concepts where landscape elements, natural resources and culture are inextricably linked (e.g. Country as understood by Aboriginal people), or where nature is considered to have personhood (e.g. Mother Earth or Pachamama; see Brondízio et al., 2019)
Nature's contributions to people (NCP)	All positive and negative contributions of nature to humans as individuals, societies, or humanity as a whole (Díaz et al., 2018)
NCP/ECI reception	The step from potential to realized NCP/ECI: Potential contributions are hypothetical and determined by entity integrity, whereas realized contributions are actually received by people and additionally depend on societal factors shaping NCP/ECI co-production (Brauman et al., 2020)
Norms	A 'code of conduct' prescribing whether actions are considered appropriate (Klöckner, 2013; Montaño & Kasprzyk, 2015). Norms are guidelines which help apply abstract values to concrete people, entities and situations
Relational norms	Norms stipulating how different people and entities of nature should interact with each other, with objects or among one another (see Pascual et al., 2017)
Sustainable	Describes actions, products or approaches that do not jeopardize nature's potential to provide positive contributions and the good quality of life of present and future generations (Díaz et al., 2015; United Nations, n.d.)
Quality of life	The extent to which people have a good quality of life - a highly value-laden and context-dependent concept comprising factors like access to food, water, health, education, security, cultural identity, material prosperity, spiritual satisfaction and freedom of choice, among others (Brondízio et al., 2019; Díaz et al., 2015)
Valence	The *positive, neutral or negative* valence of an ECI, attitude, behavioural preference, or behaviour
Values	Here, values in the sense of moral principles (Haidt, 2007), rather than value attributed to something
Value system	A set of values according to which people, societies and organizations regulate their behaviour (Pascual et al., 2017)

positive contributions like spiritual experiences from elephants rest on the cultural and spiritual significance of elephants (Figure 1b), and psychological and behavioural responses to negative contributions like elephants attacks are shaped by local social cohesion and religious norms regarding elephants (Gogoi, 2018; Saif et al., 2019).

The reception, valence (positive or negative) and significance of NCP are distributed unequally across different members of society and different entities of nature, as are people's behavioural responses to them (Clayton et al., 2016; Martín-López et al., 2020). Zooming in from nature to entities and from people to individuals helps unveil potential inequities regarding NCP impacts on quality of life, and embraces pluralistic worldviews underlying differences in NCP perception and valuing. Moreover, it accounts for the key role of individual and entity characteristics in shaping larger-scale human behaviour and ecological impacts, which is increasingly demonstrated via agent-based models (Alonso-Betanzos et al., 2017).

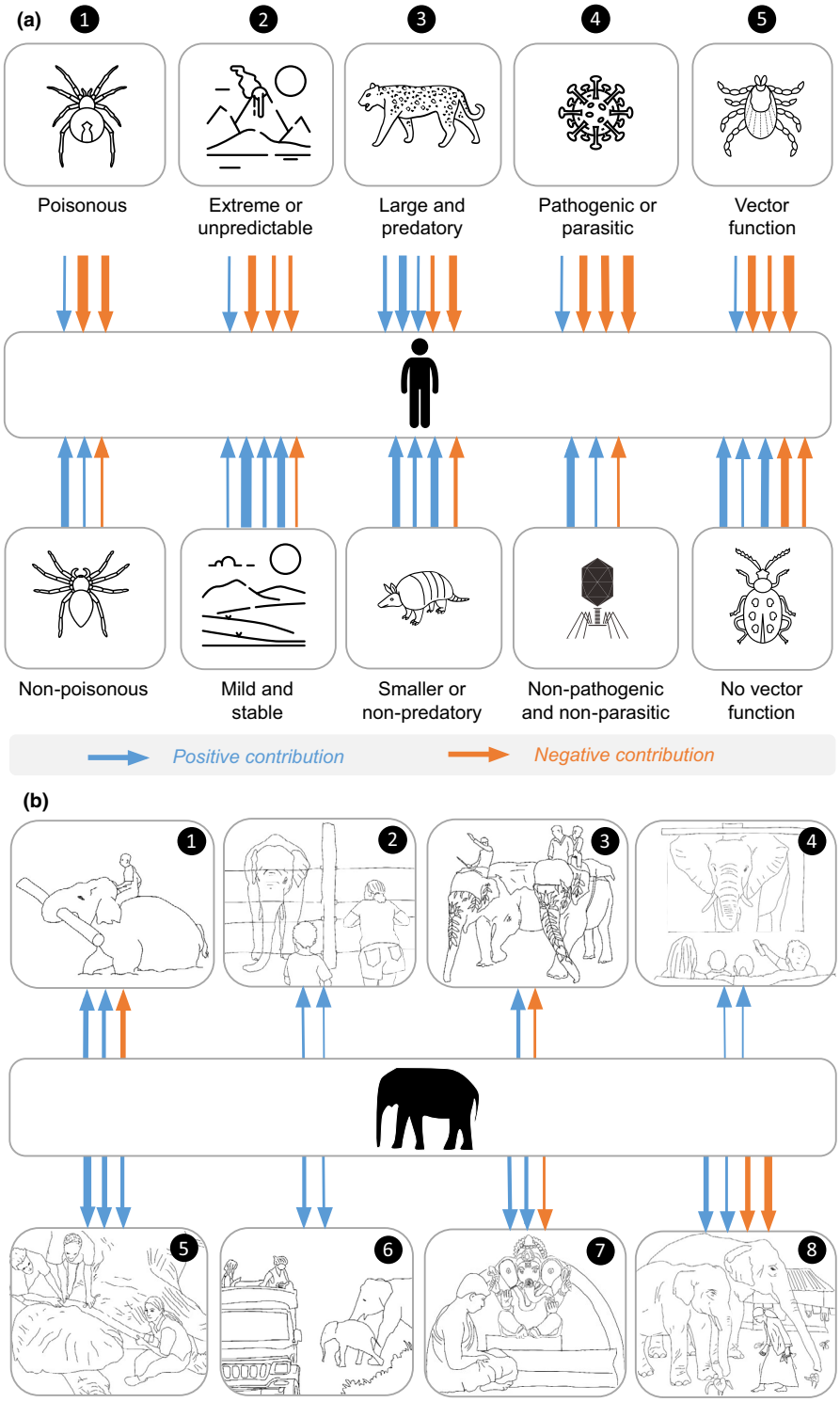

FIGURE 1 Nature's contributions to people (NCP) vary across entities and across individuals. (a) Different entities can provide different contributions to the same individual. For instance, the severity (represented by arrow strength), likelihood or proportion (represented by the number of arrows) of negative contributions tends to be higher for poison-bearing entities (1), landscapes characterized by extreme events or extreme conditions (2), large, predatory animals (3), human pathogens or parasites (4) and pathogen- or parasite-transmitting entities (5). (b) Different individuals may receive different types and proportions of positive and negative contributions from the same entity. Positive contributions received from elephants, for example, can range from provision of labour and maintenance of options for owners of work elephants (1) to psychological experiences and learning for zoo visitors (2), anchoring of social-cohesion experiences for elephant festival participants (3), inspiration, entertainment and aesthetic enjoyment for individuals watching elephants on television (4), learning, support of cultural identities and anchoring of a sense of social purpose for elephant researchers (5), aesthetic enjoyment and other physical and psychological experiences for wildlife tourists (6), anchoring of cultural identity and spirituality for individuals worshipping elephants or elephant deities (7), and ecosystem regulation, sense of place and supporting identity for people living in elephant habitat (8). Individuals living in close proximity to elephants may also receive negative contributions like elephant attacks on property or people (1, 3, 7, 8) and, in the case of farmers, crop-raiding (8)

2 | THE IREN CONCEPTUAL FRAMEWORK

To better account for variation in NCP reception and responses to NCP impacts across entities and individuals, we introduce a conceptual framework of individual relationships with entities of nature (IREN). As an author team with a mixed background in the natural and social sciences, and working on the science-society and science–policy interface (see Text S1 for our positionality statement), we have designed the IREN framework as a zoom-in version of the broader IPBES conceptual framework connecting nature and people (Díaz et al., 2015). In the IREN framework, the focus is adjusted from *people* to the *individual*, and from *nature* as a whole to a specific part of nature conceptualized as an *entity of nature* (Figure 2). The same zoom is applied to the links between the two. The IREN framework considers only the subset of *nature's contributions to people* relevant for a specific individual and entity, conceptualized as the *entity's contributions to the individual (ECI)*. It also focuses on the subset of direct *anthropogenic drivers of changes in nature* pertaining to this specific individual and entity, conceptualized as *individual behaviour impacting entity integrity* (Figure 2).

In the IREN framework, perceived ECI impacts on quality of life, and individual psychological and behavioural responses to them, are represented using three dimensions: personal attitude and behaviour towards the entity, which have been assessed in numerous studies (Knox et al., 2021; Li et al., 2019), and behavioural preference towards the entity, which we newly introduce in this article. This approach integrates various perspectives on individual relationships with nature embodied by different research fields: The step from ECI to quality of life is of increasing research interest in health and well-being studies (Seymour, 2016), while the step from ECI impacts on quality of life to attitude is a central element of human–wildlife relations research (Knox et al., 2021), and the interplay of attitude, norms and implementation barriers in shaping behaviour is at the heart of socio-psychological conservation and sustainability studies (Clayton et al., 2016; Nilsson et al., 2020). Being applicable to a flexible range

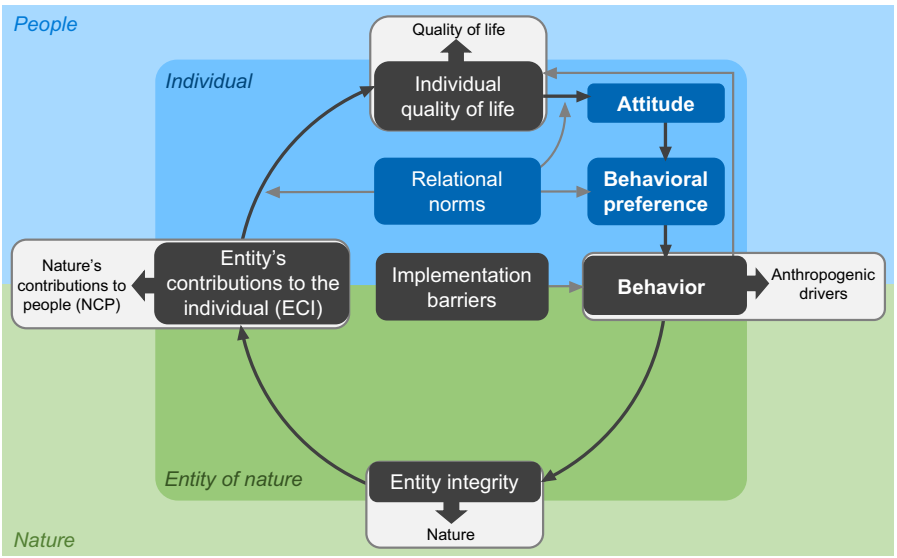

FIGURE 2 The IREN conceptual framework connecting entities of nature and individuals, embedded in the IPBES conceptual framework connecting nature and people (with both frameworks graphically simplified. Figure S1 shows a more comprehensive version that includes additional elements of the IPBES conceptual framework and its distinction between direct and indirect drivers of changes in nature.) The lower half of the illustration (green fields) refers to nature, whereas the top half (blue fields) refers to people. Text boxes placed at the interface of green and blue fields represent interactions between nature and people or, in the case of implementation barriers, factors that can be both anthropogenic or rooted in ecological states and processes. Blue text boxes symbolize aspects of the individual's inner world (psychological variables); black or white text boxes refer to the outer world. Bold text indicates the dimensions used to characterize different IREN types (Figure 3). While the IPBES conceptual framework has a broader perspective on nature (light green, outer field) and people (light blue, outer field), the IREN framework zooms in on entities of nature (darker green, inner field) and individuals (darker blue, inner field). Individual quality of life and entity integrity are connected via individual behaviour impacting entity integrity, and via the entity's contributions to the individual (ECI) and their impact on individual quality of life. Individual relational norms and thus, cultural influence, play a central role in shaping individual psychological and behavioural responses to ECI. First, relational norms can modulate ECI impacts on individual quality of life. Second, they influence to what extent those ECI impacts manifest in attitude towards the entity. Third, relational norms are a key driver of behavioural preference. Fourth, they can constitute implementation barriers determining whether behavioural preference translates into behaviour. The arrow from behaviour to individual quality of life represents impacts on individual quality of life that are associated with the behaviour itself, rather than with its outcomes (e.g. eudaimonia effects). The path from individual quality of life to behaviour via attitude and behavioural preference illustrates that individual behaviour towards an entity can be a response to ECI impacts on quality of life. Individual relational norms can weaken or reverse the relationship between attitude and behavioural preference, and implementation barriers can weaken or disrupt the relationship between behavioural preference and behaviour. Each entity- or individual-specific element of the IREN framework scales up to the higher-level IPBES equivalent when summed over entities and individuals (illustrated by block arrows)

of entities, the IREN framework additionally bridges broad entity concepts usually considered in health and sustainability science ('nature', 'the environment', 'forests', etc.) and the narrower focus of human–wildlife relations research (usually, a specific wildlife species). Merging those angles is in line with recent transdisciplinary studies that have transcended boundaries between the different approaches outlined above (Barragan-Jason et al., 2021; Methorst et al., 2020).

3 | THREE DIMENSIONS FOR CHARACTERIZING IREN TYPES

3.1 | Attitude

Individual attitude towards an entity of nature can be defined as an individual's overall tendency to evaluate this entity as good or bad (Fishbein & Ajzen, 1975). It combines the individual's beliefs and emotions regarding the entity, with more emotion-laden experiences contributing more strongly to attitude formation (Fishbein & Ajzen, 1975; Montaño & Kasprzyk, 2015). Therefore, individual attitude is influenced by the impacts of the entity's contributions on individual quality of life. For example, if Individual A perceives the contributions of wolves to have mostly negative impacts on her quality of life (e.g. worry or anger about potential attacks on livestock or children), she will probably have a negative attitude towards wolves. Conversely, if Individual B perceives mainly positive impacts (e.g. joy about a wolf encounter or the existence of wolves), he is likely to have a positive attitude towards wolves. If Individual C perceives no impact, they are likely to have a neutral attitude.

The step from ECI impacts on quality of life to individual attitude is influenced by socio-cultural context via relational norms (Figure 2). Relational norms reflect an individual's notion of appropriate interactions between different people and entities of nature. They determine to which extent someone is aware of an entity's different contributions, perceives them as normal and values or disdains them. Being exposed to hazards associated with climatic extreme events or carnivore presence may be considered normal in some places, but as outrageous in others (Clayton et al., 2016; Skogen et al., 2019); and the valuing of positive contributions is deeply entrenched in worldviews and practices related to different entities of nature (Ellis et al., 2019; Gunton et al., 2017; Peter et al., 2021). Overall, attitude thus reflects which contributions an individual perceives from an entity, and how they evaluate them. Understanding how ECI impacts on quality of life interact with relational norms in shaping attitudes towards entities is a central quest of human–wildlife coexistence research, and attitude is among the most extensively studied concepts in this field (Knox et al., 2021).

3.2 | Behavioural preference

We newly define behavioural preference as an individual's preference to have a positive, negative or no impact on an entity (Text S2). It is the intermediate of attitude and behaviour, but can also be influenced by relational norms (Figure 2). Attitude and relational norms shape behavioural preference via different mechanisms. The influence of attitude is goal-oriented and reflects the aim to achieve a good quality of life by maintaining the entity's positive or reducing its negative contributions. Reconsider the previous wolf example. Individual A with a negative attitude could harbour the desire to see wolf population size reduced or legal protection for wolves lifted in order to reduce their negative impacts. Individual B with a positive attitude may wish to protect wolves to maintain their future positive contributions.

Relational norms, in contrast, reflect a moral motive: the aim to act in harmony with one's values (Pascual et al., 2017). They vary with cultural and personal images of an entity, which determine what values and rules apply to different entities (Muradian & Pascual, 2018; Wallach et al., 2020). Taboos and rituals often exist for entities that are worshipped as deities, for example (Chan et al., 2016; Muradian & Pascual, 2018), whereas the perception that an entity is inferior to humans makes its instrumentalization socially acceptable (Manfredo et al., 2017). Variation in entity images is associated with a diversity of value systems and worldviews, including anthropocentrism, ecocentrism, sentientism, holism, instrumentalism and mutualism, among others (Batavia, Bruskotter, et al., 2020; Manfredo et al., 2017; Pascual et al., 2017; Peter et al., 2021).

Attitude and relational norms can act synergistically or antagonistically (Montaño & Kasprzyk, 2015). If the relational norms of Individual A stipulate that harm to children must be avoided by all means, or that wolves are despicable vermin, they will enhance the effect of her negative attitude, resulting in a negative behavioural preference towards wolves. In contrast, relational norms like avoiding harm to sentient beings or complying with the expectations of people who would disapprove if she harmed wolves could weaken and potentially overcome the influence of her negative attitude. Such norms might ultimately result in a neutral behavioural preference despite her negative attitude. Vice versa, Individual B may be additionally motivated to protect wolves by relational norms calling for the protection of vulnerable animals. Relational norms calling for the protection of vulnerable *people* (e.g. farmers suffering livestock kills), however, may cause him to develop a neutral or even negative behavioural preference towards wolves despite his positive attitude. In conclusion, when the effect of relational norms antagonizes and dominates over the effect of attitude, relational norms can cause behavioural preference to diverge from attitude.

3.3 | Behaviour

Behaviour refers to an individual's overall behaviour with respect to the entity in question, i.e. to a suite of actions impacting the entity that are performed or not performed by the individual. Behaviour is motivated by behavioural preference, but implementation barriers determine if this preference can actually manifest in behaviour (Figure 2). Hence, even if Individual A has a negative behavioural

preference towards wolves, she may be prevented from shooting a wolf by lack of opportunity, skills or equipment (Slagle & Bruskotter, 2019); and Individual B might not engage in wolf conservation due to time constraints. While empirical assessments of behaviour can be very challenging (Text S2), they are increasingly recognized as a necessity for characterizing, understanding and improving human–nature relationships (Nielsen et al., 2021; Nilsson et al., 2020).

4 | THE IREN TYPOLOGY

In the IREN typology, individual attitude, behavioural preference and behaviour towards an entity of nature can take three different valences: negative, neutral or positive (Figure 3a). Hence, the IREN typology defines 27 relationship subtypes, which we merge into 17 overarching types (Table S2). We differentiate between univalent (Figure 3b) and multivalent (Figure 3c–f) IREN types (Figure S2). Univalent means that attitude, behavioural preference and behaviour have the same valence, that is are either all positive, all negative or all neutral. Multivalent means that at least two dimensions have a distinct valence. We further classify multivalent types as voluntary (Figure 3c,d) or involuntary (Figure 3e,f; Figure S2). Voluntary IREN types are those where what an individual actually does is consistent with what the individual wants to do, that is where behaviour and behavioural preference have the same valence. Involuntary types are those where implementation barriers prevent an individual from doing what they want to do, causing a mismatch between behavioural preference and behaviour. Simultaneously, we distinguish between inactive (neutral behaviour; Figure 3c,e) and active (positive or negative behaviour; Figure 3d,f) types (Figure S2).

In the main text, we focus on 13 basic IREN types where at least attitude and behavioural preference, or behavioural preference and behaviour, have the same valence (Figure 3). (The remaining types, which we consider less relevant for applied efforts to improve human–nature relationships, are presented in Figure S3 and Table S2). Each IREN type is defined at the individual level, that is refers to the relationship between one individual person and one specific entity of nature. By assessing the attitude, behavioural preference, and behaviour of the individuals within a defined target group (e.g. a local community, a nation or a certain stakeholder group), researchers and practitioners can estimate the prevalence and distribution of different IREN types within this system.

4.1 | Univalent types

4.1.1 | Intolerance

We define intolerance as the combination of negative attitude, negative behavioural preference and negative behaviour

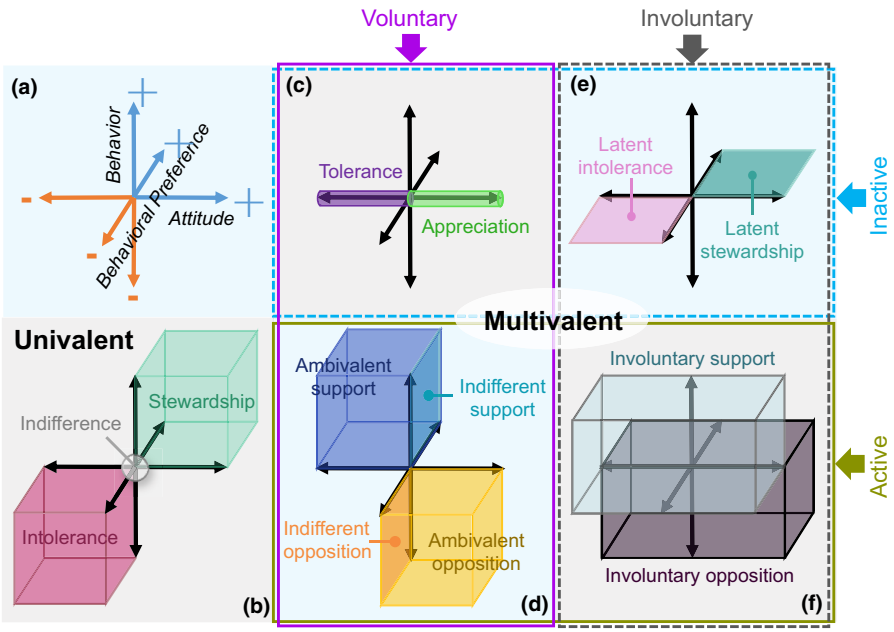

FIGURE 3 The IREN typology. (a) Different types of individual relationships with entities of nature (IREN) are defined based on three dimensions: individual attitude, behavioural preference and behaviour towards an entity of nature. Each dimension can have either a negative, neutral or positive valence. (b) Univalent types where attitude, behavioural preference and behaviour all have the same valence. Here, behaviour is voluntary and shaped by the impact of an entity's contributions on individual quality of life. (c, d) Multivalent, voluntary types with a valence mismatch between attitude and behavioural preference, where behaviour is shaped by moral motives (relational norms). (e, f) Multivalent, involuntary types with a valence mismatch between behavioural preference and behaviour, where behaviour is shaped by implementation barriers (see Table S2 and Figure S3 for additional types not displayed here. The distinction of univalent from multivalent, voluntary from involuntary and active from inactive types is detailed in Figure S2)

(Figure 3b; Table S2). We thus unify previous approaches that defined intolerance (towards wildlife) considering either attitude, behavioural intention, norms (Brenner & Metcalf, 2020; Treves, 2012), behaviour (Bruskotter & Fulton, 2012) or combinations thereof (Bhatia et al., 2020; Brenner & Metcalf, 2020). When attitudes and behavioural preferences of the individuals within a society are uniformly negative, intolerance can improve quality of life, for example when negative attitudes towards a pathogenic virus result in the development, administration, and acceptance of vaccines and eradication of the virus. Intolerance can be problematic, however, when most individuals would prefer neutral or positive impacts on the entity in question. For instance, intolerance can jeopardize the conservation of protected species, particularly where positive (e.g. joy about the species' existence, aesthetic enjoyment) and negative contributions (e.g. health and safety risks, loss of crops or livestock) are distributed unequally among different members of society (Jordan et al., 2020). Taking such inequalities into account and considering an entity's individually perceived, subjective costs and benefits is key to an equitable and effective conservation of protected entities (Redpath et al., 2017; Marchini et al. 2019).

4.1.2 | Stewardship

Here, stewardship describes the combination of positive attitude, positive behavioural preference, and positive behaviour (Figure 3b; Table S2). This unifies previous approaches defining stewardship as an attitude (Knox et al., 2021; Treves, 2012), a behaviour (Bruskotter et al., 2015; Knox et al., 2021), a combination of attitude and either norms (Brenner & Metcalf, 2020) or behaviour (Bhatia et al., 2020), a mindset (Braito et al., 2017), or a combination of emotions, perceptions, norms and behaviour (Muradian & Pascual, 2018). Stewardship could manifest as working for an ocean protection organization, bird feeding or regularly visiting a sacred tree to pay it respect.

To date, efforts to improve human impacts on nature have aimed mainly at a transition from negative to neutral behaviour, but active stewardship (positive behaviour) is increasingly recognized as a prerequisite for halting biodiversity loss or anthropogenic climate change before tipping points are reached (Ginkel et al., 2020; Richardson, Passmore, et al., 2020). Positive impacts of stewardship on entity integrity benefit people because they maintain nature's potential to provide positive contributions (Brauman et al., 2020), but these benefits are often intangible to the stewards themselves. Importantly, stewardship can have direct positive impacts on the quality of life of a steward via eudaimonia—satisfaction derived from acting righteously (Pritchard et al., 2020; Winkler-Schor et al., 2020). Thus, relational norms that make stewardship feel rewarding can motivate actions with positive impacts on entities of nature (Chan et al., 2016; Richardson, Passmore, et al., 2020).

4.1.3 | Indifference

For indifference, attitude, behavioural preference and behaviour are neutral (Figure 3b; Table S2). Previous approaches have conceptualized it as a combination of attitude and either behaviour (Bhatia et al., 2020) or norms (Brenner & Metcalf, 2020), or as an emotional driver of behaviour (Muradian & Pascual, 2018). Indifference describes, for example, someone's relationship with a moss species where the individual is not aware of the moss' existence and its potential contributions, and does not impact it with their actions. An indifferent mindset towards nature can originate from technological and urbanized environments and lifestyles rendering the contributions of nature's entities increasingly intangible (Truong & Clayton, 2020). This is problematic because connectedness with nature is central both for psychological well-being and for discouraging negative or motivating positive behaviour towards entities of nature (Barragan-Jason et al., 2021; Richardson, Dobson, et al., 2020).

4.2 | Multivalent, voluntary, inactive types

4.2.1 | Tolerance

We define tolerance towards an entity of nature as neutral behavioural preference and behaviour from someone with a negative attitude towards that entity (Figure 3c; Table S2). Previous definitions of tolerance towards entities of nature stem mainly from human–wildlife relations research, and were divided into psychological versus behaviour-based approaches (Knox et al., 2021). The three-dimensional tolerance concept proposed here unifies behaviour-based approaches (Bhatia et al., 2020; Bruskotter & Fulton, 2012) and psychological approaches defining tolerance as an attitude or behavioural intention (Treves, 2012), or as a combination of attitude and norms (Brenner & Metcalf, 2020). Tolerance could manifest as voluntary refrain from actions with negative impacts on leopards from individuals who have a negative attitude towards that species, for instance. Tolerance prominently features in human–wildlife relations research (Knox et al., 2021; König et al., 2020) because it is central for the successful conservation of wildlife species potentially providing negative contributions to people living in their proximity.

4.2.2 | Appreciation

Here, appreciation describes the combination of positive attitude, neutral behavioural preference and neutral behaviour towards an entity (Figure 3c; Table S2), merging and extending previous definitions of appreciation as a combination of positive attitude and either medium acceptability (Brenner & Metcalf, 2020) or neutral behaviour (Bhatia et al., 2020). Appreciation is at the base

of non-material benefits like health or aesthetic enjoyment received from an entity via channels like perceiving, knowing about or living within, rather than via direct interactions with the entity (Methorst et al., 2020; Soga & Gaston, 2020). Appreciation characterizes, for example, an individual who is fascinated by, and has a positive attitude towards birds, but prefers to read books about birds or watch them from a distance, rather than feeding them or rearing abandoned chicks. Appreciation can be rooted in relational norms whose central element is inactivity, which might manifest in a preference for pristine spaces and letting nature take its course, for example (Muradian & Pascual, 2018). It can also result from perceived trade-offs between positive impacts of supporting an entity and negative impacts on other entities or on other people (Batavia et al., 2020; Schwartz, 2021).

4.3 | Multivalent, voluntary, active types

4.3.1 | Indifferent opposition and ambivalent opposition

We newly introduce indifferent and ambivalent opposition, which we define as negative behavioural preference and behaviour towards an entity in combination with a neutral or positive attitude, respectively (Figure 3d; Table S2). While the relationship types outlined in the sections above were included (under slightly different definitions) in a previous typology, indifferent and ambivalent types had been omitted (Bhatia et al., 2020). However, they urgently warrant consideration for the management of entities considered invasive (Linders et al., 2021), overabundant (Martínez-Jauregui et al., 2020), pests (van Eeden et al., 2019), vectors and spillover reservoirs (Schneider et al., 2021) or compromising the conservation of endangered species (Batavia, Nelson, et al., 2020). Reducing the abundance of such entities requires support for actions with negative impacts on them, also from individuals with a neutral or positive attitude towards those entities. Ambivalent opposition can occur, for example, when someone has a positive attitude towards an invasive tree species (e.g. because they receive positive contributions like shade and firewood), but supports efforts to locally eradicate the tree because they perceive its negative contributions to others (e.g. decreased biodiversity) to outweigh personal benefits (Linders et al., 2021).

4.3.2 | Indifferent support and ambivalent support

We newly define indifferent and ambivalent support as the combination of positive behavioural preference, positive behaviour and neutral attitude in the case of indifferent opposition, or negative attitude in the case of ambivalent opposition (Figure 3d; Table S2). Those types, too, were omitted from a previous typology (Bhatia et al., 2020), but could be highly relevant for the achievement of sustainability goals. Evidence for declining connectedness with nature is growing (Brauman et al., 2020; Richardson, Dobson, et al., 2020) while simultaneously, need for action is skyrocketing as we rapidly approach socio-economic and -ecological tipping points (Ginkel et al., 2020; Otto et al., 2020). Voluntary positive behaviour despite a neutral attitude (indifferent support), motivated by social norms, for example (Cinner et al., 2021), could thus be paramount for a timely mitigation of biodiversity loss and anthropogenic climate change (Díaz et al., 2019). An example could be someone with a neutral attitude towards amphibians who decides to donate to frog conservation because her granddaughter loves frogs. While probably rare in occurrence, ambivalent support also warrants attention because the underlying relational norms must be particularly powerful to motivate positive behaviour despite a negative attitude. Once identified, such relational norms could be harnessed to foster cooperation between stakeholder groups. Shared fundamental values (Hurst et al., 2020; Lute & Gore, 2019), for example, can foster cooperation despite diverging attitudes.

4.4 | Multivalent, involuntary, inactive types

4.4.1 | Latent intolerance

We define latent intolerance as a negative attitude and behavioural preference in combination with neutral behaviour (Figure 3e; Table S2). While a previous typology regarded latent intolerance as equivalent to tolerance (Bhatia et al., 2020), we postulate a crucial difference between the two: We conceptualize latent intolerance as involuntary and resulting from implementation barriers, and tolerance as voluntary and rooted in moral motives. While coercive, top-down approaches are ethically problematic and often ineffective in the long term, measures for preventing negative behaviour towards certain entities may temporarily be required for a successful implementation of conservation policies (Redpath et al., 2017; Slagle & Bruskotter, 2019). For example, law enforcement and barring access to weapons, traps, or poison may prevent individuals with a negative attitude towards wolves from killing any. Investigating latent intolerance and its drivers can help elucidate which factors effectively prevent individual negative behaviour despite a negative behavioural preference.

4.4.2 | Latent stewardship

Latent stewardship is defined here for the first time, as a positive attitude and behavioural preference in combination with neutral behaviour (Figure 3e; Table S2). It can occur, for example, when an individual who loves oceans and would like to donate to ocean conservation is prevented from doing so by financial constraints. With increasingly positive societal attitudes and behavioural preferences towards nature (Richardson, Passmore, et al., 2020) and many obstacles to performing actions with positive impacts on nature entrenched in modern institutions and lifestyles (Huang et al., 2020; White et al., 2019), latent stewardship is arguably a commonly occurring relationship type. The urgent need for societal action to mitigate current nature-related

crises means that we need to tap the potential of positive behavioural preferences by reducing implementation barriers for nature-friendly behaviour (Richardson, Passmore, et al., 2020).

4.5 | Multivalent, involuntary, active types

4.5.1 | Involuntary opposition

We use *involuntary opposition* as an umbrella term for negative behaviour from individuals with a neutral or positive behavioural preference, irrespective of their attitude (Figure 3f; Table S2). An individual with a positive attitude towards orangutans who prefers not to harm, or even to protect them, but inadvertently contributes to orangutan habitat loss by buying unsustainable palm oil products is an example for involuntary opposition. The sustainability and social conservation literature suggest that involuntary opposition in the form of unsustainable behaviour is among the most prevalent relationship types due to implementation barriers resulting in a sustainability motivation-behaviour gap (Clayton et al., 2016). Involuntary opposition also deserves increased consideration in a human–wildlife coexistence context: While negative behaviour towards wildlife is often framed as rooted in negative attitudes (retaliatory), it can also be involuntary; for example, when someone hunts bushmeat due to scarcity of other food sources (Frick et al., 2020).

4.5.2 | Involuntary support

Involuntary support encompasses all relationship types that combine positive behaviour and a neutral or negative behavioural preference (Figure 3f; Table S2). It may occur when an action's positive impacts on the entity are not known to the individual, or a side effect rather than a motive (Nielsen et al., 2021). Depending on the supported entity, involuntary support can either jeopardize or promote sustainability and conservation goals. Involuntarily supporting the establishment of a species in a novel region can result in the spread of invasive species. However, when an individual who is indifferent towards rainforests chooses the more expensive, rainforest-friendly coffee because the coffee shop advertises its outstanding flavour, involuntary support can benefit rainforest integrity. As involuntary support does not require mental or emotional commitment, it may help achieve behavioural change much faster than inter-generational shifts in values and norms (Manfredo et al., 2017, 2020).

5 | IREN THINKING: SPOTLIGHTING JUSTICE ISSUES RELATED TO VARIATION ACROSS INDIVIDUAL PEOPLE AND ENTITIES

We introduce the IREN conceptual framework to emphasize that variation in individual background and entity characteristics has important ramifications for the distribution of positive and negative NCP impacts, and for patterns of human behaviour impacting nature. Approaches to human–nature relationships progressively recognize the importance of local context for equity issues related to NCP impacts or policies and decision-making regulating human behaviour towards nature (Ellis et al., 2019; Fletcher & Toncheva, 2021; Martín-López et al., 2020). Stakeholder participation, place- and community-based approaches, co-management of areas and resources, co-production of knowledge and the integration of indigenous and local knowledge have gained traction (Armitage et al., 2020; Balvanera, Daw, et al., 2017; Colloff et al., 2017; Varghese & Crawford, 2021); and NCP assessments increasingly integrate a context-specific perspective (Hill et al., 2021). The IREN framework aims to encourage approaches that additionally take variation *between* individuals *within* local contexts into account. This interindividual variation influences who benefits or suffers from the positive or negative contributions of different entities, and who has a voice in the development and implementation of conservation strategies. Gender-related justice issues are increasingly considered in conservation research and practice, for example (Armitage et al., 2020; Jones et al., 2020).

By adopting an entity-specific perspective, the IREN framework is geared towards recognizing pluralism in the way people think and feel about different entities and their interrelationship with people. The term 'entity of nature' can be flexibly applied not only to concepts from research fields of varying breadth and interdisciplinarity (e.g. fish stocks in economy, species populations in conservation ecology, 'nature' or 'the environment' in sustainability science), but also to concepts rooted in other knowledge systems (e.g. the spirit of a particular tree). Considering various entities and entity concepts can make trade-offs between the outcomes of human behaviour for different entities explicit, and unveil pluralism in notions of desirable human behaviour towards different entities. The latter is not only highly relevant for the recognition of local norms and narratives (e.g. taboos or practices) in conservation approaches, but also pertains to emerging discourse regarding compassionate conservation (Batavia, Nelson, et al., 2020; Coghlan & Cardilini, 2020) and the management of wildlife and free-ranging domestic animals (Marchini et al., 2019). Moreover, the flexible entity concept allows considering a 'tangibility' spectrum ranging from concrete, particular organisms a person has interacted with (e.g. a bird regularly visiting one's garden), to personally experienced broader entities (e.g. the local beach), to more large-scale or abstract (e.g. oceans), and finally, global entity concepts ('nature' or 'the environment').

Overall, the individual- and entity-specific, context-focused approach embedded in the IREN framework aligns with claims that decontextualized, global approaches alone are insufficient to understand psychological and behavioural processes underlying global-scale social-ecological problems (Clayton et al., 2016). This approach is also well-compatible with agent-based models, which can be parameterized with the characteristics of different entities and individuals to gain insights into emergent, larger-scale dynamics (Alonso-Betanzos et al., 2017).

6 | PUTTING THE IREN TYPOLOGY INTO PRACTICE

We have developed the IREN typology as a simple tool for researchers and practitioners that can serve as a basic indicator of need for action, and point towards promising target factors. Which entities are considered, what IREN types are desirable or undesirable, and what distribution of IREN types signals need for action depends on the set objective and target system. The establishment and co-management of a local protected area will require a high prevalence of stewardship and low prevalence of involuntary opposition, for example; targeting entities like the local landscape, its species, and local entity concepts such as nature deities. Fostering sustainable human–carnivore coexistence (i.e. balancing carnivore conservation with social justice goals) requires not only reducing intolerance (due to its negative impacts on protected species), but also latent intolerance (because the underlying negative attitude indicates negative carnivore impacts on quality of life). Generally, a high simultaneous prevalence of types with an incompatible behavioural preference (e.g. intolerance and stewardship) signals potential for societal conflict and thus, need for action (Estévez et al., 2015; Manfredo et al., 2003).

With the IREN typology, the prevalence of different relationship types can be assessed more accurately compared to two- or unidimensional approaches. First, it includes active, multivalent relationship types like indifferent or ambivalent support and opposition that were previously omitted (Bhatia et al., 2020). Second, introducing behavioural preference as an additional dimension allows distinguishing voluntary from involuntary types, for example tolerance from latent intolerance, appreciation from latent stewardship, intolerance from involuntary opposition or stewardship from involuntary support (Bhatia et al., 2020; Treves, 2012). This distinction is not merely a semantic issue, but can signal which aspects of the relationship should be targeted to increase or decrease its prevalence (Table S2): For involuntary types, efforts to change behaviour need to address implementation barriers, but for voluntary types, they need to consider goal-oriented motives (ECI impacts on quality of life), moral motives (relational norms) and their interplay in shaping attitude and behavioural preference.

In a human–wildlife relations context, efforts targeting ECI impacts in order to improve attitude include compensation and prevention programmes (Bautista et al., 2019), and education striving to amend perceived cost/benefit ratios of wildlife species (Johansson et al., 2016). Sustainability-oriented approaches have aimed to harness positive ECI impacts like health and connectedness to nature (Barragan-Jason et al., 2021; Corral-Verdugo et al., 2021; Richardson, Passmore, et al., 2020), or stressed negative consequences of nature degradation for humans (Kopnina et al., 2018). Efforts targeting norms to change sustainability-related behavioural preference have included interventions stressing the urgency of environmental degradation issues or moral obligations to future generations. Relational norms are also increasingly integrated in approaches seeking to foster human–wildlife coexistence by improving relations between different stakeholder groups. Recognition of pluralism and context-dependence, participatory approaches and co-development of wildlife management instruments are central in such endeavours (Jordan et al., 2020; Redpath et al., 2017).

The interaction between ECI impacts and relational norms is paramount to consider in interventions targeting attitude and behavioural preference (Figure 2). First, the domination of relational norms over ECI impacts is at the heart of tolerance towards disliked entities or the willingness to harm liked ones (ambivalent opposition). This is particularly relevant for the management of protected, overabundant or invasive species (Bhatia et al., 2020; Brenner & Metcalf, 2020; Estévez et al., 2015). Second, interventions aiming to boost motivation for sustainable behaviour by stressing positive ECI impacts may undermine long-term sustainability goals by crowding out moral motives (Cinner et al., 2021; White et al., 2019).

Overcoming implementation barriers to sustainable behaviour is a key challenge in sustainability research. While a wealth of factors have been identified as implementation barriers, there is a dearth of studies assessing the (long-term) effectiveness of strategies for overcoming them (Clayton et al., 2016). Moreover, the concrete drivers and relative importance of different factors are highly context-dependent, which makes it difficult to develop universally applicable approaches (Nielsen et al., 2021; White et al., 2019). Finally, involuntary unsustainable behaviour is often entrenched in established physical, economic and governance infrastructures that are beyond the influence of interventions (Clayton et al., 2016; Nielsen et al., 2021). Fostering sustainable behaviour thus requires reducing both internal barriers (e.g. by increasing knowledge, salience, certainty or tangibility regarding sustainability-relevant actions), and external barriers (e.g. by providing easy access to sustainable infrastructure such as recycling facilities, public transport or bicycle lanes; Huang et al., 2020; Kaaronen, 2017; Li et al., 2019; White et al., 2019). For example, establishing a well-designed bicycle-lane network can reduce car use by making the sustainable alternative more pleasant (White et al., 2019, Appendix E), and, importantly, more visible. When more people become aware of, and copy a sustainable action, shifts in personal and societal norms can lead to its self-reinforcement and lasting, large-scale transformations in societal behaviour (Clayton et al., 2016; Kaaronen & Strelkovskii, 2020).

7 | LIMITATIONS AND FUTURE DIRECTIONS

7.1 | Importance of different factors underlying behaviour

The presented categorization of IREN types can indicate the relative importance of goal-oriented motives, moral motives and implementation barriers, but there are several limitations. First, it offers only a qualitative ranking based on potential valence mismatches; and no such ranking exists for univalent types. Second, the IREN typology considers only positive, neutral and negative valences, but attitude,

behavioural preference or behaviour could also be ambivalent. For example, someone may develop an ambivalent attitude towards an entity when it provides a roughly equal proportion of positive and negative contributions (van Harreveld et al., 2009). Moreover, studies using the prevalence of incompatible IREN types as an indicator of conflict potential could benefit from considering intensity in addition to valence. This would account for higher conflict potential when 'strongly negative' and 'strongly positive' attitudes or behavioural preferences clash, compared to 'slightly negative' and 'slightly positive' ones.

7.2 | Societal interactions

Conservation outcomes and NCP impacts on quality of life are profoundly shaped by human–human interactions and social dynamics. In the IREN framework, this is considered only implicitly via the context-specific relational norms and implementation barriers. Future approaches could explicitly incorporate social networks and power relations within and among local communities, geopolitical regions, cultures, stakeholder or identity groups, and institutions (including governance and research institutions; Colloff et al., 2017; Hurst et al., 2020; Martín-López et al., 2020; Redpath et al., 2017).

7.3 | Generalization

While ultimately, the IREN approach seeks to promote equitable and effective strategies for achieving sustainable human–nature relationships, applying the IREN typology is only a first step towards this goal. Understanding and harnessing drivers of individual variation will require more sophisticated approaches following, for example, that of interconnected place-based research. Here, local-context-specific assessments are simultaneously performed at multiple sites across the globe to identify factors explaining between-site differences (Eom et al., 2016; Fletcher & Toncheva, 2021), and to elucidate links between distinct locations that shape dynamics at a larger scale (Balvanera, Calderón-Contreras, et al., 2017; Martín-López et al., 2020). Individual-based approaches could mirror this approach by targeting multiple individuals both within and across local contexts to elucidate drivers of inter-individual variation, considering, for example, power relations and social network characteristics (Bodin et al., 2019; Kluger et al., 2020).

Additionally, generalization attempts need to consider that individual behaviour does not scale up linearly due to emerging properties of collective behaviour rooted in complex interlinkages, feedback dynamics and tipping points (Clayton et al., 2016; Kaaronen & Strelkovskii, 2020). Agent-based models are increasingly applied in environmental impact and sustainability studies to detect emergent patterns within a given system (Alonso-Betanzos et al., 2017; Carter et al., 2020; Kaaronen & Strelkovskii, 2020). Understanding and guiding behavioural dynamics at large spatial or temporal scales remains challenging, however, because behavioural change feeds back on the underlying norms and institutions: The adoption of a behaviour by a critical mass will render it *norm*al given enough time (Kaaronen & Strelkovskii, 2020; Manfredo et al., 2017), and public-sphere behaviours like voting, lobbying and voicing opinion have the potential to transform governance (Clayton et al., 2016; Visseren-Hamakers et al., 2021). Overall, a profound, long-term improvement of human–nature relationships will require not only targeting NCP impacts on quality of life and human behaviour in given contexts, but also fundamental system change in infrastructures, research, economies, governance, and other institutions to transform the context itself (Armitage et al., 2020; Bai et al., 2016; IPBES plenary, 2019; Wyborn et al., 2021).

To generalize insights across entities, we need to understand how entity characteristics and their interaction with contextual variables shape human–nature relationships. A recent study has revealed variation in value systems (e.g. ecocentrism, zoocentrism) and relational norms across different entities (cougars, fungus, rainforest ecosystem; Batavia, Bruskotter, et al., 2020). Additional, systematic assessments considering a more nuanced tangibility spectrum and setting 'particular' (e.g. Yellowstone National Park) against general (e.g. national parks) entities could provide further insights regarding e.g. the role of familiarity and emotional connectedness in the future (Richardson, Passmore, et al., 2020).

8 | CONCLUSION

Recognizing variation in NCP reception, valuing and impacts on quality of life across individual people and entities of nature is an important first step towards a more equitable management of people's access and exposure to different NCP. The individual- and entity-specific perspective of the IREN conceptual framework can encourage researchers and practitioners to take the ongoing evolution towards context-sensitive, justice-oriented conservation approaches further, from implementing local context to additionally considering individual context, entity characteristics, and their interplay.

The three-dimensional IREN typology offers a novel approach for characterizing human–nature relationships that can be applied to any entity and context. Its dimensions can serve as indicators for potential inequalities in the distribution of NCP impacts on quality of life, for societal conflict potential and for (mis-)alignment of behaviour with conservation and sustainability goals. The distinction of voluntary versus involuntary and univalent versus multivalent types can inform researchers and practitioners whether prevalent behaviour is rooted mainly in goal-oriented or moral motives, or rather caused by implementation barriers. Thus, it can assist the development of tailored, more effective strategies for fostering sustainable human behaviour.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTIONS

L.L. developed the IREN conceptual framework and typology, created the figures and wrote a first draft of the manuscript with help from T.M.; U.A., K.B.-G., S.D., J.A.G. and T.M. provided critical input and contributed to the writing of later manuscript versions. All authors approved the final version of the manuscript.

DATA AVAILABILITY STATEMENT

Our manuscript does not use any data.

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